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3-1993

South Dakota State University Graduate School Bulletin 1992-1994

South Dakota State University

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Graduate School Bulletin
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Campus Map</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>University Calendars</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>About The Graduate School</strong></td>
<td>5</td>
</tr>
<tr>
<td>Board of Regents</td>
<td>5</td>
</tr>
<tr>
<td>Graduate Council</td>
<td>5</td>
</tr>
<tr>
<td>Administration</td>
<td>5</td>
</tr>
<tr>
<td>Deans</td>
<td>5</td>
</tr>
<tr>
<td>General Information</td>
<td>5</td>
</tr>
<tr>
<td>Purposes</td>
<td>6</td>
</tr>
<tr>
<td>Accreditation</td>
<td>6</td>
</tr>
<tr>
<td><strong>The Graduate School</strong></td>
<td>7</td>
</tr>
<tr>
<td>Degrees and Fields of Study</td>
<td>7</td>
</tr>
<tr>
<td>Admission to the Graduate School</td>
<td>7</td>
</tr>
<tr>
<td>Registration</td>
<td>9</td>
</tr>
<tr>
<td>Course Restriction</td>
<td>9</td>
</tr>
<tr>
<td>Grades</td>
<td>10</td>
</tr>
<tr>
<td>Tuition and Fees</td>
<td>10</td>
</tr>
<tr>
<td>Student Responsibility</td>
<td>11</td>
</tr>
<tr>
<td>Degrees and Fields of Study</td>
<td>12</td>
</tr>
<tr>
<td>Masters Degrees</td>
<td>12</td>
</tr>
<tr>
<td>Doctor of Philosophy</td>
<td>14</td>
</tr>
<tr>
<td><strong>Courses of Instruction</strong></td>
<td>19</td>
</tr>
<tr>
<td>Course Numbering</td>
<td>19</td>
</tr>
<tr>
<td><strong>Faculty</strong></td>
<td>64</td>
</tr>
<tr>
<td>Graduate</td>
<td>64</td>
</tr>
<tr>
<td>Emeriti</td>
<td>70</td>
</tr>
<tr>
<td><strong>Index</strong></td>
<td>73</td>
</tr>
<tr>
<td><strong>Application for Graduate School</strong></td>
<td>75</td>
</tr>
</tbody>
</table>
Legend

1 Administration Building
2 Agricultural
Communications Center
3 Agricultural Engineering
4 Agricultural Hall
5 Agricultural Heritage Museum
6 Alvilda M. Sorenson Family
Resources and Management Center
7 Animal Disease Research and Diagnostic Laboratory
8 Animal Science Complex
9 Binnewies Hall
10 Biology Annex
11 Bio-Stress Laboratory
12 Brown Hall
13 Central Heating Plant
14 Communications Center
15 Coughlin-Alumni Stadium
16 Coughlin Campanile
17 Crothers Engineering Hall
18 Dairy Microbiology
19 DePuy Military Hall
20 Foundation Seed Conditioning Plant
21 Grove Commons
22 Guilford C. Gross Pharmacy Building
23 Hansen Hall
24 Harding Hall
25 Heat/Power Laboratory
26 H.M. Briggs Library
27 Horticulture - Forestry
28 Intramural Building
29 Larson Commons
30 Lincoln Music Hall
31 Mathews Hall
32 Medary Hall
33 Nursing - Home Economics
34 Physiology Laboratory
35 Pierson Hall
36 Plant Science Building
37 Plant Science Seedhouse
38 Printing and Journalism Building (includes U.S. Postal Service)
39 Pugsley Continuing Education Center
40 Rutunda for Arts and Science
41 Scobey Hall
42 Sexauer Field
43 Shepard Hall
44 Solberg Hall
45 South Dakota Art Museum
46 Stanley J. Marshall HPER Center
47 State Court
48 State Village
49 Sylvan Theatre
50 Tompkins Alumni Center
51 University Student Union
52 Waneta Hall
53 Wecota Hall
54 Wenona Hall
55 West Hall
56 Wildlife and Fisheries Sciences Building
57 Woodbine Cottage (President's Residence)
58 Young Hall
1992 FALL SEMESTER
1 day Registration, 71 Class Days, 1 Reading Day, 5 Exam Days)
August 31, Monday ........................................... Registration and Orientation
September 1, Tuesday ........................................... Instruction Begins
September 7, Monday ........................................... Labor Day—HOLIDAY
September 15, Tuesday ........................................... Last day to drop or add a course and adjust final fees
September 22, Tuesday ........................................... Last day to submit graduation application for Fall 1992
October 3, Saturday ........................................... Hobo Day (Homecoming)
October 12, Monday ........................................... Native American Day—HOLIDAY
October 13, Tuesday ........................................... Monday Classes
October 15, Thursday ........................................... "W" Grade Begins
October 22, Thursday ........................................... First half Fall semester ends
October 27, Tuesday ........................................... Deficiency reports due to Registrar by 5:00 p.m.
November 10, Tuesday ........................................... Last day to drop a course
November 11, Wednesday ................................... Veterans Day—HOLIDAY
November 26-27, Thursday-Friday .................. Thanksgiving Recess
December 12, Saturday ........................................... Graduation, 10:00 a.m.
December 15, Tuesday ........................................... Last day of classes, Fall 1993
December 17, 18, 21, 22, Thursday, Friday, Saturday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday ........................................... Final Examinations
December 28, Monday ........................................... Grades due to Registrar not later than 5:00 p.m.

1993 SPRING SEMESTER
(1 day Registration, 73 Class Days, 5 Exam Days)
January 13, Wednesday ........................................... Registration and Orientation
January 14, Thursday ........................................... Instruction begins
January 18, Monday ........................................... Martin Luther King, Jr—HOLIDAY
January 28, Thursday ........................................... Last day to drop or add a course and adjust final fees
February 10, Wednesday ........................................... Last day to submit graduation application for Spring 1993
February 15, Monday ........................................... Presidents Day—HOLIDAY
February 16, Tuesday ........................................... Monday Classes
March 1, Monday ........................................... "W" Grade Begins
March 8-12, Monday-Friday ................................... Spring Break
March 16, Tuesday ........................................... First half Spring Semester ends
March 19, Friday ........................................... Deficiency reports due to Registrar by 5:00 p.m.
April 5, Monday ........................................... Last day to drop a course
April 9-12, Friday-Monday ................................... Easter Recess
April 15, Thursday ........................................... Monday Classes
May 7, Friday ........................................... Last day of classes, Spring 1993
May 8, Saturday ........................................... 107th Annual Commencement, 10:00 a.m.
May 10-14, Monday-Friday ................................... Final Examinations
May 19, Wednesday ........................................... Grades due to Registrar by 5:00 p.m.

FALL SEMESTER 1993
(1 day Registration, 72 Class Days, 1 Reading Day, 5 Exam Days)
August 30, Monday ........................................... Registration and Orientation
August 31, Tuesday ........................................... Instruction Begins
September 6, Monday ........................................... Labor Day—HOLIDAY
September 14, Tuesday ........................................... Last day to drop or add a course and adjust final fees
September 21, Tuesday ........................................... Last day to submit graduation application for Fall 1993
October 11, Monday ........................................... Native American Day—HOLIDAY
October 12, Tuesday ........................................... Thursday Classes
ABOUT THE GRADUATE SCHOOL

BOARD OF REGENTS
HONORABLE JAMES HART ................. Miller
(Term expires March 31, 1998)
HONORABLE DR. KARL WEGNER ........... Sioux Falls
(Term expires March 31, 1998)
HONORABLE ROBERT BRANCEL .......... Pierre
(Term expires March 31, 1997)
HONORABLE MAX GRUENWALD .......... Milbank
(Term expires March 31, 1997)
HONORABLE MARGIE PHILLIPS ......... Madison
(Term expires March 31, 1997)
HONORABLE THOMAS OLSEN .......... Wessington Springs
(Term expires March 31, 1996)
HONORABLE CATHY HALL ............. Aberdeen
(Term expires March 31, 1993)
HONORABLE PAT LEBRUN ........... Rapid City
(Term expires March 31, 1993)
HONORABLE CHARLES A. RITTER .... Parkston
(Term expires July 1, 1994)

GRADUATE COUNCIL
DEAN CHRISTOPHER P. SWORD .... Dean, Graduate School, Chairman
DR. VIRGINIA CLARK ....... Dean, College of Home Economics, (Education and Counseling) Term expires 1993
DR. SHARON CLAY .......... Assistant Professor of Plant Science (Plant Sciences) Term expires 1993
DR. DONNA J. HESS ........... Professor of Rural Sociology (Social Services) Term expires 1995
DR. MICHAEL HILDRETH ....... Associate Professor of Biology, (Biological Sciences) Term expires 1995
DR. JAMES E. LIDSTONE ........ Associate Professor of HPER (Health Services) Term expires 1995
DR. JOEL RAUBER, ............ Associate Professor of Physics (Physical Sciences) Term expires 1993
DR. MARY RYDER ............ Assistant Professor of English, (Humanities) Term expires 1994
DR. DAVID SCHINGOETHE ....... Professor of Dairy Science (Animal Sciences) Term expires 1994
DR. VERNON SCHAEPFER .... Associate Professor of Civil Engineering; Acting Director of NGPWRRC (Engineering Sciences) Term expires 1994
DR. LEON RANEY ............ Dean of the Libraries Professor of Library Science, Ex Officio

ADMINISTRATIVE LISTING
ROBERT T. WAGNER .......... President, Professor of Rural Sociology; Ph.D., South Dakota State University, 1972
CAROL J. PETERSON .......... Vice President for Academic Affairs, Professor of Nursing, Ph.D., University of Minnesota, 1969
RICHARD W. POWERS .......... Vice President for Administration; Ph.D., Indiana University, 1969

DEANS
CHRISTOPHER P. SWORD ......... Dean of the Graduate School, Director of Research, Professor of Microbiology; Ph.D., University of California, 1959
DAVID BRYANT ................. Dean, College of Agriculture and Biological Sciences; Professor of Animal and Range Sciences; Ph.D., University of Arizona, 1971
HERBERT CHEEVER .......... Acting Dean, College of Arts and Science; Professor of Political Science; Ph.D., University of Iowa, 1967
DARRELL JENSEN .......... Dean, College of Education and Counseling, Professor of Education; Ph.D., University of Iowa, 1971
DUANE E. SANDER .......... Dean, College of Engineering, Professor of Electrical Engineering, Ph.D., Iowa State University, 1964
VIRGINIA CLARK ............ Dean, College of Home Economics; Professor of Home Economics Education; Ph.D., Pennsylvania State University, 1984
MARY ADAMS ............ Acting Dean of the College of Nursing, Professor of Nursing; Ph.D., University of Minnesota, 1962
BERNARD E. HIEBRINK ... Dean of the College of Pharmacy, Professor of Pharmaceutical Sciences; Ph.D., University of Chicago, 1961

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 nine members elected from the Graduate Faculty assists the Graduate Dean. The council includes: The Graduate Dean (chairman); one member from the following areas: Plant Sciences, Animal Sciences, Biological Sciences, Engineering Sciences, Physical Sciences, Health Sciences, Education and Counseling, Social Sciences and Humanities. The Dean of the Library serves as an ex officio member.

The Graduate Faculty is composed of the University President, Vice President for Academic Affairs, Vice President for Administrative 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 advisor to graduate students or on their examining committee 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 Director of Summer School.

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 and the Midwestern Association of Graduate Schools.

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 College of Nursing is accredited by the National League for Nursing.

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 University also holds membership in the American Council on Education, the National Association of State Universities and Land-Grant Colleges, 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.
THE GRADUATE SCHOOL

I. The Graduate School

A. Degrees and Fields of Study

1. Master's Degrees

   Master of Science, Master of Arts, Master of Science Teaching and Master of Education degrees are offered. For a listing of majors within each degree, and for thesis and non-thesis options with requirements and procedures, see page 14.

2. Doctor of Philosophy Degree

   The Doctor of Philosophy Degree is offered with majors in Agronomy, Animal Science, Biological Science (offered in the departments of Animal and Range Sciences, Biology and Microbiology, Plant Science, Veterinary Science, and Wildlife and Fisheries Sciences), Chemistry and Sociology. The Doctor of Philosophy in Agricultural Engineering is available through a cooperative program with Iowa State University.

B. Admission to the Graduate School

1. General Procedure

   Students must be admitted to the Graduate School before enrolling in any graduate course, whether or not they are pursuing an advanced degree. A completed application must be filed with the Graduate School at least 15 days before the beginning of the first term of graduate work. Students taking only Lifelong Learning and Outreach classes or applying only for Special Student (non degree) status are exempt from the prior admission requirement, but must complete an application and be admitted to Graduate School. The application procedure includes the following:

   a. A completed form supplied by the Graduate School must be submitted and accompanied by a non-refundable application fee of $15. Former students who have attended a state institution in South Dakota and paid an application fee are exempt from the fee.

   b. Official transcripts of all undergraduate and graduate course work must be sent to the Graduate School as a part of the application, except for South Dakota State University graduates who do not intend to pursue an advanced degree and non-degree students who are graduates of other institutions and intending to enroll for 10 credits or less. If application is made before the Bachelor's degree is completed, an incomplete transcript must be filed followed by a completed transcript during the first term of graduate work. International students who cannot provide original transcripts may submit notarized or certified copies at the time of application, followed by completed transcripts and certification of degree awarded, as soon as the bachelor's degree is completed.

   c. Two letters of recommendation, written on forms supplied by the Graduate School, from persons acquainted with the academic ability and professional competency of the applicant should be sent directly to the Graduate School. This requirement may be waived by the Dean of the Graduate School on recommendation of the department.

   d. Students from foreign countries should submit their applications at least four months before registration. The application must include:

      1) The results of the Test of English as a Foreign Language (TOEFL). A score of 500 or above is required. Individual departments may require higher TOEFL scores. An institutional language proficiency examination (written and oral) is given after arrival and students who do not possess satisfactory language skills may be required to enroll in remedial courses. Remedial courses may not be used toward a graduate degree and require separate tuition payment.

      2) Evidence of available financial support for at least the first year of academic work.

      3) A statement concerning whether any financial assistance from this institution will be necessary to pursue the degree.

      4) Documents for entry into the U.S. will be issued by the International Student Affairs Office after completion of the application and academic admission is complete.

   e. Completed physical health evaluation form. A physical evaluation report, filed with the Health Service, is required of all students, except those enrolled as undergraduates at South Dakota State University during the previous year.

   After an application for admission and supporting documents are received by the Graduate School, they are reviewed by the department concerned. Using the recommendations from the department, the Dean of the Graduate School acts on the application and notifies the applicant, the department and/or committee concerned.

2. Requirements for Admission

   a. Baccalaureate Degree

      Admission to the Graduate School requires that the applicant be a graduate of an institution of higher learning. The institution must be one of recognized standing (regional accreditation) whose requirements are substantially the same as those of the department(s) of South Dakota State University in which the advanced degree will be taken.

   b. Graduate Record Examination

      Submission of the results of a Graduate Record Examination is not a requirement for admission to the Graduate School; the following programs require that scores be submitted: Health, Physical Education and Recreation, Biology, Microbiology, and Nursing. Departments should be consulted for specific requirements. The Graduate Record Examination is strongly recommended for students applying for admission to Wildlife and Fisheries programs.

   c. Departmental Requirements

      Individual departments may have additional admission requirements. Applicants should inquire about such requirements from the department of interest.
3. Admission Status

a. Unconditional Admission
An applicant may be admitted without condition if a Bachelor's degree has been earned, all undergraduate prerequisites for major and minor fields of study satisfactorily completed, and the applicant had an average 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. Applicants with less than 3.0 but 2.75 or above grade point average may also be considered for unconditional admission if other aspects of their academic and/or professional record indicate superior performance and potential.

Admission to all degree programs is competitive and limited by the availability of personnel, facilities and funding necessary to provide quality graduate education within each program.

b. Conditional Admission
Conditional admission may be granted if:
1) The applicant meets the requirements for unconditional admission for the last three semesters but has not completed the last semester of undergraduate study. Admission is conditional until the Bachelor's degree is granted, or
2) The applicant lacks prerequisite undergraduate courses specified by the major department. Admission is conditional until these courses have been completed to the satisfaction of the department. These courses cannot be used on the graduate Plan of Study, or
3) The applicant has a grade point average, between 2.5 and 3.0 for the junior and senior years.
4) Students admitted conditionally with less than a cumulative or junior-senior grade point average of 2.75 must complete a minimum of 10 graduate credits with grades of "B" or above before coming eligible for a graduate assistantship.

A student admitted conditionally must satisfy any conditions within the first year after admission. Departments will assign advisers to such students. Failure of a student to fulfill the above conditions or to do satisfactory graduate work at any point in his/her program is sufficient grounds for dismissal or reclassification as a Special Student (nondegree student).

Students with a junior-senior grade point average above 2.75 and who have pass-fail (or equivalent) grades shall have instructors for such courses furnish letter grades or shall furnish satisfactory Graduate Record Examination scores.

c. Special Student (nondegree)
Students not meeting the above admission requirements, those initially enrolled only in evening Lifelong Learning and Outreach, or Adult Education classes, those not working toward a degree may be granted admission and take courses as Special Students. Special Students may not receive Graduate Assistantships or enroll for thesis credits. The Graduate Dean will act as adviser for these students unless they are assigned to a department advisor. No more than ten credits under Special Student status may be applied toward a degree.

4. Change of Admission Status
Students with Special Student status may request and be granted a change in status to work toward a degree, provided ten credits of graduate work have been completed with grades of "B" or better. The request must include complete official transcripts and application fee if these have not been supplied previously. This request should be submitted to the Graduate School, after which it will be submitted to the appropriate department for a recommendation and processed as other applications.

5. Readmission
Students formerly enrolled as graduate students at South Dakota State University (who interrupt continuous registration) should apply for readmission at least one month prior to registration. Forms for this purpose can be obtained from the Graduate School. Official transcripts for graduate work taken at other institutions since enrollment at South Dakota State University must be furnished. Graduate School rules and regulations in effect at the time of readmission apply to students who are readmitted. The Graduate School or graduate program may require applicants for readmission to update their application file or to complete a new application including current references if required by the program.

A personal interview with the head of the major department should be arranged prior to registration.

6. Postdoctoral Study
Postdoctoral 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 approval of the Head of the Department, Dean and/or Director concerned.
C. Registration

Admitted graduate students should report at the place and time indicated in the semester schedule to receive registration materials and instructions.

1. Normal and Maximum Credit Loads

Minimum credit loads for the full-time student, including workshops, are 9 credits per semester during the academic year for master's students and 7 credits for doctoral students, 3 credits during the four-week and 6 credits during eight-week summer session. The maximum credit load for graduate assistants is as follows:

Maximum credits assistant may carry during the:

<table>
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<tr>
<th>Academic Year</th>
<th>Summer Session</th>
</tr>
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<tbody>
<tr>
<td>One-fourth time assistant</td>
<td>30</td>
</tr>
<tr>
<td>One-half time assistant</td>
<td>22</td>
</tr>
<tr>
<td>Three-fourths time assistant</td>
<td>15</td>
</tr>
</tbody>
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In calculating credit loads, audit courses and undergraduate courses, are included at full value for Graduate School, but are not allowable for loan deferral, full and part-time certification, or financial aids disbursement. Graduate assistants must be registered for at least one credit each semester during the academic year to hold graduate assistantship.

2. Converted Credits

Courses numbered 300-499 are considered to be advanced undergraduate credits and may be used in graduate programs with the following provisions:

a. Total credit for courses in this series, when applied to a graduate program, will be valued at 80 percent by discarding all fractions. After such conversion, these credits are defined as "converted credits," which may be used as graduate credit in meeting the requirements for the various degrees, provided a grade of at least "B" is obtained in each course in this series. For example, if eight credits are earned in this series, they would be equivalent to six graduate credits.

b. Courses used for converted credit must be taken during the period the student is a graduate student at this institution.

c. 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. Converted credits are usually not permitted in the Master of Science Teaching degree.

d. For the Doctor of Philosophy degree, no more than ten converted credits may be applied to the graduate program. They may be applied in the major, minor, or supporting course areas.

e. Transfer credits may not be converted.

f. Converted credits may be applied to a graduate program only with the permission of the major adviser or Advisory Committee, and Dean of the Graduate School.

NOTE: When credits in the 300-499 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. The converted credit rule also applies to 500-series courses.


All graduate students who have completed the thesis or dissertation credits specified on their Plans of Study are required to register and pay for one credit of Thesis Sustaining 791 or Dissertation Sustaining 891 each semester during the academic year and Summer Session until the degree is awarded. Registration is the student's responsibility and must be completed and payment made prior to the 10th class day of the semester. Some programs also require sustaining registration in Research and similar enrollments until graduation.

4. Summer Sessions

Many departments offer graduate courses during the summer. For information concerning the courses to be offered, write the Director of Lifelong Learning and Outreach and request a Summer Session Bulletin.

D. Course Restrictions

1. Workshops

While any number of credits may be earned in workshops, no more than two such credits may be applied toward an advanced degree. Workshop notation on transcripts will be used for application of this limitation.

2. Problems Courses

No more than four credits in problems courses may be counted toward the Master of 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.

3. Correspondence Courses

Correspondence courses are not given at the graduate level at this institution and are not permitted on a student's Plan of Study. Generally courses delivered by television are considered to be correspondence courses, with the exception of two-way interactive television offered by this institution.

4. Lifelong Learning & Outreach and Evening Students

Graduate students enrolling in Lifelong Learning & Outreach or evening classes will ordinarily be admitted as Special Students. Students must possess a bachelor's degree to enroll and receive credit for graduate courses.

5. Transfer of Credits

Graduate credits earned while in residence at other institutions may be applied toward an advanced degree if they were awarded a grade of at least "B", and if they are approved by the Advisor or Advisory Committee and the Dean. Transfer credit is limited to Graduate credit as defined by the institution issuing the transcript. Transfer credits cannot substitute for credits required for minimum residence (See Residence and Credit Requirements). Requests for transfer of credits are usually made at the time a Plan of Study is approved and must be supported by an official transcript filed with the Graduate School. For the Master's degree transfer credits are limited to 7 credits in the major and 3 credits in the minor or supporting area.

Transfer credit is not permitted for courses taken by correspondence. Independent Study, Readings' courses, Continuing Education, or Extension courses may be approved for transfer if they are regularly listed in the graduate bulletin of an accredited institution and were
taught by members of the Graduate Faculty of such institution. Subtitles or explanatory information will be required for approval of Independent Study and Readings' Courses. Transfer credit is generally not permitted for work from foreign institutions.

6. Graduate Credit for Seniors
Seniors within 15 credits of completing a Bachelor's degree at South Dakota State University may request permission from the Dean to take up to 6 credits of 600 level courses for graduate credit. Permission requires the student to have a grade point average of at least 2.5, or a junior-senior grade point average of 3.0 or higher and to enroll for not more than 18 credits (9 credits during summer school). Forms for requesting permission to take courses for graduate credit may be obtained from the Graduate School. The student must be admitted as a special student and must register for the course at the graduate level.

7. Graduate Study by University Staff
Staff members with the rank of Assistant Professor or above may not work toward an advanced degree at this institution, but all staff members may take graduate courses for credit with permission from the Department Head, Dean and/or other required authorization. A Graduate application should be completed. An "Application for reduced tuition" form, which may be obtained from the Personnel Office, should be completed and returned to the Personnel Office before registration.

Staff members below the rank of Assistant Professor who intend to work toward a degree at this institution must follow the regular process for admission to the Graduate School (Section 1B 1).

Full-time members of the research, instructional, or extension staffs may enroll for a maximum of 12 credits during the calendar year, with a maximum of seven in any one semester and two during the Summer Session. Staff must pay the application fee.

E. Grades
The student must maintain a "B" average (3.0) in all courses in the graduate program. No credit is given toward a graduate degree for any grade below "C" in 600 or 700 level courses, or below "B" in 300, 400, or 500 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.

Graduate students usually register for thesis or dissertation credit during several semesters. An "in progress" (IP) is given until satisfactory completion of the thesis and final oral examination. The advisor, upon satisfactory completion of the thesis or dissertation and final oral, will then assign a satisfactory grade (P) for all thesis or dissertation credit by notifying the Registrar. If not satisfactory, a grade of unsatisfactory (F) is given. This grading procedure also applies to Research and Design Papers.

For Seminars, a letter grade or a grade of Satisfactory (P) or Unsatisfactory (F) may be assigned at the discretion of the instructor.

When a graduate student is given an Incomplete grade (I) for any other course in the student's graduate program the instructor may indicate in writing to the student what additional work must be completed and may establish a date at which such work must be completed. A copy of this information must be filed with the Graduate School. If the work is not completed in either the manner or time prescribed, the instructor may change the Incomplete grade to whatever grade is justified as an evaluation of the student's work or may allow the grade to remain Incomplete. Incomplete grades given without this procedure will remain as Incomplete on the student's record unless changed because of completion of the remaining work in the course.

F. Tuition and Fees*

1. Academic Year
   Application fee (new students only)..........................$15.00
   + Tuition per credit hour, undergraduate resident .........43.00
   + Tuition per credit hour, undergraduate non-resident 100.40
   + Tuition per credit hour, graduate resident .................64.15
   + Tuition per credit hour, graduate non-resident ...........128.85
   General Activity fee (waived for faculty and staff completing proper forms from Personnel Department, but not for Graduate Assistants) per credit ........................11.70
   General Instruction Administrative Fee per credit ...........15.30
   General University Deposit fee (refundable) ..................60.00
   Engineering Education Fee per credit .......................10.50
   Engineering/Science Lab fees (per course) ...................15.00
   International Student fee (new international students only) .........75.00
   * Subject to change by action of The Board of Regents
   + Graduate Assistants, Fellows and Trainees on contract with the University pay one-third the resident tuition per credit.
   Students who are 65 or older pay one-fourth tuition.

2. Fees for Auditing Courses
   Regular tuition per credit will be charged for auditing a course. Faculty, fellows, graduate assistants, research and teaching assistants will not be charged tuition to audit a course (State Support Courses Only) but will be assessed general university/activity and instructional fees, and course related fees. Registration as an auditor is by add slip after registration day. Grades will be designated by the instructor as AUP or AUF. Please check the SDSU Semester Schedules for more information.

3. General Deposit
   All students enrolled in 9 or more credits or living in a residence hall must pay a $60.00 deposit to defray charges for damage of laboratory equipment or supplies, or housing facilities. Library and vehicle fines or special service fees may be assessed against this deposit. The balance at the beginning of any semester must be $60.00 and appropriate charges will be assessed at final fee payment to reinstate the balance. Any remaining balance is refundable.

4. Thesis and Dissertation Fees
   Master's students must pay a fee to the Library to cover the cost of binding four thesis copies. This must be done before the Graduate School will accept the manuscript in final form.

   Doctor of Philosophy students must pay for binding four copies of the dissertation, microfilming and publishing the abstract in "Dissertation Abstracts." This does not include Registration of Copyright, reprint costs or other incidental fees. The fee must be paid to the Graduate School when submitting the final copies of the dissertation.
5. Summer Sessions
See Summer Session catalog for tuition and fees.

G. Student Responsibility
Before a degree is granted, the student must meet all the requirements of the Advisory Committee, the Major Department and the Graduate School. Students should note that graduate studies represent advanced work and research in a discipline or interdisciplinary area and should be more than a compilation of course work. Students are responsible for conforming to all published academic policies and degree requirements. They are likewise responsible for the regulations concerning the degree they plan to obtain and any special requirements within the department or academic unit. In addition, it is the student’s responsibility to conform to the University’s policies regarding the standard of work necessary to maintain enrollment in the Graduate School.

H. Other Information
1. Fellowships and Assistantships
A number of fellowships and research and teaching assistantships are available to 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. A minimum undergraduate grade point average of 2.75 or completion of at least 10 credits of graduate credit with a grade point average of 3.0 is required for appointment as a graduate assistant.

2. Obligation Incurred in Accepting an Assistantship
The Graduate School of South Dakota State University 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 prospective graduate student, the student, having indicated acceptance before April 15, will have complete freedom through April 15 to submit in writing a resignation of the appointment in order to accept another scholarship, fellowship, traineeship or graduate assistantship. However, an acceptance given or left in force after April 15 commits the student not to accept another appointment without first obtaining formal release for the purpose. Students working on degree programs, including those on assistantships, are considered to have assumed an obligation to complete their graduate program before transferring to any other post baccalaureate or professional degree program.

3. Housing for Graduate Students
Prospective graduate students should inquire about rooms or apartments from the Director of Residential Life, well in advance of registration.

4. Living Costs
Living costs, including tuition and fees, for the single resident graduate student are estimated to be approximately $8,000 per academic year. Travel costs are not included.

5. International Students
International students should consult with the International Student Affairs Office concerning special requirements and additional expenses.

6. Filing a Graduation Application
The student must file a graduation application with the Graduate School by the date specified in the university calendar for the term in which completion of the advanced degree is expected. Failure to file this application will result in a delay in graduation.

7. Attendance at Commencement
All students are urged to participate in the Commencement exercises at which their degree is to be granted. However, attendance is optional. Students must notify the Registrar of their intent to attend or not to attend on a card mailed to them shortly before Commencement. Diplomas will be mailed approximately three months after Commencement.

8. Cap, Gown and Hood
Caps, gowns and hoods for Commencement may be obtained from the University Bookstore.
II. Degrees and Fields of Study
A. Master's Degrees
1. Degrees and Options
The Master of Arts, Master of Science, Master of Education and Master of Science Teaching degrees are offered with the majors shown below. Some majors offer thesis option A only, others have non-thesis options B or C as well. Master of Education degrees are offered only with non-thesis options B or C. Requirements for each option are given in Section II A 5.

<table>
<thead>
<tr>
<th>Major</th>
<th>Degree</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Education</td>
<td>M.Ed.</td>
<td>B C</td>
</tr>
<tr>
<td>Agricultural Engineering</td>
<td>M.S.</td>
<td>A B</td>
</tr>
<tr>
<td>Agronomy</td>
<td>M.S.</td>
<td>A B</td>
</tr>
<tr>
<td>Animal Science</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Biology</td>
<td>M.S., MST***</td>
<td>A B C</td>
</tr>
<tr>
<td>Chemistry</td>
<td>M.S., MST***</td>
<td>A C</td>
</tr>
<tr>
<td>Counseling, and Human Resource</td>
<td>Development</td>
<td>M.S.</td>
</tr>
<tr>
<td>Curriculum &amp; Instruction</td>
<td>M.Ed.</td>
<td>A B C</td>
</tr>
<tr>
<td>Dairy Science</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Economics</td>
<td>M.S.</td>
<td>A B</td>
</tr>
<tr>
<td>Economics, J.D./M.S.**</td>
<td>M.S.</td>
<td>A B</td>
</tr>
<tr>
<td>Educational Administration</td>
<td>M.Ed.</td>
<td>A B C</td>
</tr>
<tr>
<td>Engineering*</td>
<td>M.S.</td>
<td>A B C</td>
</tr>
<tr>
<td>English</td>
<td>M.A.</td>
<td>A</td>
</tr>
<tr>
<td>Entomology</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Geography</td>
<td>M.S.</td>
<td>A B</td>
</tr>
<tr>
<td>Health, Physical Education and Recreation</td>
<td>M.S.</td>
<td>A B C</td>
</tr>
<tr>
<td>Home Economics</td>
<td>M.S.</td>
<td>A B C</td>
</tr>
<tr>
<td>Industrial Management</td>
<td>M.S.</td>
<td>A B C</td>
</tr>
<tr>
<td>Journalism</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Mathematics</td>
<td>M.S., MST***</td>
<td>A B C</td>
</tr>
<tr>
<td>Microbiology</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Nursing</td>
<td>M.S.</td>
<td>A B</td>
</tr>
<tr>
<td>Plant Pathology</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Physics</td>
<td>MST***</td>
<td>C</td>
</tr>
<tr>
<td>Rural Sociology</td>
<td>M.S.</td>
<td>A B</td>
</tr>
<tr>
<td>Speech</td>
<td>M.A.</td>
<td>A</td>
</tr>
<tr>
<td>Wildlife and Fisheries Sciences</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Wildlife Option</td>
<td>M.S.</td>
<td>A</td>
</tr>
<tr>
<td>Fisheries Option</td>
<td>M.S.</td>
<td>A</td>
</tr>
</tbody>
</table>

* M.S. in Engineering is available with emphasis in Agricultural Engineering, Civil Engineering, Computer Science, Electrical Engineering, Mechanical Engineering, and Physics.
** (Agricultural emphasis) See page 28.
*** MST degree has majors in biology, chemistry, mathematics and physics.

The major fields shown with the exception of Nursing may be selected as minor fields. In addition, Botany, Gerontology, History, Political Science, Mechanized Agriculture (Agricultural Engineering Department) Music or Planning may result in disapproval of courses taken prior to approval. After approval, changes in the Plan of Study must be requested on a form furnished by the Graduate School, approved by the Advisory Committee and the Dean of the Graduate School.

2. Admission
Applicants must meet the requirements for admission to the Graduate School as listed in section 1 B.

3. Advisory Committee
As a minimum, the Advisory Committee will be composed of the major advisor (Graduate Faculty member), the minor advisor (Graduate Faculty member), an additional member of the major department, and a Graduate Faculty representative (appointed by the Graduate Dean and representing the Graduate Faculty). The major advisor should be chosen or assigned by the head of the major department. Following selection by the student and recommendation of the major advisor, the Advisory Committee should be appointed by the Dean of the Graduate School as soon as practical after starting work on the graduate program.

The Advisory Committee is responsible for assisting the student in developing a suitable graduate program, providing continuing guidance and counsel and certifying the completion of the degree requirements to the Dean of the Graduate School. The Advisory Committee approves the Plan of Study and any revisions of it, approves the thesis proposal (in options requiring one of these), conducts the examinations appropriate to each option, supervises the validation of courses and ensures that professional standards have been met in completing the degree requirements.

4. Plan of Study
During the first semester of graduate work and no later than the end of the first year, the Plan of Study should be prepared on the appropriate form and approved by the Advisory Committee. After approval by the Advisory Committee, the Plan of Study will be submitted to the Dean of the Graduate School for approval. Courses for the major must be taken in the major department or in related fields. At least 50% of the credits on a Plan of Study must be in courses open only to graduate students (700-series or above). Failure to submit a Plan of Study may result in disapproval of courses taken prior to approval. After approval, changes in the Plan of Study must be requested on a form furnished by the Graduate School, approved by the Advisory Committee and the Dean of the Graduate School.

5. Requirements by Option, semester hours

<table>
<thead>
<tr>
<th>Options</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum total</td>
<td>30</td>
<td>32</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Minimum major, including thesis or research problem**†</td>
<td>19</td>
<td>19**</td>
<td>19**</td>
<td></td>
</tr>
<tr>
<td>Thesis</td>
<td>5-7</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Research Problem</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Minimum minor, or supporting courses from two or more disciplines***††</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

† Consult CHIRD department for requirements.
* Consult major department for requirements.
** M.Ed. degree requires 21 credits for Option B, and 24 credits for Option C in the major.
***Courses in the major department may be used as supporting courses, providing they are considered sufficiently diverse by the major department.

NOTE: See separate listing for Master of Science Teaching requirements.

6. Minimum Residence Requirements
Residence is considered an essential component of a graduate program because it offers the student an opportunity to use and become familiar with library resources, a variety of graduate faculty and students, computer analysis, and statistical support.

The minimum residence requirement is 22 semester hours, including at least one semester or two summer sessions of graduate work spent on the Brookings campus or at an approved resident center. A resident center is an academic center recognized by South Dakota State University with
7. 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:

a. The grade point average is "B" or better in the major and "B" or better in the minor or supporting courses, and

b. Reasonable progress has been made in the research for the thesis, research report or design paper as applicable, and

c. An approved program of study is on file at the Graduate School, and

d. The major adviser recommends it.

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

8. Thesis

A thesis meeting the requirements of the major department and the Graduate School must be submitted by each student completing a Masters degree in those options requiring a thesis. The thesis must represent a scholarly contribution to research knowledge in the major field.

A research area for the thesis topic should be chosen after consultation with the major advisor as early in the student's program as possible. A written research plan must be approved by the Advisory Committee not later than the end of the second semester of graduate work. The thesis accounts for 5 to 7 semester hours in the major. The thesis may be prepared with a view to publication and conform to the style of one of the journals in the major field as required by the major department and must be prepared in the format required by the Graduate School as shown in "Instructions for Thesis and Research Reports" available from the Graduate School. The thesis should be a single document rather than a compilation of individual manuscripts.

Grades for thesis are submitted as In Progress (IP) until the oral examination. If the thesis is accepted by the examination committee, the major advisor and the Dean of the Graduate School, a grade of Satisfactory (P) is given for all thesis credits.

A copy of the thesis must be filed with the Graduate School for review at least ten working days (excluding Sundays and holidays) before the oral examination. The student should distribute one copy to each member of the advisory committee (including the Graduate Faculty Representative). Two copies (one on at least 50 percent rag content paper), corrected in accordance with suggestions by the advisory committee and the Graduate School, must be returned to the Graduate School with a receipt from the Library showing that the fee for binding for four copies of the thesis has been paid. This should be completed at least five days prior to commencement.


Students following Option B must complete at least two credits for a Research Problem (or Design Paper in Engineering) in the major field presented as a written report. The content, style and format of the report must meet the requirements of the major department. The Research Report (or Design Paper) must be approved by the Advisory Committee, and filed in the major department. A copy of the written report should be provided to each committee member and be available at the final oral examination. Grades of satisfactory (P) are given.

10. 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.

11. Examinations

a. Comprehensive

In those departments and options (academic programs) requiring a comprehensive written examination, the examination will be given by the Advisory Committee at least two weeks prior to the final oral examination, filed in the major department for review, and be present at the final oral examination. A comprehensive written examination is required of students on non-thesis Option C programs.

b. Final

An oral examination will be administered by the Advisory Committee covering the student's program. This examination should be comprehensive, testing the student's ability to analyze, integrate and apply knowledge from the discipline. This examination should occur at least ten working days (excluding Sundays and holidays) before commencement.

12. Time Limitation

a. Obsolete program

If the requirements for the Master's degree are not completed within six years from the time of admission to work toward the degree, a reconsideration of the student's program will be required and the rules of the Graduate School in effect at the beginning of the seventh year will apply.

b. Obsolete Coursework

Courses completed more than six years prior to completion of the requirements of the Master's degree and not part of a previous degree are regarded as obsolete coursework. Such courses may be used in the Master's degree program if validated. Validation is allowed at the discretion of the Advisory Committee and the department involved and can be accomplished by passing a written validation examination in the subject matter area.

Validation of obsolete coursework cannot exceed six graduate credits and must be certified by the Advisory Committee on a form prescribed by the Graduate School.
13. Checklist for Master's Degree

<table>
<thead>
<tr>
<th>Requirements</th>
<th>When Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Application for Admission to</td>
<td>One month before initial Graduate School registration</td>
</tr>
<tr>
<td>2. Designation of Major Advisor</td>
<td>Prior to registration for first semester or as soon as practical after starting program.</td>
</tr>
<tr>
<td>3. Designation of Advisory Committee</td>
<td>During first semester or as soon as practical after starting program.</td>
</tr>
<tr>
<td>4. Approval of Plan of Study by Advisory Committee</td>
<td>During second semester (Option A) or Research Problem Plan (Option B)</td>
</tr>
<tr>
<td>5. Approval of Thesis Proposal</td>
<td>After 20 graduate credits have been earned</td>
</tr>
<tr>
<td>6. Admission to Candidacy</td>
<td>During last semester of course work, at least two weeks before final oral examination where required</td>
</tr>
<tr>
<td>7. Comprehensive Written Examination</td>
<td>Within the first three weeks of last semester</td>
</tr>
<tr>
<td>8. Filing of Graduation Application</td>
<td>At least ten working days before final oral examination</td>
</tr>
<tr>
<td>9. Thesis (Option A) or Research Problem (Option B) submitted to Advisory Committee</td>
<td>At least ten working days before final oral examination</td>
</tr>
<tr>
<td>10. Thesis submitted to Graduate School (Option A)</td>
<td>At least ten working days before final oral examination</td>
</tr>
<tr>
<td>11. Request for Scheduling Oral Examination examination</td>
<td>At least ten working days before final oral examination</td>
</tr>
<tr>
<td>12. Final Oral Examination</td>
<td>At least ten working days before commencement</td>
</tr>
<tr>
<td>13. Corrected copies of Thesis submitted to Graduate School and Library (Option A) or Research Paper filed in major department (Option B)</td>
<td>At least five days before commencement</td>
</tr>
</tbody>
</table>

B. The Doctor of Philosophy Degree

1. Majors
The Doctor of Philosophy degree is offered with majors in Agronomy, Animal Science (offered in the Department of Animal and Range Sciences and in the Department of Dairy Science), Biological Science (offered in the departments of Animal and Range Sciences, Biology and Microbiology, Plant Science, Veterinary Science, and Wildlife and Fisheries Sciences), Chemistry and Sociology. The Doctor of Philosophy degree in Agricultural Engineering is offered through a cooperative program with Iowa State University.

2. Admission Requirements
Applicants for the Doctor of Philosophy degree will usually have a Masters degree. In those cases where applicants do not have a Master's degree, departmental requirements will apply, either requiring completion of a Master's degree or permitting an individual to move directly into a doctoral program.

3. The Advisory Committee
After consultation with the student, the head of the major department will designate a major advisor prior to first registration where practical. During the student's first semester in residence (or before the completion of 12 credits part-time) the major advisor will recommend to the Dean of the Graduate School members of an Advisory Committee as follows:

a. The major advisor who acts as chairperson of the committee
b. The head or representative of the major department or of a department in the area of the major;
c. An additional member of the major department or a related department, and
d. The minor advisor or a representative from an area where the supporting courses will be taken.

e. In addition, the Graduate School Dean will select a fifth member from a department representing an area not closely related to the major or minor department or supporting area. This member represents the Graduate Faculty, ensuring that its rules and regulations are followed by the Committee. The above five members shall be members of the Graduate Faculty. Additional members of the committee may be requested by the student or the major advisor and assigned to the committee by the Dean of the Graduate School.

The Advisory Committee is responsible for assisting the student in developing a suitable graduate program, providing continuing guidance and counsel, evaluating student progress and certifying the completion of the degree requirements to the Dean of the Graduate School. The Advisory Committee approves the Plan of Study and any revision(s) of it, approves the Dissertation Proposal, reviews the Dissertation, evaluates the student's progress, determines the student's proficiency with the research tools, conducts the comprehensive examinations and the final examination, supervises the validation of courses and ensures that professional standards have been met in completing the degree requirements.

4. Plan of Study
Within six weeks after appointment, the Advisory Committee will meet with the student to approve a Plan of Study and to consider a research area for the dissertation. The Plan of Study must be prepared on the appropriate form and approved by the Advisory Committee and the Dean of the Graduate School. Delay in submitting a Plan of Study may result in disapproval of courses taken prior to approval. The student cannot take the comprehensive written examination prior to approval of the Plan of Study. Changes in the approved Plan of Study must be requested on a form furnished by the Graduate School, and must be approved by the Advisory Committee and the Dean of the Graduate School.

5. Residence and Credit Requirements
a. Total
A minimum of three academic years of full-time work beyond the Bachelor's degree (minimum 90 semester credits) or a minimum of two academic years of full-time work beyond the Master's degree (minimum of 60 semester credits) are required for the Doctor of Philosophy degree. Where consideration is given to a master's degree it must be in the area of the major, minor or a related area, be an academic program from
a regionally accredited institution, and be declared at the time the Plan of Study is submitted. The Advisory Committee may require more credits than the minimum listed above if it believes the extra requirements are in the best interest of the student. The Research Tool requirements are in addition to this total.

b. The Major
At least 60 credits of the 90 or 40 of the 60 credits required for the degree must be earned in the major. Dissertation and transfer 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.

c. The Minor or Supporting Courses
At least 15 credits of the 90 or 10 of the 60 credits required for the degree must be earned in a minor or in supporting courses (coursework chosen from two or more fields). Transfer credits may apply. All courses applying in the minor or supporting fields must be taken outside the major department or area, unless courses in the major department are considered sufficiently diverse by the Advisory Committee.

d. Graduate Credit Requirement
At least 50% of the credits on a Plan of Study must be in courses open only to graduate students (700-series or above).

e. Residence Requirements
The minimum residence requirement is 50 credits, including two semesters spent on campus. Those on full time faculty appointment and graduate assistants may satisfy the residence requirements within one academic year.

f. Additional Requirements
The Advisory Committee may require more credits in residence than the minimum indicated above if they feel it is in the best interest of the student.

6. Research Tool Requirements
The Plan of Study must include development of proficiency with at least one research tool. Research tools are skills which are useful in advanced research in the major field, but which are not an integral part of the major or the minor fields (or supporting courses). Since relevant skills are involved, the number of credit hours cannot be specified, but generally will be equivalent to 8 to 10 credits of coursework. Each department, with the approval of the Graduate Council, shall specify the research tool requirements for students in its program. The Advisory Committee will determine that proficiency has been obtained and will certify completion of the Research Tool requirement on a form supplied by the Graduate School. Research tools that have been required frequently include foreign languages, statistics and computer programming. Credits earned in attaining proficiency with research tools may not be included in the degree program.

7. The Dissertation
a. Proposal
The student in consultation with the major advisor or dissertation advisor shall prepare a written dissertation proposal for approval by the Advisory Committee.

b. Requirements
The dissertation should represent at least one academic year of full time research (18-30 credits). Of no specific length, it should advance or modify knowledge in the major discipline and demonstrate the candidate's mastery of the subject. The dissertation should be prepared in the style of one of the journals in the major discipline as required by the Major Department and in the format required by the Graduate School as specified in "Instructions for Thesis and Research Reports". When submitted, it is accompanied by an abstract of no more than 350 words.

While the dissertation should be an integrated document providing opportunity for philosophic inquiry, the student is encouraged to develop one or more journal articles from it. Some departments may require that the journal articles be a part of the dissertation. However, the dissertation should be a single document rather than a compilation of individual manuscripts.

After the dissertation is approved by the major advisor or dissertation advisor, a copy is delivered to the Graduate School. After the dissertation is found acceptable in form by the Graduate School it is returned to the student who must distribute copies to the members of the Advisory Committee ten days (excluding Sundays and holidays) prior to the final oral examination.

After the final oral examination, all necessary corrections in the dissertation are made and four copies are delivered to the Graduate School (two copies for the Library, one for the department and one for the dissertation advisor). The cost for binding these copies is the responsibility of the student. The student must agree to the publication of the abstract and payment for publication of the abstract and microfilming of the dissertation.

8. Examinations
a. Interim Evaluation
Upon completion of approximately half of the coursework on the Plan of Study the Advisory Committee will meet to evaluate the progress of the student, provide advice and counsel, and recommend continuance or termination of the program. Since the Doctor of Philosophy is a terminal academic degree, evaluation of student performance includes an evaluation of progress in the program as well as academic perfor-
mance. The Advisory Committee may recommend to
the Dean of the Graduate School termination of the
student in the program.

b. Comprehensive Written and Oral Examinations
When coursework has been substantially completed
and the research tool requirement has been met, examina-
tions covering the coursework are taken. These
examinations are open for all members of the Graduate
Faculty to listen, but not participate in the questioning.
The first is a comprehensive written examination
which is followed on satisfactory completion by an
oral examination. These examinations are to test the
student’s knowledge and ability to integrate this
knowledge in both the major and minor (or supporting
courses) areas.

The Advisory Committee arranges for examinations
and conducts them at times approved by the Dean.
Review of the examination is accomplished by all
members of the Advisory Committee, the results are
reported to the Dean of the Graduate School on the
appropriate form and copies of the written examination
are filed in the major department. The comprehensive
examinations must be completed at least two months
before the final examination is taken. Upon satisfactory
completion of the comprehensive examination a student
is formally admitted to candidacy for the Ph.D.
degree.

c. The Final Examination
This examination is conducted by the Advisory Com-
mitee at a time and place announced by the Graduate
School. While the Advisory Committee determines
the character and length of the examination, sufficient time
should be devoted to the dissertation, including journal
articles to test the ability of the student to defend the
research. In addition, questions to test the student’s
general knowledge, judgement and critical powers are
usually asked. The final oral examination cannot be
taken earlier than two months following successful
completion of the comprehensive examinations and
must be completed ten days prior to commencement.

9. Dissertation Sustaining
After satisfactory completion of the dissertation require-
ments in the Plan of Study, a student must register
continuously each semester during the academic year and
summer session for Dissertation 891, until the degree is
awarded. Failure to do so will automatically terminate the
degree program. Reinstatement requires retaking the
Comprehensive Written Examination with performance
approved by the Advisory Committee. Registration is the
student’s responsibility and must be completed, and
payment made, prior to the 10th class day of the semester.

10. Time Limitation
a. Obsolete Program
If the Doctor of Philosophy degree is not completed
within eight years from the time of admission to work
toward the degree, a reconsideration of the student’s
program will be required. In such cases, the rules of the
Graduate School in effect at the beginning of the ninth
year will become effective for the student.

b. Obsolete Coursework
Courses completed more than eight years before
completion of the doctorate and not part of a previous
degree are regarded as obsolete coursework. Such
courses, may be used in the doctoral degree program if

validated. Validation is allowed at the discretion of the
Advisory Committee and department involved and can
be accomplished by passing a written validation exami-
nation in the subject matter area. Validation of obsolete
coursework cannot exceed six graduate credits and must
be certified by the Advisory Committee on a form
prescribed by the Graduate School. However, credits
earned as a part of a Master’s degree which is applied
toward the doctoral program remain valid and require no
validation.

11. Checklist for Doctor of Philosophy Degree

<table>
<thead>
<tr>
<th>Requirements</th>
<th>When Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Application for Admission to Graduate School</td>
<td>One month before first registration</td>
</tr>
<tr>
<td>2. Designation of Major Adviser</td>
<td>Prior to registration for first semester where practical</td>
</tr>
<tr>
<td>3. Designation of Advisory Committee</td>
<td>Within first semester of graduate work or prior to 12 semester hours of graduate work</td>
</tr>
<tr>
<td>4. Approval of Plan of Study by Advisory Committee</td>
<td>Within first semester of graduate work</td>
</tr>
<tr>
<td>5. Approval of Dissertation Proposal by Advisory Committee</td>
<td>Before beginning research</td>
</tr>
<tr>
<td>6. Interim Evaluation by the Advisory Committee</td>
<td>Not later than halfway through the coursework in the Plan of Study</td>
</tr>
<tr>
<td>7. Language Examination/Completion of Research Tools</td>
<td>Prior to comprehensive examination</td>
</tr>
<tr>
<td>8. Comprehensive Examinations, Candidacy for Ph.D. degree</td>
<td>Near completion of coursework and at least 2 months prior to final oral examinations</td>
</tr>
<tr>
<td>9. Filing of Graduation Application</td>
<td>Within the first four weeks of last semester</td>
</tr>
<tr>
<td>10. Dissertation Due at Graduate School and to Advisory Committee with request for scheduling Final Oral Examination</td>
<td>Not later than ten working days prior to final oral examinations</td>
</tr>
<tr>
<td>11. Final Oral Examination</td>
<td>No later than ten workingdays prior to commencement</td>
</tr>
<tr>
<td>12. Corrected Copies of Dissertation Due at Graduate School</td>
<td>Not later than five days prior to commencement</td>
</tr>
<tr>
<td>13. Arrangements for microfilming and binding of Dissertation</td>
<td>Not later than five days prior to commencement</td>
</tr>
</tbody>
</table>
COURSES OF INSTRUCTION

COURSE NUMBERING SYSTEM

300-499 series
Courses numbered 300-499 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 policy on converted credits (see C. 2, Page 4)

NOTE: When credits in the 300-499 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.

500-599 series
Courses numbered 500-599 are advanced undergraduate courses open to selected undergraduate students (Juniors and Seniors, only) having the necessary prerequisites. Such courses, except for fifth year pharmacy courses, may not be used as a requirement for the Bachelor's degree, but may serve as electives in an undergraduate program.

600-699 series
Courses numbered 600-699 are graduate level courses but are open to SDSU senior students for graduate credit if they meet the following requirements:

1. Within 15 credits of completing Bachelor's degree;
2. Have an overall grade point average of 2.5 or higher, or a Junior-Senior grade point average of 3.0 or higher
3. Enroll for no more than 18 credits (9 credits during Summer School).

These courses are approved as graduate credit and undergraduate students must meet the same level of performance as graduate students.

700-799 series
Courses numbered 700-799 are graduate level and are open only to graduate students.

800-899 series
Courses numbered 800-899 are doctoral and post doctoral level open only to doctoral students or those holding an earned doctoral degree.

900-999 series
Courses numbered 900-999 are post-baccalaureate and not for degree credit.

Abbreviations Used
Cr, Credit; P, Prerequisite; F, Fall semester; S, Spring semester; Su, Summer session. Other abbreviations explained in text.

DEPARTMENT OF AGRICULTURAL ENGINEERING

Associate Professor Ralph Alcock, Head;
Professors Chu, De Boer, M. Hellickson;
Associate Professors Froehlich, Werner;
Assistant Professor Anderson;
Emeriti Lytle, Moe, Wiersma

Graduate major offered:
Ph.D. in Agricultural Engineering—Cooperatively with Iowa State University.

Master of Science degree with major in Agricultural Engineering.

Master of Science in Engineering. The Agricultural Engineering courses listed below are also offered in support of the Master of Science in Engineering program (See College of Engineering).

Graduate minors offered:
Agricultural Engineering, Mechanized Agriculture.

Prerequisites for graduate study:
For the graduate majors a Bachelor of Science degree in engineering or its equivalent.

For the graduate minor prerequisites refer to the graduate courses selected.

Two Options for Master of Science Degree:
Option A requires a minimum of 30 semester credits, including a thesis and a comprehensive oral examination.

Option B requires a minimum of 32 semester credits, including a two-credit design paper and a comprehensive oral examination.

AGRICULTURAL ENGINEERING (AE)

603 Energy and Environment ........................3 (3,0) S 1993, F 1994
Analysis of world energy resources and their relation to land and water environments. Energy technology in fossil fuels and investigations of research and technologies of non-fossil fuels. Analysis of energy requirements for selected tasks and energy conversion techniques.

612 Advanced Agricultural Tractors and Machines ...........................................2 (2,0) S 1993, F 1994
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 321, and AE 464 or equivalent.

622 Bio-environmental Engineering ......2 (2,0) F 1992, S 1994
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 324.

633 Advanced Irrigation Engineering* ...3 (2,3) F 1993, S 1995
Basic soil-water-crop relationships. Theory and design of pumping plants, surface, sprinkle, and trickle irrigation systems. Design of pipe network distribution systems. P AE 434 or consent.

642 Engineering Phases of Crop Processing 2 (2,0) F 1993, S 1995
Study of physical properties of agricultural crops and engineering principles as they apply to cutting, shearing, collecting, packaging, transporting, drying, handling and storing of agricultural products. P, AE 444.
732 Advanced Hydrology in Agriculture...2 (2.0) F 1993, S 1995

733 Ground Water Engineering in Agriculture

752 Theoretical Micro-Climatology...2 (2.0) S 1993, F 1994
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 ground. P, Calculus, Physics, AE 353.

763 Instrumentation

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

771 Graduate Seminar
Discussion and reports of current topics and investigations in Agricultural Engineering. (Limit of 2 credits.)

772 Similitude*
A systematic approach to the principles and theory of dimensional analysis, problems of model design and test. The use of true, distorted and dissimilar models as they pertain to engineering design and research.

773 Programming Agricultural Systems...3 (2.2) S 1993, F 1994
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, CSci 213.

790 Thesis
Senior thesis research project. S-7 F S Su

DEPARTMENT OF ANIMAL AND RANGE SCIENCES

Professor James Males, Head;
Professors Costello, Emerick, Garner, Libal, Romans, Slyter;
Associate Professors Marshall, Miller, Pritchard, Pruitt;
Assistant Professors P. Johnson, McFarland;
Emeriti Briggs, Bush, Carlson, Dinkel, Embry, Kamstra, Kohler, Lewis, Luther, McCarty, McConic, Minyard, Morgan, Wahlstrom

Graduate majors offered:
Master of Science degree with a major in Animal Science. Doctor of Philosophy degree with majors in Animal Science and Biological Science (Separate listing). Research toward the graduate degrees in this department may be pursued in the areas of animal breeding, animal production (beef, sheep, swine) ruminant nutrition, swine nutrition, muscle biology, reproductive physiology, meat science and range management

Graduate minors offered:
Animal Science.

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. International students must have TOEFL score of 550 or above.

ANIMAL SCIENCE (AS)
691 Research Problems
Investigation of problems in the following areas with results submitted as a technical paper: Animal Breeding; Nutrition; Meats; Livestock Production; Range Management; Reproductive Physiology; Wool Technology; Poultry.

692 Special Topics
Course work specializing in a specific discipline. Will deal with machinery, or structures, or soil and water, or in-service teacher training for Vocational Ag teachers. P, Consent of instructor and department head.

693 Special Topics
Opportunity for qualified students to investigate special problems or carry out independent study under supervision of department staff. Objectives, scope of work, and plan of study specified by the professor and student(s). P, Consent of instructor and department head.

711 Ruminology
...3 (3,0) F Odd Years
See Dairy Science 711 for description.

712 Ruminant Nutrition
...3 (3,0) S

723 Population Genetics
...3 (3,0) S (Odd Years)
Genetic structure of populations, and forces affecting this structure. Theories of biological variation, race and species formation. P, Bio 371 or equivalent, Stat 641 or equivalent highly recommended.

731 Experimental Procedure
...2 (2,0) F (Odd Years)
Research methods and planning of experimental work, necessary records, interpretation of results and presentation of material. Introduction to research application of linear programming. P, Stat 641 or equivalent.
DEPARTMENT OF BIOLOGY/MICROBIOLOGY

Professor C.R. McMullen, Head;
Professors Chen, Granholm, L. Haertel, Hutcheson, Larson, G. Myers, Peterson, Sword, Westby, Whalen;
Associate Professors Gibbons, Hildreth, Kayongo-Male, Westfall;
Assistant Professors Cheesbrough, Hurley, Reese;
Emeriti Faculty: Benfield, Francis, Libal, Vickers (Vet Science), McFarland (ARS), West (Chem), and Riedell (NGIRLUSD);
Emeriti Baker, Huggins, Morgan, Pengra, Semeniuk, Taylor

Graduate major offered:
Master of Science degree in Microbiology, Master of Science degree in Biology with options in Biology, Botany and Zoology, or Master of Science Teaching. See pages 35, 56-57. Doctor of Philosophy degree in Biological Sciences. See page 14.

Graduate minors offered:
Microbiology, Biology, Botany or Zoology, the latter three require a minimum of 8 semester credits.

Prerequisites for graduate study:
For the graduate major in Biology a Bachelor’s degree, with at least 24 credits in biological sciences or consent. For the graduate major in Microbiology a Bachelor’s degree with at least a minor in Microbiology with supportive courses including two semesters of organic chemistry.

All applicants are required to take the Graduate Record Examination.

For the graduate minor in Biology, Botany, or Zoology, a Bachelor’s Degree with at least 6 credits in the appropriate field. For the graduate minor in Microbiology, a Bachelor’s degree including prerequisites for the graduate courses elected.

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

Two Options for Biology Master of Science Degree:

**Thesis Option:** This program requires a minimum of 30 semester credits including a thesis and comprehensive oral exams. The student may select breadth in coursework or specialize in certain areas such as botany, ecology, genetics, physiology, etc. Supporting courses are available from other biological science departments on campus.

**Non-thesis Option:** This program requires a minimum of 32 semester credits including 2 credits of Biology 793 “Biological Research Problems.” The student may select breadth in coursework from all levels of biological organization.

### DEPARTMENT OF BIOLOGY/MICROBIOLOGY

**BIOLOGY (Bio)**

**265 Biology of Aging** ........................................... 2 (2.0) S
Primarily human aging studied at the molecular, cellular, tissue, organ, and whole animal levels. Physical, sensory and physiological changes with age. Diseases of aging including arteriosclerosis, cancer and Alzheimer’s disease. Altered metabolism and dosage of drugs, aging as part of the entire life cycle. P, Zool 325 or Ch 260.

**653 Advanced Genetics** ........................................... 3 (3.0) F (Even Years)
Procedures in genetic studies as they relate to molecular and classical genetic applications. (Cross-listed PS 653.)

**662 Eukaryotic Molecular Biology** ............................. 3 (3.0) S
Molecular mechanisms for regulation of cellular and metabolic function in eukaryotes. P, Bio 343 or 371 and Chem 361 or Micro 436.

**695 Strategies in Science Teaching** ............................ 3 (3.0) F
Training in identifying and teaching certain processes deemed fundamental to science and scientific behavior.

**740 Metabolic Response to Environmental Stress** ............... 3 (3.0) F (Even Years)
Mechanism by which plants and animals respond to environmental stress at the molecular level. P, Bio 343 and Chem 361 or Micro 436.

**751 Biology of Algae** ........................................... 4 (2.6) F (Odd Years)
Physiology, ecology, taxonomy and evolution of algae. Laboratory includes identification and field and laboratory techniques. P, two years of biological science and one year of chemistry or consent.

**762 Eukaryotic Molecular Biology Laboratory** ................. 1 (0.3) S

**773 Cytogenetics** .................................................. 3 (2.3) F (Even Years)
A comprehensive study of genetic mechanisms that direct and regulate fundamental processes of animal and plant (eukaryote) development. Topics of discussion include but are not limited to: (1) Nature of eukaryote DNA as distinguished from prokaryote DNA, (2) Transcription, RNA processing, and post-translational modifications unique to developmental aspects of eukaryotes, (3) Molecular strategies of development, P, Bio 343, Bio 371, Zoo 383, Micr 436 or equivalent of above.

**775 Meat Science** .................................................. 3 (2.3) F (Even Years)

**781 Graduate Seminar** ........................................... 1(1,0) F
Reports and discussion of current research in animal science. Maximum of two credits for M.S. and four credits for Ph.D.

**790 Thesis, Master of Science** .................................. 5-7

**791 Thesis Sustaining** ........................................... 1

**890 Dissertation, Ph.D.** ........................................... 1-3 F Su
Investigation of problems in range science with results submitted as a technical paper.

**891 Dissertation Sustaining** ..................................... 1-3 F Su
Advanced study of one or more selected topics in range science.

**RANGE SCIENCE (Rang)**

**691 Research Problems in Range Science** ...................... 1-3 F Su
Investigation of problems in range science with results submitted as a technical paper.

**692 Special Topics** ............................................... 1-3 F Su

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Type</th>
<th>Credits</th>
<th>Prerequisites/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>780</td>
<td>Developmental Genetics</td>
<td></td>
<td>3 (3,0)</td>
<td>S</td>
</tr>
<tr>
<td>782</td>
<td>Special Problems</td>
<td>1-4 F S Su</td>
<td></td>
<td></td>
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<tr>
<td>790</td>
<td>Thesis in Biology</td>
<td></td>
<td>1-7</td>
<td></td>
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<tr>
<td>791</td>
<td>Thesis Sustaining</td>
<td></td>
<td>1</td>
<td></td>
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<tr>
<td>792</td>
<td>Graduate Seminar</td>
<td></td>
<td>1 (1,0)</td>
<td></td>
</tr>
<tr>
<td>793</td>
<td>Biological Research Problems</td>
<td></td>
<td>1-2</td>
<td></td>
</tr>
<tr>
<td>802</td>
<td>Morphology of Non-Vascular Plants</td>
<td></td>
<td>1-3 F (Odd Years)</td>
<td>Morphology has been defined as philosophical anatomy. This course will address comparative features of different plant forms in light of biological desert and consequent relationships. Non-vascular morphology (Bot 512/612) surveys diversities in the bacteria, algae, fungi, mosses and liverworts. To gain insight into and unity from, homeostasis and diversity through evolution. It may be taken for variable credit depending upon groups surveyed.</td>
</tr>
<tr>
<td>812</td>
<td>Morphology of Vascular Plants</td>
<td></td>
<td>3 (2,3)</td>
<td>S</td>
</tr>
<tr>
<td>715</td>
<td>Advanced Plant Ecology</td>
<td></td>
<td>4 (2,3)</td>
<td>S</td>
</tr>
<tr>
<td>727</td>
<td>Advanced Plant Physiology</td>
<td></td>
<td>4 (2,4)</td>
<td>S (Even Years)</td>
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<tr>
<td>730</td>
<td>Plant Molecular Biology</td>
<td></td>
<td>3 (3,0)</td>
<td>F (Odd Years)</td>
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<td>731</td>
<td>Plant Tissue Culture</td>
<td></td>
<td>3 (2,3)</td>
<td>F (Even Years)</td>
</tr>
<tr>
<td>782</td>
<td>Special Problems</td>
<td></td>
<td>1-4</td>
<td></td>
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<tr>
<td>794</td>
<td>Bio S 890 Dissertation Ph.D.</td>
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<td>1-7</td>
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<td>795</td>
<td>Bio S 891 Dissertation Sustaining</td>
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<tr>
<td>803</td>
<td>Bio S 892 Ph.D. Seminar</td>
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**BOTANY (Bot)**

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<th>Type</th>
<th>Credits</th>
<th>Prerequisites/Comments</th>
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<tbody>
<tr>
<td>612</td>
<td>Morphology of Non-Vascular Plants</td>
<td></td>
<td>1-3 F</td>
<td></td>
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<tr>
<td>613</td>
<td>Morphology of Vascular Plants</td>
<td></td>
<td>3</td>
<td></td>
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<tr>
<td>705</td>
<td>Aquatic Plants</td>
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**ZOOLOGY (Zool)**

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<th>Prerequisites/Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>723</td>
<td>Systemic Physiology Cross-listed Vet Sci</td>
<td></td>
<td>4 (3,5)</td>
<td>F</td>
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<tr>
<td>725</td>
<td>Systemic Physiology Cross-listed Vet Sci</td>
<td></td>
<td>4 (3,5)</td>
<td>S</td>
</tr>
<tr>
<td>782</td>
<td>Special Problems</td>
<td></td>
<td>1-4</td>
<td></td>
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**MICROBIOLOGY (Micro)**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Type</th>
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<th>Prerequisites/Comments</th>
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<tbody>
<tr>
<td>624</td>
<td>Virology</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>637</td>
<td>Systematic Bacteriology</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>692</td>
<td>Advances in Microbiology</td>
<td></td>
<td>1-4</td>
<td></td>
</tr>
<tr>
<td>713</td>
<td>Industrial Microbiology</td>
<td></td>
<td>4</td>
<td></td>
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<tr>
<td>738</td>
<td>Microbial Metabolism</td>
<td></td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>790</td>
<td>Thesis in Microbiology</td>
<td></td>
<td>5-7</td>
<td></td>
</tr>
<tr>
<td>791</td>
<td>Thesis Sustaining</td>
<td></td>
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<td></td>
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</tbody>
</table>

*Special Topics in Zoology* *Special Topics are taught as regular courses dependent upon student demand. Information about content, prerequisites and semester offered can be obtained from the department.*
Professor D. C. Hilderbrand, Head; Professors Emerick, Evenson, Fitzgerald, Gehrke, Grove, Hecht, Jensen, Kenefick, Palmer, Rue, Spinar; Associate Professors Houglum, Lewis, Matthees, West; Assistant Professors, McFarland, Rice, Utecht; Emeriti Brandwein, Halverson, Johnson, Klug, Olson, Wadsworth, Webster, Whitehead

Graduate majors offered:
Master of Science and Doctor of Philosophy degree with a major in Chemistry and Master of Science Teaching. See pages 55-56, 57-58.

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 selected.

CHEMISTRY (Chem)

616 Chemical Literature .................................. 3
The course will present methods of searching the chemical literature including patents and government documents. Emphasis will be placed on both traditional and computer assisted literature search procedures.

622 Advanced Organic Chemistry .......................... 3 (3,0)
Review and discussion of nomenclature, stereochemistry, resonance theory, equilibria, elementary kinetics. Discussion of intermediates and mechanisms. Introduction to the chemistry of polymers, heterocyclics and natural products. P, 328, 344 or concurrent.

632 Advanced Analytical Chemistry ..................... 3 (3,0)
Theoretical treatment of principles involved in noninstrumental analytical chemistry including sampling and statistics. P, 344.

642 Advanced Physical Chemistry ........................ 3 (3,0)
A review of the principles and applications of physical chemistry. Several topics such as thermochemistry, quantum mechanics, spectroscopy, kinetics, and electrochemistry will be considered. P, 344.

654 Advanced Inorganic Chemistry ........................ 3 (3,0)
General discussion of inorganic systems including theoretical, representative group and transition metal topics. P, 344.

662 Principles of Biochemistry ............................ 2.3, 5 (0,6 or 3.0 or 3.6)
Chemistry of biological processes occurring in plants and animals. P, 260.

691 Special Problems* .................................... (0,*) FS
P, consent. Limited to a total of 4 credits.

720 Special Topics in Organic Chemistry .................. 1-6
One term advanced courses taught upon demand and covering such topics as stereochemistry, advanced synthetic organic chemistry, etc. P, consent.

722 Synthesis of Natural Products .......................... 3
Synthetic strategies in pathways for the formation of natural products P, Ch 328.

724 Structural Determination of Organic Compounds ........ 3 (2.3)
Determination of the structure of organic compounds primarily by spectroscopic techniques P, 328. Alternate years.

725 Polymer Chemistry ...................................... 4
The chemistry of high molecular weight polymeric molecules will be discussed. The laboratory will consist of the preparation, reactions, and properties of select polymers. P, Chem 328.

726 Physical Organic Chemistry ............................ 3 (3.0)
Physical organic reaction mechanisms, M.O. calculations, orbital symmetry, and E.S.R. spectroscopy, P, 328 and 344. Alternate years.

728 Bioorganic Chemistry .................................... 3

730 Special Topics in Analytical Chemistry ............... 1-6
Individualized studies in mass spectrometry, electroanalytical, trace analysis, or instrumental and electronics, P, consent.

732 Analyses in Agricultural and Environmental Chemistry .... 4
The principles of analytical chemistry as applied to agricultural and environmental chemistry will be presented in the lecture portion of the course and the performance of those procedures will be presented in the laboratory section of the course. P, Chem 434.

734 Analytical Spectroscopy ................................ 3 (3.0)
In-depth treatment of the quantitative applications and theory of modern spectroscopy techniques including atomic absorption, emission, and fluorescence; molecular absorption and fluorescence; and X-ray spectroscopy. P, 434. Alternate years.

736 Chromatography and Separations ....................... 3 (3,0)

738 Electroanalytical Chemistry ........................... 3
The principles of electrochemistry as applied to analytical methods will be presented in this course. Topics covered will include polarography, potentiometry, conductance, coulometry, and related topics. P, Ch 434.

740 Special Topics in Physical Chemistry ................... 1-6
One-term advanced courses taught upon demand covering such topics as electrochemistry, surface chemistry, kinetics, quantum chemistry, etc. P, consent.

741 Quantum Chemistry I .................................... 3
The application of wave mechanics to simple atomic and molecular systems, properties of wave functions, and approximate methods. P, Ch 642, Math 321. Triennial years.

742 Quantum Chemistry II ................................... 3
Continuation of 741. P, 741. Triennial

744 Chemical Thermodynamics ............................. 3 (3,0)
Discussion of the laws and theories of classical and statistical thermodynamics as related to macroscopic chemical systems. P, 344. Alternate years.

745 Statistical Thermodynamics ............................ 3

746 Atomic and Molecular Structure ........................ 3 (3,0)
Introduction to quantum mechanics and theoretical treatment of chemical structure and binding. P, 328, 344, or concurrent registration in 344. Alternate years.

748 Chemical Kinetics ....................................... 3

750 Special Topics in Inorganic Chemistry ................ 1-6
One-term advanced courses taught upon demand and covering such topics as coordination chemistry of transition elements, structural determinations, etc. P, consent.

752 Descriptive Inorganic Chemistry ........................ 3 (2,3)
Discussion centered on periodic relationships of the elements. The laboratory work includes preparation and purification of typical inorganic compounds. P, 120 (4 credits), 232, 354. Alternate years.
753 Organometallic Chemistry

The study of metal compounds containing organic moieties and related inorganic compounds. Major emphasis will be focused on transition metal-carbon compounds such as the carbonyls, aromatic hydrocarbons and nonaromatic olefin and acetylene complexes. Homogeneous catalysts will be discussed. P. 352.

754 Physical Methods in Inorganic Chemistry

The study of instrumental methods and spectral interpretation used to investigate inorganic compounds. EPR, X-ray, NMR, UV-Vis and IR will be discussed. P. Chem 344, 352

756 Coordination Chemistry

The study of metal-ligand compounds. Emphasis will be focused on transition metal complexes with Group V, VI, and VIIA donor ligands. Topics to be discussed will include bond theory, structure and reactivity. P. 352.

757 Special Topics in Biochemistry

Selected concepts covering the more advanced concepts in the biochemistry field, new research techniques, etc. P. consent.

760 Biochemistry I

Study of carbohydrates and lipids. Includes aspects of enzyme kinetics and regulation as well as principles and characteristics of ATP-synthesizing complexes. P. 662. Alternate years.

766 Biochemistry II


767 Biophysical Chemistry

Discussion of the theoretical and practical aspects of biophysical methods. These will include an examination of electrophoresis, centrifugation, light scattering, optical rotary dispersion, X-ray diffraction, viscosity/diffusion, and spectroscopy. P. 340, 662.

768 Plant Biochemistry

Chemistry of structural and functional elements of plants with special emphasis on bioenergetics, photosynthesis, nitrogen fixation, sulfur metabolism, carbohydrate interconversion, secondary plant products, seed development and fruit ripening, and genome expression. P. 662.

769 Nutritional Biochemistry

Study of the biochemistry of systems that are significant in nutrition including metabolism, requirements and deficiencies.

772-773 Seminar

Required of all graduate majors in chemistry.

781 Bioinorganic Chemistry

A study of biological systems stressing the role of metals ion, primarily the transition metals. Model systems included in the discussion. P. 120 (4 credits), 354 or consent. Alternate years.

782 Radioisotope Techniques

Theory and measurement of radioactivity. Techniques for the application of radioactive isotopes in chemical and biological experimentation. P. consent.

783 Group Theory

Definitions and theorems of group theory will be introduced. Chemical applications will be developed in areas such as construction of hybrid orbitals, ligand field theory, symmetry aspects of MO theory and molecular vibrations. P. 334.

790 M.S. Thesis in Chemistry

791 Thesis Sustaining

890 Ph.D. Dissertation

891 Dissertation Sustaining

*To be arranged.

The following Physics courses may be used in either the graduate major or minor program

Phys 635 Reactor Physics

Phys 637 Science of Solids

Phys 743 Statistical Mechanics

Phys 775 Advanced Quantum Mechanics

Phys 779 Group Theory in Quantum Mechanics
DEPARTMENT OF CIVIL ENGINEERING

Professor Dwayne Rollag Head;
Professors Hassoun, Koepsell, Selim, Sigl;
Associate Professor Schaefer;
Assistant Professor D.E. DeBoer;
Emeriti Dornbush

The following Civil Engineering courses are offered to support the Master of Science in Engineering program (see College of Engineering), as well as other graduate programs in the University.

CIVIL ENGINEERING (CE)

611 Bituminous Materials ...........................................3 (2,3) F
Properties of bituminous materials including their compatibility with various types of aggregates. Asphalt cement surface courses are designed and tested for stability. Standard tests are performed on bituminous materials with emphasis on test results. P, CE 216.

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

624 Industrial Waste Treatment ...................................2 (2,0) S
Characteristics and composition of industrial wastes, sampling and analysis of methods of analysis of these wastes and remedial measures for treatment and disposal. P, 423 or consent.

625 Environmental Engineering Planning .............................3 (3,0) S
Analysis and review of basic concepts and procedures involved in environmental aspects of planning. Consideration given to local effects of projects as well as effects on the area or the state or region. P, Graduate standing or consent.

633 Open Channel Hydraulics ........................................3 (3,0) F

634 Fluvial Hydraulics .................................................3 (3,0) S
Erosion, transportation and deposition of sediments by flowing water, bed load and suspended load movement, river behavior control. P, 433.

635 Water Resources Engineering .................................3 (3,0) S
Topics related to water resources engineering including: multiple purpose river development, economic analysis of flood control measures, aspects of water law and other topics related to surface and ground water hydrology and administrative aspects of water resources planning. P, 433.

636 Foundation Engineering .......................................3 (2,3)
Bearing capacity, load induced pressures and settlements, soil exploration and sampling, lateral earth pressure, retaining walls, sheet pile structures, pile formation and cessions. P, 446.

646 Advanced Soils Engineering ....................................3 (2,3) S
Application of basic soil mechanics to engineering problems. Stability, compaction, embankments, seepage, draining, and stabilization. P, 446.

652 Prestressed Concrete .............................................3 (3,0)

655 Pre-cast Concrete Structures .....................................3

656 Advanced Reinforced Concrete Design .........................3 (3,0)

657 Matrix Analysis of Structures ....................................(3,0)

659 Advanced Structural Mechanics .................................3 (2,3) S
Matrix methods, arches and rings, buckling, structural dynamics, computer solutions. P, 353, 455.

700-701 Seminar ..........................................................0-1
Current, state-of-the-art, topics in civil engineering.

723 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.

724 Land Treatment of Waste Water ...............................3 (2,3) Su
State-of-the-art planning and process design of land treatment systems for the disposal of municipal, industrial, and agricultural wastes. Physical, chemical and biological limiting factors with emphasis on site selection and process feasibility. Land disposal of sludges.

726 Water Quality Analysis ...........................................3 (1,6) F
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.

727 Water Treatment Plant Design ................................3 (1,6) F
Water supply sources, design of treatment plants, cost estimates of water supply systems. P, 327.

728 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, 423.

733 Advanced 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, 635.

737 Hydraulic Design .................................................3 (3,0) F
Hydraulic design as applied to hydroelectric power development and turbine design, flood routing in reservoirs and natural channels, design of drainage structures, and energy dissipators. P, 433.

738 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, 433.

749 Structural Dynamics ...............................................3 (3,0) F

751 Plastic Design .....................................................2 (0,6)
Modes of failure, plastic hinges, design rules and applications.

754 Advanced Design of Steel Structures .........................3 (3,0)
Design of slender compression elements tapered members, hybrid plate girders, column base plates subjected to bending moments, bolted and welded connections. Cold form steel structures. P, 455. Alternate years.

763 Highway Administration and Economy .......................3 (3,0) Su
Highway administration, highway and transportation costs, road user benefits, cost benefit ratio.
Advanced Transportation Engineering .......................... 3 (2.3) F
Planning and designing of railroads, highways, water and air transportation facilities and coordination of transportation facilities.

765 Pavement Design ............................................. 3 (3.0) S
Stresses in and design of flexible and rigid pavements including subgrades, bases and sub-bases. P, 363.

769 Design of Steel and Concrete Bridges ........................ 3 (3.0)

770 Engineering Research or Design Paper ........................ 2
Conduct a research or design project and write a report on the work done using thesis format.

DEPARTMENT OF COMMUNICATION STUDIES & THEATRE

Professor Schliessmann, Head;
Professors Ferguson, Johnson, Jorgensen, Widvey;
Emeriti Denton, Hoogestraat, Meyer, Stine

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

Graduate minor offered:
Speech

Prerequisites for graduate study:
For the Master of Arts with a major in Speech: a minimum of 20 semester hours of undergraduate credit in Speech, Theatre, Journalism, or Communication.

For the graduate minor in Speech: a minimum of 12 semester hours of undergraduate credit in Speech, Theatre, Journalism, or Communication; or the consent of the Department Head.

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

Degree requirements:
The required curriculum for the Master of Arts degree with a major in Speech consists of: (1) A minimum of 22 semester hours in Speech including 5-7 hours in SpCm 790, and electives approved by the advisor to bring the combined total to not less than 30 semester hours, and (2) Completion and approval of a thesis based on appropriate research.

GENERAL COMMUNICATION (GCom)

605 Theories of Communication .................................. 3 (3.0)
See GCom 605, Theories of Communication under Department of Journalism and Mass Communication.

RADIO TELEVISION & FILM (RTVF)

637 Educational Corporate Television .............................. 3 (3.0)
Educational broadcasting with practical work in the preparation and presentation of educational and instructional materials for radio, television, and film and their use for instruction.

660 Special Problems in Radio, Television or Film ............. 1-2
Directed research. May be repeated to a total of 4 credits in problem courses. P, consent.

664 Film Studies .................................................... 3 (3.0)
Film art forms, artists, and critics. Viewing and making films.

792 Research Methods in RTVF .................................. 3 (3.0)
See MCom 791, Research Methods in Communication under Department of Journalism and Mass Communication.

SPEECH COMMUNICATION (SpCm)

616 History and Criticism of American Public Address ........ 3 (3)
Critical evaluation of American speakers from Colonial to contemporary period. P, consent.

624 Persuasion ....................................................... 2 (2)

652 General Semantics .............................................. 3 (3)
Relations between symbols; human behavior in reaction to symbols including unconscious attitudes, linguistic assumptions; and the objective systematization of language.

676 Directing Speech Activities .................................. 3 (3.0) S &
Organizing and directing oral interpretation, dramatic, and forest programs.

707 Speech/English/Drama for Teachers .......................... 1-3 S &
Designed to help teachers develop curriculum materials and curricular/co-curricular instruction of literature and drama.

766 Rhetorical Theory .............................................. 3 (3.0)
Historical development of rhetorical theory from classical to modern times.

790 Thesis ............................................................ 1-7 S &
Independent investigation of special problem and written thesis.

791 Thesis Sustaining ............................................... 1 S &

792 Special Engineering Problems ................................. 1
Elective course for special or detailed study or investigation.

793 Special Topics ................................................... 1
Special topics in the field of Civil Engineering. P, consent.

THEATRE (Thea)

660 History of Theatre .............................................. 3 (3)
Periods, theatres, and representative dramatic literature from classical to present day.

796 Special Problems in Theatre .................................. 1-4
Directed research. May be repeated to a total of 4 credits in problem courses. P, consent.
DEPARTMENT OF COMPUTER SCIENCE

Professor Gerald E. Bergum, Head;
Assistant Professor Ali Salchnia

The following Computer Science courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the University.

610 Principles of Higher Level Languages ................. 3 (3,0) F
Formal definition of the syntax and semantics of programming languages; semantics both by means of interpreters and by using the axiomatic approach. Concepts underlying programming languages and their instantiations in a selected group of languages. Program description at compilation time and execution time. P; CSc 114 and CSc 213, CSc 290 and CSc 230.

620 Artificial Intelligence ........................................ 3 (3,0) F S
Introduction to ideas, issues and applications of Artificial Intelligence. Knowledge representation, problem solving, search, inference techniques, theorem proving, expert systems, Artificial Intelligence programming languages.

630 Principles of Data Base System Design ............... 3 (3,0) 5

640 Computer Networks ........................................... 3 (3,0) F S
Analysis of current and future computer network with emphasis on the OSI model. Local and wide area networks. TCP/IP SNA, token ring, ethernet and other common networks will be covered. Protocol and interfaces within and across networks including the OSI layers, routers, bridges and gateway. P; CSc 285, Math 381 or Stat 341.

DEPARTMENT OF CONSUMER AFFAIRS AND HOME ECONOMICS EDUCATION

Associate Professor Delores Kluckman, Acting Head;
Professor Virginia Clark;
Emeritus Ardyce Gilbert

The following Consumer Affairs and Home Economics Education courses are offered to support the Master of Science in Home Economics program (see College of Home Economics) as well as other graduate programs in the University.

CONSUMER AFFAIRS (CA)

692 Special Problems ........................................... 1-3
Individual research and study in Consumer Affairs. P, consent of instructor.

693 Current Topics ................................................ 1-3
Study of contemporary issues and concerns in Consumer Affairs. Focus on topics not included in other graduate courses in the college. Can be repeated.

792 Special Problems ........................................... 1-3
Individual research and study in Consumer Affairs. P, consent of instructor.

793 Current Topics ................................................ 1-3
Study of contemporary issues and concerns in Consumer Affairs. Focus on topics not included in other graduate courses in the college. Can be repeated.

HOME ECONOMICS EDUCATION (HED)

673 Special Problems ........................................... 1-4 (on sufficient demand)
Individual research and study in Home Economics Education. May be repeated to a total of four credits. P, consent.

647 Computer Graphics .......................................... 3 (3,0) F
Principles of computer graphics. A study of the algorithms used to generate raster and vector graphics. P; CSc 114 and CSc 285, Math 215, Math 224.

700/701 Seminar .............................................. 1-7
Current state-of-the-art topics in Computer Science. P, permission of Instructor.

740 Management Information Systems ............................ 3 (3,0) F S
Computer appreciation course providing technical background for understanding and raising issues treated in other courses. Structure and operation of computer systems. Hardware technology and software development. Tools and methods for developing computer applications. Structure and components of Management Information Systems. Using the computer to support operations of management in planning and control and decision making, MIS development, organization, management and evaluation. Acquiring computer resources. The computer industry and profession. P; CSc 313 or 316 and CSc 361, 610, 620.

790 Thesis ..................................................... 1-7

791 Thesis Sustaining ........................................... 1

792 Research Report/Design Paper .................................. 2
Conduct an approved research or design project and complete an approved research report or design paper in Computer Science.

693 Current Topics ................................................ 1-3
Study of contemporary issues in home economics education. Focus on topics not included in other graduate courses in the college.

701 Trends in Home Economics Education ..................... 2 (2,0)
Trends in home economics education, 1-3 with emphasis on the effect on teaching in high school classes or youth groups.

702 Seminar in Home Economics Education ................. 1-2 (on sufficient demand)
Review and discussion of current literature in home economics education.

741 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.

773 Special Problems ........................................... 1-4
Individual research and study in Home Economics. May be repeated for a total of 4 credits. P, consent of instructor and department.

792 Special Problems ........................................... 1-3
Individual research and study in home economics education. P, consent of instructor.

793 Current Topics ................................................ 1-3 (on sufficient demand)
Study of contemporary issues and concerns in the field of Home Economics Education. Focus on topics not included in other graduate courses in the college. Can be repeated. P, consent.
DEPARTMENT OF DAIRY SCIENCE

Professor John G. Parsons, Head;
Professor Schingoethe;
Associate Professor Baer;
Emeriti Baker, Spurgeon

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

Graduate minor offered:
Dairy Science

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

DAIRY SCIENCE (DS)
712 Physiology of Lactation ...................... 3 (3,0) S 1993
722 Advanced Dairy Microbiology .................. 3 (2,3) S 1994
Role of microorganisms in manufacture and spoilage of dairy products. Emphasis on starter culture technology. P, 301 or Micro 311. Alternate years.

DEPARTMENT OF ECONOMICS

Professor Ardelle Lundeen, Head;
Professors Dobbs, Gilbert, Greenbaum, Janssen, Kamps, Kim, Lamberton, Mura, Shane, Taylor;
Associate Professor Pfueger;
Emeriti Aanderud, Allen, Helfinstine, Hsia, Kohlmeyer, Myers, Sogn, Thompson

Graduate majors offered:
Master of Science degree with a major in Economics.
The graduate curriculum is designed to prepare students for professional placement or further graduate study. Emphasis is placed on theory and development of analytical skills. Students can take supporting courses in agri-business management, applied economics or other disciplines which suit their interests and career goals. A limited number of research assistantships are available for qualified students. Additional information is available from the Economics Department, Scobey Hall, SDSU.

Graduate minor offered:
Economics.

Prerequisites for graduate study:
Unconditional admission requires that applicants have a Bachelor's Degree including successful completion of courses in Intermediate Microeconomic Theory, Intermediate Macroeconomic Theory, Statistics and Calculus. Applicants who otherwise qualify for admission can take these courses during their first year in the M.S. program. Additional background in mathematics, statistics and communications will benefit graduate students in economics.

Requirements for the Master of Science Degree:
Option A requires a minimum of 30 semester credits, including a thesis (5 credits) and comprehensive oral examination.
Option B requires a minimum of 32 semester credits, including a research paper (2 credits) and comprehensive oral examination.

702 Seminar ...................................... 1 (1,0)
Research report writing, oral reports and discussion of current research in dairy production, dairy manufacturing, and related sciences. Maximum of 2 credits will be allowed for Master of Science or 4 credits for Doctor of Philosophy degree.
711 Ruminology .................................. 3 (3,0) F (Odd Year)
Biochemical, physiological, and microbiological activity occurs in the rumen and the relation of rumen function to animal response. P, 361 and Vet 323 or consent. Alternate years.
731 Laboratory Techniques in Dairy Science 2 (0,6) (Even Year)
Research design, laboratory techniques, and data management presentation in Dairy Science. Laboratory procedures include photometry, gas chromatography, and microbiological (fermentation and anaerobic) assays. Alternate years.
780 Dairy Science Problems .......................... 1-4 FS
Investigation of problems in dairy production or dairy manufacturing. Results submitted as a technical paper. P, consent.
790 M.S. Thesis
791 M.S. Thesis Sustaining
890 Dissertation, Ph.D.
891 Dissertation, Ph.D. Sustaining

All students must complete the core requirements plus sufficient additional graduate hours in this department and either a minor or another department or supporting courses.

No graduate credit on a converted basis for 300-499 advanced undergraduate courses will be granted for the following courses: Econ 301 Intermediate Microeconomics; Econ 302 Intermediate Macroeconomics; Econ 380 Personal Finance; Stat 341 Statistics I.

Core Requirements:
Econ 701 Research Methods
Econ 703 Advanced Macroeconomics
Econ 704 Advanced Microeconomics
Econ 705 Econometrics
Econ 724 Advanced Mathematical Economics

J.D./M.S. in Economics A cooperative program between the University of South Dakota School of Law and South Dakota State University of Economics is available. The two institutions mutually accept up to nine semester hours of transfer credit. Students design their academic program in Economics to best suit their career goals and interests. For details, students should consult with the USD Law School or SDSU Economics Department.

AGRICULTURAL ECONOMICS (AgEc)
630 Advanced Agricultural Marketing and Prices .................. 3 (3,0)
Economic theory and quantitative techniques used in analysis of agricultural market problems, construction of economic models, statistical estimates of supply and demand, and price forecasting. P, 301, 423, AgEc 354 or consent.
670 Advanced Farm and Ranch Management .................................. 3 (3,0) S
Leasing arrangements, capital investment, computerized accounting and budgeting. Use of linear programming as a tool for planning and organizing the farm business. P, 202, AgEc 271, 2 credits of CSc or consent.

690 Special Problems ...................................................... 1-3 (1-3,0) F S
Advanced work in area of economics of particular interest to an individual student. Area of study must have prior approval of a graduate faculty member. P, consent.

ECONOMICS (Econ)

604 History of Economic Thought ....................................... 3 (3,0)
The historical development of economic ideas. A study of the various schools of economic thought and the economic environment which produced them. P, 301, 302 or consent.

620 Economics of the Public Sector ..................................... 3 (3,0)
The effects of public policies—fiscal, monetary, and regulatory—on the economic well-being of individuals, groups and society. Welfare economics and social choice theory. P, 301, 302 or consent.

640 Economics of the International Sector ............................. 3 (3,0)

650 Industrial Organization .................................................. 3 (3,0)
The elements involved in market power and how they function. A theoretical and empirical study of how the structure and conduct of sellers and buyers affects economic performance. P, 301 and 302 or consent.

660 Economic Development .................................................. 3 (3,0)
Current status of national developing and developed economies. Factors impacting economic development. Role of public policies in development. Agricultural and rural development issues emphasized. P, 201, 202 or consent.

672 Resource Economics .................................................... 3 (3,0)
Economic analysis applied to problems in allocation, conservation and development of natural resources. Environmental economics, water and land use, and methods of evaluating projects and programs. P, 202.

701 Research Methods ......................................................... 2 (2,0) S
Planning and conducting empirical research in economics; the organization of research; the philosophy and aim of science. P, two statistics courses or consent.

703 Advanced Macroeconomics .......................................... 3 (3,0) S
Comparative statics analysis of aggregate income determination; comparison of alternative stabilization policies; modeling of investment and consumption behavior, dynamic analysis of optimal growth. P, 428 or consent.

704 Advanced Microeconomics ........................................... 3 (3,0) F
Rigorous analysis of topics in microeconomics including: methodology of economic science, economic choice, production, resource allocation, distribution, welfare economics, and general equilibrium. P, 428 or consent.

705 Econometrics .............................................................. 3 (3,0) S

710 Financial Management .................................................. 3 (3,0) F
Advanced techniques for managing working capital, capital budgeting, analysis of financial structure and cost of capital, valuation, financial planning and control. P, BAD 310, Actg 210, Stat 341 or Math 381.

724 Advanced Mathematical Economics ............................... 3 (3,0) F
Integral calculus, differential and difference equations, optimal control and other methods used to analyze economic dynamics, investment, growth and other advanced topics in economics. P, 428.

753 Advanced Marketing Management ................................. 3 (3,0) F
Strategic marketing and decision making with emphasis on utilizing both qualitative and quantitative techniques as well as marketing models. P, Econ 301, 353, and Stat 341 or Math 381.

760 Operations Management ............................................... 3 (3,0) F
Product planning, demand forecasting and management, capacity planning, scheduling, inventory planning and timing, materials management, quality, work standards and measurement. P, BAD 360, Econ 301 and Stat 341 or Math 381.

782 Personnel and Labor Relations ...................................... 3 (3,0) F
Labor relations, negotiation and arbitration; pay and benefits; hiring, promotion and termination policies; use of testing in the workplace. P, BAD 360 or consent.

790 Thesis ................................................................. 5 F S Su
Independent investigation of a special problem and written thesis. To be taken under Option A.

791 Thesis Sustaining

792 Research Paper ......................................................... 2 F S Su
Independent investigation of special problem and written research paper. To be taken under Option B.

793 Graduate Special Topics ............................................. 1-4
Organized by an instructor in consultation with the department head and a group of students. The course will provide a medium through which a specific topic can be pursued. The course will normally be experimental and may be a one time only effort for a particular semester and the unique group of students. Maximum: 4 hours credit per semester, 7 hours credit per degree.
COLLEGE OF EDUCATION AND COUNSELING

Darrell Jensen, Dean;
Howard Smith, Department Head
Counseling & Human Resource Development;
Charles Lingren, Department Head
Advanced Studies in Education;
Professors Edeburn, Hanson, Lingren, Smith, Steinley, Widvey;
Associate Professors Bill, Daugherty, R.L. Erion, Moeller, Marshall;
Emeriti Everett, Scholten

Graduate majors offered:
Master of Education degree with a major in Agricultural Education, Educational Administration, and Curriculum and Instruction.
Master of Science in Counseling & Human Resource Development.

Graduate minors offered:
Agricultural Education, Educational Administration, Curriculum and Instruction, and Counseling & Human Resource Development.

Program Options and Specific Prerequisites:
The Graduate Program in Education is designed to provide professional preparation above the Bachelor's degree. The program includes the following options:

1. The Agricultural Education major is designed to provide the professional preparation and competencies for teachers in Agricultural Education/Agri-Business. Specific prerequisites include a course in General Psychology, nine credits in General Education and eight credits of science and mathematics.

2. The Educational Administration major is designed to provide the basic professional preparation for those who expect to become qualified administrators in schools where certification is required and for other institutions, businesses, industries and service-oriented agencies that have educational programs. The South Dakota State Board of Education requires two years of teaching experience for administrator certification.

3. The Counseling and Human Resource Development major is designed to assist the student to develop professionally so they can function more effectively in a helping relationship with others. The program emphasizes the development of the professional competencies expected of qualified counselors and staff members in schools, higher education, agencies and other institutions.

4. The Curriculum and Instruction major is designed to provide advanced work in the area(s) of instruction and in Education for those who are potential educators or who are employed in schools where certification is required and for those who teach in higher education or with business, industry or other service-oriented educational programs.

The courses in the College of Education and Counseling are divided into the following areas: Agricultural Education (AgEd), Adult Higher Education (AHEd), Counseling and Human Resource Development (CHRD), Educational Administration (EdAd), Education, Evaluation and Research (EdER), Educational Foundations (EdFn), Elementary Education (EEd), Educational Psychology (EPsy), Secondary Education (SeEd), and Vocational Teacher Training Education (VTTE).

ADULT HIGHER EDUCATION COURSES (AHEd)

600 Special Problems in Extension..........................2-6 F S Su
Individually assigned investigative problems in Extension. Individual conference with laboratory and/or field work. Arrangements with Extension staff must be made prior to registration.

681 Workshop in Adult and Continuing Education............
Special areas in adult and continuing education are comprehensively explored in an intensive time framework. Designed to increase specific skills and understanding in a current area.

691 Problems ........................................1-3 F S Su
Directed reading and research in selected individual adult and continuing education topics.

710 Adult Curriculum and Instruction..........................3 (30)

711 Organization and Administration of Adult Education 3 (30)
Organization and implementation of adult education programs. Particular emphasis on curriculum development, financing, staff development, marketing, and evaluation of adult programs.

751 Principles of College Teaching ..........................3 (30)
An analysis of teaching methodologies, planning procedures, evaluation techniques, and professional relationships. Emphasis will be on learning and using strategies suitable for teaching.

782 Seminar ........................................1-3 F S Su
Study in selected areas of adult and continuing education including special investigation, reports and discussion.

789 Internship in Education ..............................1-6 F S Su
On the job participation in teaching or related fields in school under the supervision of local school personnel and a staff member from the College of Education and Counseling.

792 Research Problems in Adult Education ..........................2 F S Su
A problem is selected, analyzed, and reported in form approved by the research advisor. Required of all graduate students in education qualifying for the degree under Option B. Can be elected under Option C if desired. P, consent.

AGRICULTURAL EDUCATION (AgEd)

605 Seminar ........................................1-2 (1,0) or (2,0) F S Su
Selected areas of Agricultural Education including special investigation, reports, and discussion.

606 Problems ........................................1-3 F S Su
Directed reading and research in selected agricultural education topics.

706 Adult Education in Agriculture ..........................2 (2,0) Su
Policies, methods, materials and organization of adult education program in vocational agriculture/agri-business; course planning, procedures, media, follow up and evaluation in adult programs. P, graduate student in Agricultural Education.

707 Supervised Occupational Experiences and Student Groups in Agricultural Education ..........................2 (2,0) Su
Emphasizes relationships of occupational experience and student organization in agriculture to instructional programs; needs scope, techniques and materials in developing and improving these programs. P, graduate student in Agricultural Education.

776 Curriculum in Agricultural Education ..........................2 (2,0) Su
For teachers, administrators and supervisors of vocational agriculture/agribusiness programs at secondary, post-secondary and adult levels; principles and procedures in course building, course of study, and curriculum. P, graduate student in Agricultural Education.

792 Research Problems in Agricultural Education ..........................2 F S Su
A problem is selected, analyzed, and reported in form approved by the research advisor. Required of all graduate students in education qualifying for the degree under Option B. Can be elected under Option C if desired. P, consent.
Counseling and Human Resource Development (CHRD)

603 School Counseling ................................................. 3 (3.0) S Su
A study of the role and function of a K-12 school counselor including individual counseling, small group counseling, classroom guidance, and consultation with parents, teachers, administrators.

610 Foundations of Guidance ...................................... 3 (3.0) F S Su
Developing basic human relations and helping skills, self-awareness and its role in the interpersonal communication process; emphasis on understanding self and others. Introduction to basic counseling and helping skills.

630 Gender Issues in Counseling .................................... 3 (3.0) F Su
Emphasis on increasing the counselor's knowledge and awareness of facts and factors in gender-specific experiences which are relevant to the counseling situation.

651 Mental Health and Personality Development ............... 3 (3.0) F
The nature of personality and its development. Mental health issues of children, adolescents, and adults are emphasized as are programs and strategies for positive mental health. Various personality assessment methods are used.

661 Theories of Counseling ........................................... 3 (3.0) F S Su
An overview of major theories, the methods employed and appropriate applications. Assist beginning counseling students in comprehending the scope of various approaches in dealing with the client(s).

681 Workshop ............................................................. 1-3
Special topics are comprehensively explored in an intensive time framework. Designed to increase specific skills and understandings in a current topic area.

682 Seminar .............................................................. 1-3 F S Su
Selected area of education including special investigation, reports, and discussion.

690 Special Topics ....................................................... 1-3 F S Su
Advanced courses taught upon demand covering topics of interest to the field of counseling. Courses taught on experimental basis also carry this title.

706 Counseling the Victim .............................................. 3 (3.0) S Su
Study of effective counseling during the crisis and recovery stages of the healing process. Addresses the victim's experience with such issues as developmental concerns, dissociation, post-traumatic reaction, denial and loss of memory about/around the victimization.

713 Administration and Management of Human Services Programs ......................................................... 3 (3.0) S Su
Developing and managing a comprehensive counseling program in schools and agencies. Emphasis on the planning process management, budgeting, organizational structure, supervision, evaluation, and consultation.

716 Human Resource Management in Business and Industry ......................................................... 3 (3.0)
This course will focus on the human factors affecting the workplace. Specific topics to be covered will include employee assistance programs, wellness programs, management training, conflict resolution, and career planning.

721 Counseling Through the Life Span I ................................ 3 (3.0) F Su
Provides an understanding of the developmental needs of children and adolescents and appropriate intervention methods to be used in counseling.

722 Counseling Through the Life Span II ................................ 3 (3.0) S Su
A study of young, middle-aged and older adults to increase understanding of the developmental needs and intervention strategies necessary to engage them in effective therapeutic relationships.

733 Counseling the Family .............................................. 3 (3.0)
Counseling the Family is a course which describes the major systems of family therapy and the resulting impact upon the counseling process. An inter-psyche, systematic framework will be formulated as a supplemental way to view familial problems and promote change.

736 Appraisal of the Individual ..................................... 3 (3.0) F Su
Assessment methods used in studying individuals. Standardized instruments, self-report inventories, observation, case study techniques and other non-standardized assessment tools are used. Recording, analyzing, compiling and interpreting data for use in counseling setting.

742 Career Counseling and Planning .................................. 3 (3.0) F Su
Examination of the career development and counseling process through the life span. Assist those intending to counsel at elementary, secondary, higher education and the community/workplace. Explores strategies and resources for career-life planning. Various interest inventories and personality assessment methods are used.

755 Mental Pathology ..................................................... 3 (3.0) F
Focuses on the various abnormalities in personalities, behaviors and levels of functioning in society. Specific attention is given to the behavioral disorders which are most commonly seen in our society. P, Abnormal Psychology.

756 Counseling the Addictive Client .................................. 3 (3.0)
Counseling the addictive client is a course which describes how one can identify and treat addictive behaviors. Emphasis is on preventive and remedial action.

766 Group Counseling ................................................... 3 (3.0) F S Su
Processes and procedures used in small group counseling. Students participate in group counseling, facilitate in-class counseling sessions and develop structured units for specific populations. P, CHRD 610, CHRD

770 Student Development: Theory and Practice ..................... 3 (3.0) F
Develops an understanding of college student personnel functions and their interrelatedness in a coordinated effort to provide student services. Focuses on the personnel administrator's role in understanding and incorporating concepts to student development.

771 Student Personnel Services ........................................ 3 (3.0)
Focuses on legal cases and precedents that have a major impact on higher education and the field of student personnel administration, the development of conflict management skills, control theory, transactional analysis, and other communication concepts.

787 Counseling Practicum .............................................. 3-5 F S Su
Emphasis on developing/refining counseling skills and personal counseling theory. Minimum of 40 one-hour counseling sessions. Limited to advanced graduate majors in CHRD and consent.

788 Group Counseling Practicum ..................................... 2-4 F S Su
Supervised practicum in conducting small group counseling sessions. P, CHRD 766.

789 Internship (Topical) .................................................. 2-6 F S Su
This course provides the experiential component of the students' curriculum. The student will be gaining experience under the direct supervision of a duly certified mental health or student personnel professional in an approved setting. This course may be repeated for up to maximum of 12 credit hours (a maximum of 6 credit hours per semester), in one of three areas of emphasis (School Setting, Agency Setting, or Student Personnel). P, CHRD 610, 661, 766, 787, and EDER 761.

790 Thesis ....................................................................... 1-6 F S Su

791 Thesis Sustaining ..................................................... 1 F S Su

792 Research Problems .................................................. 2 F S Su
A problem is selected, analyzed, and reported in form approved by the research adviser. Required of all graduate students in counseling qualifying for Masters degree under Option B. Can be elected under Option C if desired. P, consent.
Directed reading and research in selected individual guidance and counseling topics.

**EDUCATIONAL ADMINISTRATION (EdAd)**

**700 Public School Administration** ........................................... 3 F Su
A broad overview of administration. Areas of philosophies of schooling, organizational theory, management of conflict, community relations, climate studies, evaluation and supervision models, staff development, legal and financial issues, equity for special populations, and an introduction to the effective school movement

**710 Elementary School Administration** ................................. 3 (3,0) Su
This course will focus on the organization and administration of effective elementary schools. Topics studied will include: selection and development of personnel, supervision and evaluation, curriculum development and instructional leadership, monitoring student progress in achievement, student management, budget and plant management, and school/community relations.

**711 Secondary School Administration** ................................. 3 (3,0) Su
This course offers recommendations and suggestions for improving current practices of administration and supervision. Emphasis will be placed on the secondary principal's role and function as the principal interacts with the various constituencies in the school and community. Focus includes: starting the school year, organizing for supervision and evaluation, monitoring student progress in achievement, student discipline processes, providing curriculum and instructional leadership, time management, teacher selection, staff development, and developing 'active' parent/community relationships.

**715 Supervision** .................................................. 3 (3,0) S Su
A study of leadership styles and the effects of different styles have on motivating people. Emphasis on utilizing and developing human potential. Several supervisory models are explored.

**730 School Finance** .................................................. 2 (2,0) Su
Develop an understanding and a working knowledge of school finance theory and practice. Emphasis will be placed on the school finance reform movement in recent years.

**732 School Buildings and Grounds** .................................. 2 (2,0) Su

**735 School Law** ..................................................... 3 (3,0) S Su
Course is designed to give a comprehensive view of the impact of the law upon the operation of public schools in the United States, the region, and South Dakota. Current legal decisions regarding teacher rights, student rights, liability issues, curriculum challenges, and church-state relationship are presented with an emphasis on proactive administrative strategies.

**740 Administration of Reading Programs** ......................... 3 (3,0) Su
Provides a framework of knowledge to guide administrators in providing leadership in the development of the reading curriculum. Focuses on topics such as overviews of reading approaches, recent research, the role of the principal, evaluating programs, and choosing a basal. The course is also of value to classroom teachers who, though not directly involved in the teaching of reading, want background in the area.

**781 Workshop** ......................................................... 1-3 F S Su
Special areas in educational administration are comprehensively explored in an intensive time framework. Designed to increase specific skills and understanding in a current area.

**782 Seminar** ......................................................... 3 F S Su
Study in selected areas of educational administration including special investigation, reports, and discussion.

**789 Internship** ....................................................... 1-6 FS Su
On-job participation in administration or working with administrative tasks in public schools under supervision of local school administrator and a staff member from the College of Education and Counseling.

**792 Research Problems in Educational Administration** 2 FS
A problem is selected, analyzed, and reported in form approved by the research advisor. Required of all graduate students in education qualifying for the degree under Option B. Can be elected under Option C if desired. P, consent.

**793 Problems** ......................................................... 1-3 FS Su
Directed reading and research in selected education administration topics.

**795 Special Topics** .................................................. 1 FS
Advanced study covering topics not regularly taught within a regular program. Topics may include the administrator and special education rural schools, managing change. These advanced courses would be taught upon demand and when sufficient enrollment would warrant them.

**EDUCATION, EVALUATION AND RESEARCH (EdER)**

**690 Special Topics** .................................................. 1-3 FS Su
Advanced courses will be taught upon demand covering such topics as Least Restrictive Environment, computers in education, observation techniques for classroom evaluation.

**691 Problems** ......................................................... 1 FS
Directed reading and research in selected education topics.

**711 Group Testing** .................................................. 3 (3,0) FS
Theory and principles of standardized group tests. Aptitude achievement, career, and personality assessment instruments are examined. Practice in administration, scoring, and interpretation of results.

**716 Research and Writing** ........................................... 3 (3,0) FS
Introduction to education and counseling-related research. Emphasis is upon the understanding and evaluating of research reported in journals. Students will conduct library research and complete a paper in the APA format. This course is required of all graduate students in the College of Education and Counseling.

**EDUCATIONAL FOUNDATIONS (EdFn)**

**605 Computers in the Classroom** .................................. 2 (2,0)
Examines the relationship between teaching methods, learning theory, and the place of the computer in the classroom; covers salient topics as the data processing cycle, an overview of computer hardware and software, computer vocabulary, career opportunities, and some programming. P, EPsy 302 or consent

**610 BASIC Programming Applications in Education** ........ 3 (3,0)
Examines the utilization of microcomputers and microcomputer software in the classroom; covers BASIC programming language which allows educators effectively to evaluate and modify software programs to meet the needs of teachers and students in the classroom. P, EPsy 302 or consent

**620 History and Philosophy of Education** ....................... 2 (2,0) FS
An overview of the history of education from ancient times to the present coupled with the development and application of educational philosophy in contemporary practice.

**625 Teaching Diverse Populations** ................................. 3 (3,0) Su
Deals with issues surrounding the diversity of populations, both within the schools and in our global society. Part of this diversity within the schools can be attributed to the multi-cultural nature of the American population, including the integration of handicapped and gifted children.
EDUCATIONAL PSYCHOLOGY (EPsy)

650 Gifted and Talented ...........................................3 (3,0) Su
Overview of the Gifted and Talented field; explores the development of gifted/talented children as well as identification and curriculum adaptations for meeting the needs of these children; also focuses on issues surrounding the parents and families of gifted and talented as well as program development and evaluation.

652 Enhancing Creativity ...........................................3 (3,0) Su
Explores the various dimensions of creativity, including what it is, how it develops, how to teach creative students; and how to evaluate creative works. Emphasis will be on how to work with students who already exhibit significant creative abilities as well as bow to foster creativity with all students.

674 Research on Effective Schools ................................3 (3,0) F Su
Addresses the extensive research relating to the concepts of school effectiveness. Pertinent conceptualizations and research related to such areas as school climate, instructional leadership, focus, and the establishment of school/teacher expectations will be analyzed.

723 Adolescent Psychology ........................................3 (3,0) Su
Emphasis will be on the social, emotional, physical and intellectual development of the adolescent learner.

740 Advanced Educational Psychology ..................................3 (3,0) F Su
A study of theories of learning. The goal of the course is for each student to gain insight into their own beliefs about how learning occurs.

761 Testing Practicum: Intellectual Assessment ..................2 (2,0) S
A psychological testing practicum that focuses on intellectual assessment. The student learns to select, administer, score, and interpret the Waco scales as well as write a psychological report. P; CHRD 736, 755, and permission of instructor.

762 Testing Practicum: Personality Assessment ........................2
A psychological testing practicum that focuses on objective personality assessment. The student learns to select, administer, score, and interpret the MmP and the Nc as well as write a psychological report. P; CHRD 736, 755, and the permission of the instructor.

763 Testing Practicum: Projective Techniques ........................2
A psychological testing practicum that focuses on projective techniques. The student learns to select, administer, score, and interpret the TAT, H-T-P and various other projective techniques as well as write a psychological report. P; CHRD 736, 755, and permission of the instructor.

SECONDARY EDUCATION (SeEd)

672 Motivation and Discipline ........................................2 F Su
Theories of motivation and discipline and their application in the classroom. Stresses techniques for preventing discipline problems, with emphasis upon ways to provide success experiences and positive reinforcement for students. Emphasizes effective procedures of group management as applied to the classroom situation. The course is appropriate for teachers, guidance, and administrative personnel.

681 Workshop ........................................................1-3 Su
Special areas in secondary education are comprehensively explored in an intensive time framework. Designed to increase specific skills and understanding in a current area.

682 Seminar ..........................................................1-3 F Su
Study in selected areas of education including special investigation, reports, and discussion.
690 Special Topics .....................................................1-3 F S Su
Advanced courses taught upon demand covering such topics as questioning techniques, classroom management, systematic observations of teaching, school policy making, changing roles in education, computer applications, etc.

691 Problems .........................................................1-3 F S Su
Directed reading and research in selected education topics.

740 Secondary School Curriculum ..................................3 (3,0) S Su
A study of the nature and principles of curriculum and curriculum development in the secondary schools. Process of curriculum change, development and evaluation will be examined. Roles of teachers, administrators, students and the public in curriculum change will be studied.

789 Internship ..........................................................1-6 F S Su
On-the-job participation in teaching in the public schools under the supervision of a local school instructor and a staff member from the College of Education and Counseling.

792 Research Problems in Education .................................2 F S Su
A problem is selected, analyzed, and reported in a form approved by the research advisor. Required of all graduate students in education qualifying for the degree under Option B. Can be elected under Option C if desired. P, consent.

VOCATIONAL TEACHER TRAINING EDUCATION (VTTE)
625 Development of Vocational Education, Thought and Practice ........................................3 (3,0) Su
Philosophy, origins and development of vocational, technical and practical arts, education programs at adult, post-secondary, secondary, and pre-vocational levels. Current and emerging principles, practices and issues are stressed. P, senior in Education.

673 Problems: Home Economics or Agricultural Education ........................................1-4 F S S
Directed reading and research in selected individual topics.

674 Special Topics .....................................................1-3 F S Su
Advanced courses taught upon demand covering such topics as computer applications, state and federal roles and regulations, curriculum development, etc.

731 Administration and Supervision of Vocational Education ...........................................3 (3,0) S
Organization, administration of vocational-technical education and the practical arts at all levels. Local-state-federal relationships in administration and supervision. State plan development, reimbursement plans and procedures, projected activities and program standards. Principles of effective supervision and evaluation applicable to vocational-technical education. P, consent.

743 Special Topics: Home Economics or Agricultural Education ........................................1-3 F S S
Advanced courses taught upon demand.

751 Curriculum in Home Economics Education .................................................................
761 Evaluation in Home Economics .................................................................
776 Curriculum in Agricultural Education .................................................................
For teachers, administrators and supervisors of vocational agriculture/programs at secondary, post-secondary and adult levels; principles and procedures in course building, courses of study, and curriculum.

782 Seminar .................................................................
Study in selected areas of vocational education including special investigation reports, and discussion.

793 Problems .................................................................
Directed reading and research in selected vocational education topics.
Three programs are offered in engineering:

Master of Science in Engineering

Option A requires a minimum of 30 semester credits including a thesis and a comprehensive oral examination.

Option B requires a minimum of 32 semester credits including a 2-credit design or research paper (of thesis quality and style) and a comprehensive oral examination.

Option C requires a minimum of 35 semester credits and a comprehensive written and oral exam. This option is offered at the discretion of the faculty within each department.

Master of Science in Agricultural Engineering

Option A and B are available just as in the case of the M.S. degree program in Engineering. See departmental detailed description.

Master of Science in Industrial Management

Options A, B, and C are available. Option C requires a minimum of 35 semester credits of coursework and a written exam as well as an oral exam.

Master of Science in Engineering

The purpose of the Graduate Program in Engineering is to provide the opportunity for an interdisciplinary education for engineers and scientists who will become leaders and experts in:

1. development and control of land, water and energy resources;
2. development and promotion of industrialization;
3. application of engineering principles to technological problems;
4. control of pollution and preservation of the environment.

The degree granted is the Master of Science in Engineering. This degree gives the student an opportunity to acquire a broad interdisciplinary and technological education. Students will take course work not only from the engineering departments of Agricultural, Civil, Computer Science, Electrical, Mechanical Engineering, Mathematics, Physics, but from departments throughout the University which are related with the individual student's research area, such as Chemistry, Zoology, Microbiology, Plant Science, Rural Sociology, Economics, Statistics, etc.

Research organizations which exist on campus for the purpose of assistance and direction in research include the following: Engineering and Environmental Research Center, Engineering Extension, Water Resources Institute, Agricultural Experiment Station the Center for Power System Studies, and the Northern Great Plains Water Resources Research Center. These and other mission-oriented organizations as well as all academic departments on campus offer the graduate student a wealth of assistance and course offerings.

The formal course offerings for Master of Science in Engineering are divided into four groups:

1. A primary core
2. A secondary core
3. Supporting courses
4. The thesis, or design paper

The primary core shall consist of at least seven (7) credits of graduate level courses chosen from subjects within the following areas: mathematics, physics, statistics, operations research, instrumentation, computer science, and seminar. These courses shall be chosen after consultation with the departmental advisor to give the student an advanced technical background to pursue research and advanced design.

The secondary core consists of courses taken from the following list:

- AE 612 Advanced Agricultural Tractors & Machines
- AE 622 Bio-Environmental Engineering
- AE 633 Advanced Irrigation Engineering
- AE 642 Engineering Phases of Crop Processing
- AE 733 Ground Water Engineering in Agriculture
- AE 772 Similitude
- CE 611 Bituminous Materials
- CE 623 Environmental Engineering
- CE 624 Industrial Waste Treatment
- CE 633 Open Channel Hydraulics
- CE 634 Fluvial Hydraulics
- CE 636 Foundations Engineering
- CE 646 Advanced Soils Engineering
- CE 656 Advanced Reinforced Concrete Design
- CE 657 Matrix Analysis of Structure
- CE 726 Water Quality Analysis
- CE 728 Water Treatment Plant Design
- CE 754 Advanced Steel Design
- CE 764 Advanced Transportation Engineering
- CE 765 Principles of Data Base System Design
- CSE 720 Artificial Intelligence
- CSE 740 Management Information Systems
- EE 715 Linear Systems Theory
- EE 720 Advanced Digital Hardware
- EE 765 Electrical Properties of Materials
- EE 770 Information and Signal Processing
- EE 785 Microwave Theory
- ME 603 Thermo-Fluid Energy Systems
- ME 635 Modeling and Simulation of Dynamic Systems
- ME 711 Advanced Heat Transfer I
- ME 721 Viscous Flow I
- ME 741 Advanced Stress Analysis in Mechanical Design
- Phys 637 Science of Solids
- Phys 725 Plasma Physics
- Phys 751 Theoretical Mechanics

These courses shall be taken to broaden the student's interdisciplinary background or to strengthen the student's background and ability to pursue research or advanced design. A minimum of 15 hours of course work must be taken from the primary and secondary core. These courses shall be determined by consultation with a departmental adviser.

The supporting courses can be chosen from a number of departments and colleges at South Dakota State University to allow the student further specialization within a primary professional area in engineering or further developments of interdisciplinary interests.

The thesis provides research experience and a degree of specialization. This experience will help the student apply information learned in course work to the solution of practical problems which are of importance to South Dakota and the world.

The design or research paper will provide experience in searching the literature, applying theory to practice, considering economic factors, and considering the consequences of alternate solutions.

Course descriptions are listed under individual departments.
Master of Science in Industrial Management
The Master of Science Degree in Industrial Management is offered through the College of Engineering in cooperation with the Graduate School at South Dakota State University. The purpose of this program is to provide the knowledge, skills, techniques, and analytical tools necessary to effectively manage and understand the financial and technical aspects of a complex operation. Participants in this program will be from backgrounds such as those who have recently graduated with a technical or management specialty, those who have recently assumed positions of management responsibility in industry, or those experienced managers who want to develop new management styles and techniques or upgrade their technical background. Studies may concentrate in manufacturing areas such as quality control, inventory management, materials handling, reliability, testing or production equipment design. Product planning and design, safety, liability and product promotion, management leadership styles, motivation, etc., could also be areas of special emphasis.

The program consists of required core courses which consist of at least three (3) semester credit hours of work chosen from four of the following topic areas: management, finance, manufacturing, and quantitative analysis tools, and management information systems.

Flexibility of the program provides that major and minor areas of focus may be chosen depending on the background of the student. Those students with a technical background would normally choose management and finance related courses as their focus in the major area of study and upgrade their technical knowledge by choosing courses for the minor area. Those with management backgrounds would choose technically oriented courses as their focus in the major area and utilize the minor area of study to upgrade their management backgrounds by choosing higher level management and finance courses.

This degree is also attractive for students with Economics backgrounds who desire a technical understanding of manufacturing processes and operations. Economics students are referred to the Economics Department for further details and a suggested curriculum appropriate to their background and interests.

It is suggested that those entering this program have either a technical background, some relative experience in industry, or extensive undergraduate course work related to finance and management topics. An undergraduate degree in engineering is not required for entry into the program. Mathematical and technical background experience is desired to ensure they will be prepared to take statistical or computer application related courses. However, deficiencies can be corrected through undergraduate course work.

The following table summarizes the MSIM requirements.

MSIM Requirements
Core Requirements

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<thead>
<tr>
<th>Topic Area</th>
<th>Required Credit</th>
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<tr>
<td>Management</td>
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<td>Finance</td>
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<td>Manufacturing</td>
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<td>Quantitative</td>
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<td>Management Information Systems</td>
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*Plan of Study Requirements

Major Area
At least 19 credits (Includes 5-7 thesis credits—option A, or design paper credits—option B).

Minor Area
At least 8 credits.

*Minimum of one course from each of four topic areas listed above.

DEPARTMENT OF ELECTRICAL ENGINEERING

Professor V. Ellerbruch, Head;
Professors Finch, Knabach, Sander;
Associate Professors Gold, Miron;
Emeriti Dracy, Storry

The following Electrical Engineering courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the University.

ELECTRICAL ENGINEERING (EE)

610 Passive and Active Filter Design ............. 3 (3,0) or 3 (2,3)
The analysis and design of passive and active filters for electrical signals. Topics include Butterworth, Chebyshev, Bessel-Thompson response characteristics, feedback and Sallen-Key circuits, frequency and impedance transformations, sensitivity, gyrators, negative impedance elements, leapfrog filters and switched capacitor filters. P, EE 321 or consent.

615 Microprocessor Controls ..................... 3 (2,3)
Analysis and Design of Control Systems based on Microprocessors. Both Linear and Non-Linear Systems considered.

622 RF Electronics ............................... 3 (3,2)
Performance analysis and design methods for the functional blocks of radio frequency systems operating below the microwave bands. P, EE 321.

631 Computer Analysis of Power Systems ......... (3,0)
Concepts used in formulating load flow and fault study problems for computer solution. P, EE 430; EE 432; FORTRAN or consent.

647 Advanced Microprocessor System Design ...... 3 (3,0)
Details of microcomputer hardware design, DMA, multiprocessing memory management and testing strategies. Advanced microprocessor architectures. P, EE 345; EE 447.

650 Biomedical Electronics ....................... 2 (2,0)
Design and operation of basic biomedical electronic instrumentation. Measurement and continuous monitoring of physiological variables: ECG, body temperature, blood pressure, etc. Data acquisition, telemetry data and reduction techniques. P, EE 321 or consent.

652 Biomedical Systems Analysis .................. 3 (3,0)
Engineering concepts applied to the study of biological systems. Modeling of representative biological systems and analysis using techniques developed in the engineering disciplines. P, EE 316 or equivalent.

654 Biomedical Instrumentation & Safety for Health Facilities .................. 3 (3,0)
Methods for designing instrumentation for measurement and safety analysis of instrument dynamics, interpretation of electrical codes and facility safety. Provides background material for engineers working with architects, consultants, and contractors. P, EE 430, EE 321.

670 Communication Systems ...................... 3 (3,0)
Statistical methods, random signals and noise, physical sources of noise, statistical communication theory and digital communications. P, EE 470 or consent.
Theory and application of optical fibers and communications systems. Topics include fundamentals of optical fiber waveguides, electrooptical sources, single-mode and multimode propagation, coupling consideration photodetectors, signal degradation, fabrication and cabling, and transmission link analysis. P, EE 316 or consent.

690 Special Electrical Problems .......... 1-3

693 Special Topics Electrical Engineering 1-3

P, consent.

700-701 Seminar ................. 0-1

715 Linear Network Theory .......... 3 (3,0)


720 Advanced Digital Hardware .......... 3 (3,0)

Topics may include a deeper examination of fundamentals of combinational and sequential circuits, design for testability, advanced function implementation, design with current programmable technologies.

DEPARTMENT OF ENGLISH

Professor George West, Head;
Professors Brandt, Duggan, Evans, Kildahl, Taylor, Veglahn,
Williams, Witherington, Woodward, Yarbrough;
Assistant Professor Ryder;
Emeriti Alexander, Brown, Foreman, Marken, Nagle

Graduate major 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 or consent of Department Head. For the graduate minor a minimum of 16 semester hours of undergraduate credit in English or consent of the Department Head.

Degree requirement:
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 9 hours must be included in a field related to the major or in two fields supporting the major. The candidate must have a reading knowledge of at least one modern foreign language, or must have at least two years of undergraduate credit in a foreign language on the transcript. Unless English 706 or a similar course has been taken previously, it is required for the M.A. A full-time student may complete the degree requirements in one academic year. Graduate assistants should be able to complete the requirements in five semesters.

The candidate is required to present a minimum of 30 hours of graduate work including 6 hours of thesis (English 709); at least 20 hours must be taken in residence. The candidate will present a thesis which reports the results of research directed by a member of the faculty in English. The candidate will be required in an oral examination to defend the thesis and to demonstrate knowledge of English and American literature, both generally and in particular in those areas in which graduate courses have been taken.

Qualifying Exam
Prior to being admitted to candidacy for the Master's degree, each graduate student will take a written qualifying examination based on a reading list of representative literary works.

Note: Before registering for graduate work the graduate student should consult the advisor for graduate students in the English Department.

ENGLISH (Engl)

619 Comparative Novel ........................ 3 (3,0)
Selected European and international novels.

625 Victorian Literature ..................... (3,0)
Intensive study of the chief writers of British poetry and prose from 1840 to 1900.

630 The English Romantic Movement ......... 3 (3,0)
The chief writers of English Romantic poetry and prose from 1785 to 1832, with emphasis on intellectual trends.

634 Advanced Shakespeare .................... 3 (3,0)
Intensive study of selected plays of Shakespeare and significant Shakespearean criticism.

635 Chaucer ........................................ 3 (3,0)
A study of the works of Chaucer, with some attention to his sources and his language. Alternate years.

647 Pre-Civil War American Writers ......... 3 (3,0)
A selection of writers from American transcendentalism and Romanticism.

648 The American Realists and Naturalists ...... 3 (3,0)
An examination of Post Civil War realistic and naturalistic writers.

650 Modern American Novel .................. 3 (3,0)
An intensive study of selected American novelists after 1920 and through the post World War II novel, particularly emphasizing twentieth century themes and forms in the novel.

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

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

706 Research Tools in the Humanities ......... 3 (3,0)
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.
707 Speech/English/Drama for Teachers .......................... 1-3 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.

720 Studies in Early English Literature ...................... 3 (3,0)
Intensive study of a phase of English literature of the era before 1550.

723 Studies in Restoration Literature ........................... (3,0)
Intensive study of an important writer or group of writers or of a significant aspect of English neoclassical literature.

726 Studies in Seventeenth Century Literature ............... (3,0)
Intensive study of the literature of an important writer or group of writers with consideration of the relationships between the literature and the historical and social events between 1600 and 1700.

727 Studies in Elizabethan Literature ........................ (3,0)
Intensive study of an area of Elizabethan literature chosen to meet the needs and interests of the students. Alternate years.

758 Modern American Thought ................................. 3 (3,0)
Analysis of selected economic, political, and philosophical ideas of the late 19th and 20th centuries, their relationship to selected segments of American life, and their reflection in American literature.

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

790 Thesis ......................................................... 6
791 Thesis Sustaining ........................................... 1
792 Seminar in American Indian Literature ................. 2-3 (2,3,0)
Intensive study of the American Indian literature of the past or present with concentration on the Plains Indians.

793 Seminar in English Literature ............................. 3 (3,0)
Intensive study of a selected type, author, or period of English literature.

794 Seminar in American Literature .......................... 3 (3,0)
Intensive study of a selected type, author, or period of American literature.

795 Independent Research and Study ......................... 1-3 (1-3,0)
Directed independent research. May be repeated to a total 6 credits. P, consent of instructor and graduate advisor.

797 Special Studies in Composition and Literature 1-3 (1-3,0) F
Special Studies in various areas of writing grammar and literature. May be repeated to a total 6 credits. Given only with the permission of the Head of the Department of English.

LINGUISTICS (Ling)

620 The New English ........................................... 3 (3,0) F S Su

643 Development of the English Language .................. 3 (3,0) S
Historical survey of the phonology, grammar, syntax, and lexicon of English leading to an understanding of the present state of the language and future developments.

690 Special Topics in Language & Culture .................. 1-3 (3,0)
Readings and discussions of selected topics dealing with a variety of aspects of culture. Training and practice in the use of the spoken language. May be repeated for credit.

691 Directed Study in Foreign Languages and Cultures (Topical) .......................... 1-3
Independent study on a selected author or work. Readings, discussions and written papers will enable the student to improve language skills and deepen understanding of the corresponding culture.

DEPARTMENT OF FOREIGN LANGUAGE

Associate Professor Karen Cardenas, Head;
Professors Bates, Redhead, Richter;
Emeritus Barnes

660 Topics in French, German or Spanish Literature 1-4 (1-4,0)
An intensive examination of a significant writer(s), period or theme in French, German, or Spanish literature. It may be repeated for credit if topic is different.
Courses in Engineering mechanics are taught by staff from the Civil Engineering Department and the Mechanical Engineering Department.

The following courses are provided in support of the Master of Science in Engineering program.

**ENGINEERING MECHANICS (EM)**

621 Introduction to Mechanics of a Continuous Medium .................................................. 3 (3,0) (On sufficient demand)

The general theory of a continuous medium. Kineamatics of deformation and flow stress tensors: conservation of mass, momentum, and energy; invarianee requirements; constitutive equations for solids and fluids; applications for special problems. P, Math 331; EM 331.

622 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 plate with a circular hole. P, EM 321, Math 331 or equivalent.

623 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 622, consent.

724 Theory of Plates and Shells .................................................. 3 (3,0)


731 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 331, Math 331 or equivalent.

741 Finite Element Analysis .................................................. 3 (3,0)


**DEPARTMENT OF GENERAL ENGINEERING (GE)**

Assistant Professor Frank Kombaum, Acting Head
Administrative Committee:
Dean of Engineering D.E. Sander
Professors Alcock, Bergum, Ellerbruch, Froehlich, Hein, Rollag, Yocom; Emeritus Skubic

Graduate major offered:
The Master of Science in Industrial Management degree is offered by the Department of General Engineering and coordinated through the College of Engineering with the University of South Dakota School of Business as well as other colleges on the SDSU campus. This degree provides an opportunity for technically oriented students to broaden their management knowledge or management oriented students to broaden their technical knowledge and thereby become better industrial managers. The program is provided for traditional as well as non-traditional students who recognize the need for additional training in order to improve their management and technical skills.

**GENERAL ENGINEERING (GE)**

The following General Engineering courses are offered to support the Master of Science in Engineering and the Master of Science in Industrial Management program (see College of Engineering) as well as other graduate programs in the University.

610 Human Factors in Engineering and Design .................................................. 3

Human factors engineering (HFE)—sometimes called ergonomics—deals with optimizing working and living conditions through designing for human use. The central approach of HFE involves the systematic application of relevant information about user characteristics, behavior and expectations in the design of man-made products, equipment, facilities, and environments. The objectives of HFE are (1) to enhance the effectiveness and efficiency of work and other human activities; and (2) to enhance the product users comfort, safety, health and satisfaction. P, Math 111, junior standing or consent of instructor.

620 Industrial Safety Engineering .................................................. 3

Safety requirements and standards common to all industries and processes are reviewed. Attention is focused on legal safety requirements, particularly the Occupational Safety and Health Administration (OSHA) Standards. Emphasis is placed on how to recognize, evaluate, and control safety hazards associated with common industrial methods and technologies.

625 Management of Industrial Safety .................................................. 3

Industrial accidents are caused by error-making human beings. Safety results achieved only through “safety engineering” and OSHA compliance are limited. Optimum levels of accident prevention can only be achieved through a coordinated program of both safety engineering and safety management. The focus on modern safety management includes: Management’s direction of safety, measuring safety performance, behavior modification, motivating safety performance, profiling, program organization, products safety, and safety in the adjunct fleet.

643 Project Management .................................................. 3

A systems approach to planning, scheduling and controlling projects and programs to better understand the organizational structure and quantitative methods of project management.

692 Special Problems .................................................. 1-3

Problems in engineering of mutual interest to graduate students and faculty.

693 Special Topics .................................................. 1-3

Current topics in selected engineering areas.

700-701 Seminar .................................................. 0-1 (1,0) F S

703 Designing the Workplace for Productivity .................................................. 3

Designing the workplace to support the structuring of interpersonal communication and action in the workspace and to optimize the use of human energy through the total integration of corporate policy and culture with the physical environment. Includes the evaluation of operation procedures, the construction of behavior, computer assisted facilities management, developing control and order in the workplace, perceived stability as corporate support, flexibility as a catalyst to successful innovation.

790 Thesis .................................................. 5-7

791 Thesis Sustaining .................................................. 1

792 Research Report/Design Paper .................................................. 1-3

793 Special Topics .................................................. 1-3

795 Research or Design Paper Sustaining .................................................. 1
DEPARTMENT OF GEOGRAPHY

Associate Professor Roger Sandness, Head;
Professors C. Griziner (Graduate Coordinator), Hogan, Opheim

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

The Department of Geography offers graduate students the opportunity to earn the Master of Science degree. The degree program is designed to prepare students for employment in such areas as planning, geographic techniques, government service, business and teaching. Likewise the program is also designed to provide the students with the education background necessary for further graduate study.

The graduate curriculum is organized through formal courses, seminars, internship experiences and supervised research. The student seeking the Master of Science degree is expected to select courses that will provide a sound background in Geography supported by courses outside the department. Areas outside the department beneficial to the student include Civil Engineering, History, Economics, Education, Biology, Engineering, Plant Science, Planning, Political Science and Sociology. The minor or supporting areas from outside the department should be selected from these or other disciplines, to provide the student with a balanced, well-developed background.

The department offers several special programs for students interested in unique educational experiences. Among programs offered are: an interdisciplinary Planning minor; the Classroom on Wheels Field Experience; the Futurology Institute; the Industrial Development Workshop; and the Workshops on Teaching Geography. Other Special Programs can be taken through educational experiences provided for in the Alternatives and Options Programs of the College of Arts and Science, and cooperative education programs with the EROS Data Center and the Office of Remote Sensing. Internships can be arranged with planning districts, governmental agencies and business and industry.

Graduate minor offered:
Geography, Planning

Prerequisites for graduate study:
A Bachelor's degree with at least 24 credits in geography or cognate social or physical sciences. If a student is deficient in geographic background, certain deficiencies may have to be removed by taking courses for which no degree credits will be earned.

Credit Requirements
Option A requires a minimum of thirty (30) semester credits for the Master's degree, of which at least 22 must be earned in the major. The thesis accounts for 6 of these credits.

A minimum of 8 credits must be selected from one department other than Geography as a minor field, or at least 2 different departments for supporting course fields for the Master's degree. Courses in the Department of Geography may be used as supporting courses provided they are considered sufficiently diverse by the major department.

Option B requires a minimum of 32 semester credits including a research paper and a comprehensive oral examination.

GEOGRAPHY (Geo)

606 Seminar in Systematic Geography:(Topical) .......... 1-4 FS
Selected topics in systematic geography. The seminars will deal with one or more aspects of human geography, economic geography, physical geography, population geography, historical geography, and systematic techniques. This course may be repeated for credit. The specific topic to be studied will change each semester.

620 Advanced Regional Studies in Geography:(Topical) 1-4 FS
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.

700 Seminar in Geography:(Topical) ......................... 1-4
Studies in selected geography fields. This course may be repeated for credit. The specific topic to be studied will change each semester.

710 Evolution of Geographic Thought ......................... 2 (2,0) FS
The history and development of geography and its theories, schools of thought and current ideas.

712 Introduction to Graduate Study .......................... 2
Introduction to the nature, scope, and applications of geography as a discipline and to numerous practical concerns including geographic literature, schools of thought, and vocational opportunities. Alternate semesters. Alternate years.

714 Research and Writing ........................................ 2
Development of geographic research and writing skills including a survey of data sources and literature, and preparation of reports, papers, articles, and the masters thesis. Alternate semesters. Alternate years.

760 Advanced Demographic Theories and Techniques 3 (3,0) S
(See Sociology 760). Alternate years.

765 Advanced Studies in Land Utilization:(Topical) .. 1-4 FS
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.

770 Advanced Geographic Technique:(Topical) .......... 1-4 (1,4,0) FS
Selected geographic techniques such as cartography, aerial photograph interpretation, remote sensing, information systems and map interpretation. This course may be repeated for credit. The specific topic to be studied will change each semester.

785 Quantitative Methods in Geography .................. 3 S
Descriptive and Inferential Statistics will be studied in this course. The traditional regression and correlation routines will be addressed as well as probabilities. Statistical routines on the mainframe computer will be utilized in problem solving involving real-world geographic-sociological situations.

790 Thesis in Geography ........................................ 1-6
791 Thesis Sustaining ........................................... 1
792 Special Problems in Geography (Topical) .......... 1-4
Selected studies in geography to meet the needs of advanced students.

793 Seminars in Anthropology (See Anthropology 791)
794 Research Paper in Geography
GERONTOLOGY

Gerontology Minor:
An interdisciplinary minor in Gerontology, the study of aging, is available.

Students who select this minor become familiar with the patterns, processes, and problems of aging. The minor in Gerontology is administered by an interdisciplinary committee. The student is responsible for declaring the minor within 10 credits of admission to the graduate school to qualify for admission to the minor. Questions and applications should be directed to the Dean's office in the College of Home Economics.

A total of 10 credit hours are required for the graduate gerontology minor, 6 of which must be from the list below. The other 4 credit hours must be selected from courses having some content related to elderly persons or the study of human beings. This list of courses is available from the Office of the Dean of Home Economics.

- Bio 625 Biology of Aging (2 credits)
- HDCF 714 Adult Development (3 credits)
- NFS 761 Nutrition of the Aged (3 credits)
- Nurs 655 Health Care and the Older Adult (2 credits)
- Pha 519 The Geriatric Patient (2 credits)

Seminar, Current Topics or Special problems. The topics and credits vary by semester and must be approved by the Gerontology Committee.

DEPARTMENT OF HEALTH, PHYSICAL EDUCATION AND RECREATION

Professor, Fred Oien, Head
Associate Professor James Lidstone, Coordinator of HPER Graduate Program;
Professors Booher, Ewing;
Emeriti Crabbs, Forsyth, Huether, Robinson, Williamson

Graduate major offered:
Master of Science degree with a major in Health, Physical Education, and Recreation.

Graduate minor offered:
Health, Physical Education and Recreation.

Prerequisites for graduate study:
For the graduate major a Bachelor's degree with a major in Health, Physical Education, and Recreation or its equivalent, the General Exam of the Graduate Record Exam, and prerequisites to the courses to be pursued.

Thesis Option:
Option A requires a minimum of 30 semester credits, including a thesis and comprehensive oral examination.

The thesis is to be completed in an area of emphasis in Health, Physical Education, and Recreation. Areas of emphasis include: Athletic Administration, Behavioral Science Exercise Physiology, Pedagogy, and Sports Medicine.

Non-thesis Options:
Option B requires a minimum of 32 semester credits, including HPER 792 (Individual Research), and a comprehensive oral examination.

Option C requires a minimum of 35 semester credits and comprehensive written and oral examinations.

Obtain further details from the Health Physical Education and Recreation Department.

HEALTH EDUCATION (Hth)
760 Advanced Administration of School Health Programs .................................................. 2(2,0) S Su
Methods of health instruction, problems of health service; problems in supervision of health environment; recent trends and problems in safety education. P, permission of staff.

HEALTH, PHYSICAL EDUCATION AND RECREATION (HPER)
681 Workshop in HPER .................................................. 1-3 F S Su
Lectures, conferences, and outside assignments to increase understanding of a specific area. P, consent.

682 Seminar in HPER .................................................. 2 (2,0) F S Su
Courses designed to offer current information on subjects of interest in field.

741 Philosophy of Physical Education, and Recreation .................................................. 3 (3,0) F S Su
Discussion and analysis of major philosophic contributions to physical education. Formation and evaluation of one's belief concerning physical education. P, consent.

742 Psychological Aspects of Sport and Physical Activity .................................................. 3 (3,0) F S Su
Psychological principles and theories applied to physical education and sport. Interpretation and analysis of behavior in sport. P, consent.

743 Basic Issues in HPER .................................................. 2 (2,0) S Su
Directed reading in recent literature in field; discussion of current problems; critical analysis of recent research. P, consent.

744 Supervision of HPER .................................................. 2 (2,0) S Su
Techniques, principles, organization and philosophy of supervision in this field. P, consent.

745 Sports Medicine
A review of the basic fundamentals of athletic training and exposure to recent developments in the sports medicine field.

751 Advanced Evaluation of HPER .................................................. 3 (3,0) F S Su
Critical look at the measurement tools and techniques currently used in the assessment of the product and process in physical education. Discussion of current issues and trends, in evaluation. Computer work. P, consent.

760 Motor Learning and Development .................................................. 3 (2,2) S
Analysis of various teaching methods. Survey of research in motor learning. Demonstrations and study of methods applied to various activities. P, consent.

765 Athlete Profiling .................................................. 2 (2,0) S
Application of measurement and evaluation technique to assess physiological, psychological, sociological, and motor performance dimensions of elite athletes.

780 Seminar in HPER .................................................. 1 F S Su
Reports and Discussion of current research in HPER. Two credits required.

783 Research Methods in HPER .................................................. 3 (3,0) S Su
By studying prevalent quantitative and qualitative research techniques students will become critical consumers and potential producers of research relevant to Health, Physical Education and Recreation. Computer work. P, consent.

790 Thesis in HPER .................................................. 1 F S Su

791 Thesis Sustaining .................................................. 1

792 Individual Research and Study in HPER .................................................. 1-4 F S Su
Special problems by individuals. Results of study presented in special reports and term papers. P, major in this field.
PHYSICAL EDUCATION (PE)
660 Methods and Materials for Elementary Physical Education .........................................................2 (2,0) S Su
Analysis of activities, materials, techniques, and methods used in physical education for elementary grades. Progression in curriculum planning in areas of dance, games, self-testing, and movement exploration. P, consent.

730 Physical Education Teacher Education ..........................2 (2,0) F
Readings, lectures, and discussions designed to analyze the process of preparing physical educators for the teaching profession.

750 Applied Exercise Physiology ....................................3 (3,0) F
Physiological basis of factors which influence physical fitness and physical performance; application of physiological measures to fitness programs, critical analysis of current literature; emphasis on bioenergetics, neuromuscular and circulorespiratory function, body composition and physical training. P, undergraduate Exercise Physiology.

770 Advanced Administration of Interscholastic 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, consent.

DEPARTMENT OF HISTORY
Professor Rodney Bell, Head;
Professors Function, Crain, Sweeney, Miller;
Emeritus Volstorff

Graduate major offered:
None

Graduate minor offered:
History

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

HISTORY (Hist)
638 European Intellectual History ..............................................3 (3,0)
History of literature and the arts, leading cultural and ideological movements of Western Man from the Renaissance to the present.

641 Europe in the 19th Century ..................................................3 (3,0)
Europe, 1815-1914. The emerging power struggle in 19th Century Europe, the race for world empire, forces leading up to the outbreak of WW I and scientific, cultural and artistic achievements of the age.

COLLEGE OF HOME ECONOMICS
Virginia L. Clark, Dean

The purpose of the Graduate Program in Home Economics is to provide an interdisciplinary education for home economists who will become leaders in fields related to the four home economics departments.

These are:
Human Development, Child and Family Studies,
Consumer Affairs and Home Economics Education,
Nutrition and Food Science, and
Textiles, Clothing, and Interior Design.

The degree granted is the Master of Science in Home Economics. This degree gives the student an opportunity to acquire a broad education with a measure of specialization within the field of Home Economics.

Core Requirements:
The formal courses offerings for the Master of Science in Home Economics, as determined by the College of Home Economics, are divided into three groups: research requirements, subject-matter specialization, and supporting courses.

The following core credits are required:
HE 701 Seminar in Home Economics (2 credits)
HE 700 Research Methods in Home Economics (3 credits)
HE 790 Thesis in Home Economics
In addition to these research requirements, a statistics course must be taken prior to enrollment in Research Methods. Additional credits in statistics and research methods are encouraged and may be required for some concentrations.

A minimum of nineteen credits in the area of concentration are required including 2 credits in Seminar in Home Economics and a minimum of 5 credits in Thesis, Individual Research and Study, or Internship.

Supporting courses may be selected from any of the other colleges and departments at South Dakota State University. Courses must contribute to an integrated plan of study.

Plan of Study
All plans of study must be signed by both the dean of the college of Home Economics and the major advisor. (Major advisor forwards to dean). They are then forwarded to the Graduate School for action.

600 Practicum in Home Economics ..................................... 2-6
This course is for persons wishing to get experience in a job or career related to their subject specialization. A wide variety of experiences are possible. The supervising faculty member and student develop a learning plan prior to the practicum. P, consent.

601 Seminar ................................................................. 1-2
Review and discussion of current literature in home economics.

692 Special Problems .................................................. 1-3
Individual research and study in home economics P, consent of instructor.

693 Current Topics .......................................................... 1-3
Study of contemporary issues and concerns in home economics. Focus on topics not included in other graduate courses in the college.

700 Research Methods in Home Economics ........................ 3 (3,0)

701 Seminar in Home Economics .............................................. 5-1
Reports and discussion of research in various areas of home economics. Required of graduate majors. Must be repeated for total of 2 credits.

711 History & Philosophy of Home Economics .................. 2 (2,0)
Analysis of historical developments impacting on the profession and field of home economics; critical investigation of various concepts of home economics.

751 Curriculum in Home Economics ................................ 2 (2,0)
Theories of curriculum development. Development of ideas and use of theory.

761 Evaluation in Home Economics .................................. 2 (2,0)
Methods and techniques used in evaluating programs in home economics.

790 Thesis in Home Economics ............................................. 1-7

791 Thesis Sustaining ...................................................... 1

792 Special Problems .................................................. 1-3
Individual research and study in Home Economics. P, consent of instructor.

793 Current Topics .................................................. 1-3
Study of contemporary issues and concerns in the Home Economics profession. Focus on topics related to Home Economics as an integrated profession and not included within the departments of the college. P, consent. Can be repeated up to 5 credits.

794 Internship .................................................. 1-7

795 Individual Research and Study .................................. 1-7

796 Individual Research Paper Sustaining .......................... 1
This course designation allows students to remain enrolled at SDSU while finishing reports associated with work completed for a Research Paper in Home Economics. P, HE 795.

797 Internship Paper Sustaining ........................................... 1
This course designation allows students to remain enrolled at SDSU while finishing reports associated with work completed for an Internship in Home Economics. P, HE 794.

DEPARTMENT OF HORTICULTURE, FORESTRY, LANDSCAPE AND PARKS

Professor W. Carter Johnson, Head
Professors D. Paul Prasher, P. Schaefer;
Emeritus Peterson

611 Plant Breeding
Cross-listing with PS 643

DEPARTMENT OF HUMAN DEVELOPMENT, CHILD AND FAMILY STUDIES (HDCF) (Previously CDFR)

Assistant Professor Judy Branum, Acting Head;
Professor Jay Richardson

The following Human Development Child and Family Studies courses are offered to support the Master of Science in Home Economics program (see College of Home Economics) as well as other graduate programs in the University.

HUMAN DEVELOPMENT, CHILD AND FAMILY STUDIES (HDCF)

692 Special Problems .......................................................... 1-3 as arranged
Individual study for qualified students. P, consent.

693 Current Topics .......................................................... 1-3 (1-3,0) F S
Study of current issues and concerns in human development, family therapy, and family studies. Focus on topics not included in other graduate courses in the department. P, consent. Can be repeated.

702 Seminar .......................................................... 1-3 (1-3,0) (On sufficient demand)
Report and discussions of current literature, including research methodology in human development, family studies, and family therapy. Maximum of 4 credits may be applied to advanced degree. P, consent.

711 Child Development Theory and Application .......................... 3 (3,0) S
In-depth study of human development. Emphasis upon current theories and their application to an understanding of the developmental growth processes; relationship between cognitive, social, physical and emotional development and behavior; range of normality in growth and behavior. Focus on normal development but with consideration of impact of deviance from normative development on child, family, neighborhood.
714 Adult Development .......................................................... 3 (3,0) F
Study of research, theoretical adult development; physical, intellectual and personality development of the adult integrates issues of individual, family gender, and career development and provides opportunity for application in working with adults.

742 Family Relations .......................................................... 3 (3,0) F Su
Current theoretical approaches to family interactions; impact of various forces (social, personal, intra-personal) upon dynamic aspects of family relationships; patterns and sequences of coalitions and alliances; factors which result in stress and breakdown or enhanced and rewarding relationships. Emphasis upon normal families but family problems are also studied.

744 Human Development: Gender Issues, Roles and Relationships ............................................. 3 (3,0 ) Su (On sufficient demand)
Study of recent literature regarding changing gender roles on individual development across the lifespan, family relationships, employment, and other areas of life. P, consent.

765 Parent Education: Theory and Issues .......................................................... 3 (3,0) F
Study of various approaches in parent education to become acquainted with programs and resources available, and to apply the knowledge in working with parents. Will involve the analysis of goals, trends, methods, and models of parent involvement and parent education.

776 Early Childhood Education, Administration and Practicum .......................................................... 1-4 (On sufficient demand)
Field experience with early childhood education (teaching, supervising, and administration). P, 211, 361, 362, 364, departmental consent.

777 Child and Family Counseling .......................................................... 3 (3,0) S (On sufficient demand)
Theory and philosophy of counseling and therapy with children and families using a family systems approach. P, instructor consent.

792 Special Problems .......................................................... 1-3 as arranged
Individual study for qualified students. P, consent.

793 Current Topics .......................................................... 1-3 F S
Study of current issues and concerns in human development, family therapy, and family studies. Focus on topics not included in other graduate courses in the department. P, consent. Can be repeated.

DEPARTMENT OF JOURNALISM AND MASS COMMUNICATION

Professor Richard W. Lee, Head;
Emeriti Laird, Wentzy

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

The Graduate major in journalism is intended to meet the needs of (1) professional journalists who wish to broaden their education in communications and social sciences; (2) individuals who teach communications courses in high school, who have school public relations responsibilities, or who supervise school publications; and (3) individuals with undergraduate degrees in non-journalism specialties who wish to develop their mass communication skills.

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

Because journalism is largely an interdisciplinary subject, most courses are open to students with non-journalism undergraduate specialties.

Graduate minor offered:
Journalism

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 pre-
requisites may be accepted on condition and required to complete
specified courses to meet deficiencies. Final exam may be post-
poned until all prerequisites are met to the satisfaction of the staff.

**GENERAL COMMUNICATION (GCom)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examinations of major theories of communication, including the mass media and interpersonal communication</td>
<td>3 (3,0)</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Public Opinion and Propaganda</td>
<td>3 (3,0)</td>
<td>S</td>
<td>Study of propaganda techniques, agencies, theories.</td>
</tr>
</tbody>
</table>

**MASS COMMUNICATION (MCom)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seminar in Mass Communication</td>
<td>2 (2,0)</td>
<td>F</td>
<td>Work selected areas of journalism and mass communication including special investigation, reports and discussions.</td>
</tr>
<tr>
<td>Editorial Writing and Policy</td>
<td>2 (2,0)</td>
<td>F</td>
<td>Study of writing and decision-making in the mass media; great editorials and editorial writers; shaping policy.</td>
</tr>
<tr>
<td>Media Administration and Management</td>
<td>3 (3,0)</td>
<td>S</td>
<td>Study of management of newspapers, magazines, and broadcast management.</td>
</tr>
<tr>
<td>Persuasion</td>
<td>2 (2,0)</td>
<td>S</td>
<td>Study of persuasion and influence in the mass media.</td>
</tr>
<tr>
<td>Educational Radio and Television</td>
<td>3 (3,0)</td>
<td>S</td>
<td>Study of educational and instructional materials for radio, television and film and their use in the classroom.</td>
</tr>
</tbody>
</table>

**DEPARTMENT OF MATHEMATICS AND STATISTICS**

**Mathematics**

<table>
<thead>
<tr>
<th>Professor K. Yocom, Head Professor Bennett, Bergum, Lacher; Assistant Professor Kindermann; Emeriti Kranzler, Wente</th>
</tr>
</thead>
</table>

**Graduate major offered:**

Master of Science with a major in Mathematics and Master of Science Teaching. See pages 55, 56, 58-59.

**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:

**Three options for Master of Science degree:**

**Option A** requires a minimum of 30 semester credits, including a thesis and a comprehensive oral examination.

**Option B** requires a minimum of 32 semester credits including a research paper (expository) and a comprehensive oral examination.

**Option C** requires a minimum of 35 semester credits and comprehensive written and oral examinations.

Obtain further details from the Mathematics Department.

**MATHEMATICS (Math)**

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intro to Topology</td>
<td>3 (3,0)</td>
<td>S</td>
<td>A first course in point-set topology, covering the elementary concepts of metric and general topological spaces, closure, interior, boundary, connectedness, compactness, and separation. Special attention is given to continuity of functions. P, 225, 253.</td>
</tr>
<tr>
<td>Projective Geometry</td>
<td>3 (3,0)</td>
<td>S</td>
<td>(On demand) A synthetic and/or analytic approach to geometric properties invariant under projective transformations: Theorems of Desargues, Pascal, Brianchon and applications. P, 224 or consent of instructor.</td>
</tr>
<tr>
<td>Numerical Analysis</td>
<td>3 (3,0)</td>
<td>F</td>
<td>A survey of numerical methods including methods of interpolation, curve fitting, integration, solving equations (including differential equations with initial or boundary values). Errors of the methods are analyzed and the digital computer is used to apply the methods. P, 321.</td>
</tr>
<tr>
<td>Special Topics</td>
<td>1-3 (1,0)</td>
<td>S Su</td>
<td>Topics of current interest not included in regular course offerings.</td>
</tr>
<tr>
<td>Seminar</td>
<td>1 (1,0)</td>
<td>F</td>
<td>Current Topics in Mathematical Research.</td>
</tr>
<tr>
<td>Theory of Algebraic Structures I</td>
<td>3 (3,0)</td>
<td>F</td>
<td>Abelian Groups, homomorphisms, permutation groups, Sylow theorems, group representations and characters. P, 313.</td>
</tr>
</tbody>
</table>
717 Theory of Algebraic Structures II .................................. 3 (3,0) S
Rings, Modules, Fields, Galois theory, solvable groups, commutative rings and modules. P, 716.

726-727 Real Variables I, II ........................................... 3 (3,0) F S
Set Theory, The Real Number System, Theory of Functions of a Real Variable, Lebesgue Measure, the Lebesgue Integral, Differentiation and Integration, Metric Spaces, Topological Spaces, Compact Spaces, Banach Spaces, Measure and Integration, The Daniell Integral, Topology, and Mappings of Measure Spaces.

728 Complex Variables I ............................................... 3 (3,0) F

729 Complex Variables II .............................................. 3 (3,0) S
Continuation of 728, Laurent series, calculus of residues, conformal mapping, analytic continuation, Riemann surfaces, infinite products, special functions. P, 728.

731 Ordinary Differential Equations .................................... 3 (3,0) F

732 Partial Differential Equations ...................................... 3 (3,0) S

784 Applied Probability Theory ........................................ 3 (3,0) F
Topics in probability including an introduction to the axiomatic development of probability, random variables and distributions with emphasis on the exponential, binomial and Poisson distributions. Applications to discrete stochastic processes such as Markov chains and queuing theory are covered in some detail. P, 381 or consent.

790 Thesis ................................................................. 5-7 F S

791 Thesis Sustaining ................................................... 1 F S Su

792 Research Paper .................................................... 2 F S Su

793/794 Advanced Topics ............................................... 1-3 F S Su

795 Special Problems .................................................. 1-3 F S Su

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DEPARTMENT OF MECHANICAL ENGINEERING

Associate Professor D. Froehlich, Head
Professors H.S. Ghazi, H. Hamidzadeh, A. Moutsoglou;
Assistant Professor C. Remund;
Emeritus Sandfort

Note: Prerequisites for all 700 level courses are: grad standing or consent.

The following Mechanical Engineering courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the University. Each course is taught on sufficient demand.

MECHANICAL ENGINEERING (ME)

627 Gas Dynamics I ................................................... 3 (3,0)
Review of fundamental principles in fluid dynamics and thermodynamics. Steady one dimensional compressible flow with area changes, friction, and heat transfer. Shock and expansion waves. Method of characteristics.

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Statistics
Administrative Committee:
Professors P. Edeburn, Evenson, Ewing Kim, Lacher, Monahan, Nielsen, Tucker, Vandever, Wicks;
Instructor Ellingson

Statistics is concerned with the development and application of the most effective methods of collecting, tabulating, and interpreting quantitative data in such a manner that the validity of conclusions and estimates may be assessed by means of inductive reasoning based on the mathematics of probability.

STATISTICS (Stat)

641 Statistical Methods II ............................................ 3 (3,0) S
Analysis of variance, various types of regression, and other statistical techniques and distributions. Sections will be offered in the areas of Biological Science, and Social Sciences. P, 341 or 381. Credit not given for both 641 and 681.

645 Nonparametric Statistics .......................................... 2
Covers many standard nonparametric methods of analysis. Methods will be compared with one another and with parametric methods where applicable. Attention will be given to: (1) analogies with regression and ANOVA; (2) emphasis on construction of tests tailored to specific problems. P, 341 or 381.

681 Statistics for Physical Sciences .................................. 3
Analysis of variance, various types of regression, and other statistical techniques and distributions. P, 341 or 381. Credit not given for both 641 and 681.

751 Interpretation of Statistical Software Output ..................... 2
Interpretation of statistical software package(s) include statistics such as correlation, means, standard deviation, standard error, t-test, chi-square, simple and multiple linear and curvilinear regression, and balanced and unbalanced analysis of variance. P, 641 or 681.

761 Experimental Design ............................................... 3
Experimental designs involving confounding will be explored as it relates to factorial experiments, incomplete block, lattice, and incomplete latin square designs. P, Stat 641 or 681.

792 Special Topics in Statistics ...................................... 1-3 (6 students maximum)
Advanced study of one or more selected topics as student need justifies; for example, sampling, statistical genetics, multivariate statistics. P, Stat 641 or 681.

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640 Computer-Aided Design ........................................... 3 (3,0)
Use of digital computer as a design tool. Techniques and algorithms that increase the rationality of the design process. Design principles and optimization theory. General approach to constrained optimization. Probabilistic approaches to design. Computer-aided design to reliability specification. Application of computer graphics to engineering design. Emphasis on extending the designer's potential and not on automating activities. P, competence in FORTRAN programming and consent.

690 Special Problems .................................................. 1-5
Provides an opportunity for study or investigation of special problems or project at graduate level. P, or consent.

695 Special Topics .................................................... 1-3

700/701 Seminar ....................................................... 0-1

703 Thermo-Fluid Energy Systems ................................... 3 (3,0)
Review of viscous fluid, basic modes of heat transfer, and thermodynamic energy conversion. Discussion of energy sources, uses, conversion, transmission, and economics. Analysis of conventional energy generation, storage, and transmission systems, criteria for design and analysis of energy systems such as nuclear, wind, solar, geothermal, etc.
### Advanced Analytical Methods

- **731 Advanced Analytical Methods**
  - **712 Convection Heat Transfer**
  - **721 Viscous Flow I**
  - **728 Gas Dynamics II**
  - **731 Advanced Analytical Methods**
  - **735 Modeling and Simulation**
    - A systems approach to the analysis of electrical, mechanical and hydraulic systems Generalized modeling methods; governing equations; system response; synthesis and design of dynamic systems; and specific applications of modeling technique.
  - **739 Advanced Metallurgy**
    - Crystal lattices and diffraction by crystals. Structure determination, defects, registration by microscopic methods, single crystal orientation and analysis of stress caused by phase transformation.

### DEPARTMENT OF MUSIC

**Professor Warren Hatfield, Head**

**Graduate major offered:**

None

**Graduate minor offered:**

Music

**Prerequisites for graduate study:**

For the graduate minor, a Bachelor's degree with a major or minor in Music.

**MUSIC (Mus)**

- **690 Independent Studies**
  - 1-3
- **691 Directed Studies**
  - 1-3
- **695 Course Specials**
  - 1-5
- **791 Directed Studies**
  - 1-4

- **741 Advanced Stress Analysis in Mechanical Design**

- **745 Advanced Machine Design**

- **761 Operations Research**
  - 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.

- **762 Quality Control and Reliability**
  - 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.

- **763 Topics in Reliability Engineering**
  - Probability concepts and typical models involved in the statistical prediction of reliability. Methods for estimating required parameters from experimental data. Reliability and maintainability techniques in practice, and a survey of recent developments in the field.

- **765 Systems Analysis**
  - 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.

- **767 Decision Theory**
  - Examination and evaluation of modern techniques of decision making. Mathematical models and measurement theory. Certainty, risk, and uncertainty.

- **790 Thesis**
  - 5-7
- **791 Thesis Sustaining**
  - 1
- **792 Research Report/Design Paper**
  - 2
- **794 Special Problems**
  - 1-3
- **795 Special Topics**
  - 1-3
The general purpose of graduate education in nursing is to prepare professional leaders with special knowledge and skills to meet the nation's needs in nursing service and nursing education. The aim of the program is to prepare nurses in the functional roles of either nurse educator, clinician, or patient care manager with a focus on adult/gerontology or family/child. Achievement of this aim includes study in related fields and the use of research in the examination of nursing problems.

Program Focus
The general purpose of graduate education in nursing is to prepare professional leaders with special knowledge and skills to meet the nation’s needs in nursing service and nursing education. The aim of the program is to prepare nurses to practice at an advanced level in nursing and in the functional roles of either nurse educator, clinician, or patient care manager with a focus on adult/gerontology or family/child. Achievement of this aim includes study in related fields and the use of research in the examination of nursing problems.

Objectives of Program
The graduate of the Master of Science in nursing program will:
1. Synthesize advanced knowledge from the sciences, humanities, other cognates, and nursing in the development of a conceptual framework.
3. Contribute to the development of nursing as a scientific discipline through the generation of new knowledge and expansion of existing knowledge by application of the deliberative process at an advanced level.
4. Practice with expertise at an advanced level in the specialized nursing care of the client.
5. Synthesize and utilize knowledge and skills basic to the functional role of clinician, nurse educator, or patient-care manager.
6. Evidence competence in research by evaluating research, conducting a research study and using research results in advanced nursing practice and in a functional role.
7. Plan and initiate leadership and change strategies to improve nursing practice, health care, and the health care system.
8. Collaborate with clients, community and other health professionals to enhance the delivery of health care to the client. Prediction and optimal decisions.

Prerequisites for graduate study:
In addition to meeting basic requirements for admission to the Graduate School, applicants for graduate study in nursing must have:
1. A bachelor’s degree in nursing from an NLN accredited program with an upper division major in nursing.
2. Maintained a “B” average (3.0 or higher on a 4 point grading system).
3. Current licensure in South Dakota or be eligible to obtain licensure.
4. Professional nursing liability insurance.
5. One year of experience in nursing practice.
6. A course in physical assessment or documented skills in this area (evidenced by test or transcript).
7. A course in statistics, including descriptive and inferential statistics.
8. Submitted results of the Graduate Record Examination Aptitude Test to the College of Nursing.

Candidates not meeting basic prerequisites may be given special consideration if it appears that deficiencies can be corrected.

General Program Description
The degree granted is the Master of Science with a major in nursing. The program gives the student an opportunity to acquire a broad graduate education focusing on the health needs of clients in multiple care settings. The program requires a minimum of 38-41 semester hours which may be completed in three to four semesters of full-time study. Part time study is available.

Formal course offerings in the program are divided into the following groups: core courses which all students take; functional role courses specific to either teaching, patient care management or advanced clinical practice; courses which support the major and/or the functional role; and elective courses. The student may choose to do either a thesis or a research project. Plans of study vary slightly for these two options. A comprehensive written or oral examination is required of all students.

Students may choose to focus on the older client by emphasizing gerontological coursework in the supportive and elective areas.

Core Courses (All students)
Nurs 610 Theory and Conceptual Frameworks in Nursing
Nurs 620 Pathophysiological Basis for Nursing Practice
or Nurs 621 Developmental Physiology
or Nurs 623 Physiology for FNP’s
Nurs 694 Research Methods in Nursing
Nurs 720 Leadership and Role Development
Nurs 760 Concepts in Advanced Nursing I
Nurs 765 Concepts in Advanced Nursing II
or Nurs 766 Concepts in Advanced Nursing of Families
Nurs 782 Communication for Advanced Nursing Practice

Functional Role Courses
(Vary depending on option)
1. Nurse Educator
   Nurs 710 Curriculum Development in Nursing
   Nurs 775 Nurse Role Practicum, Nursing Education Section

2. Patient-care Manager
   Nurs 725 Patient Care Management
   Nurs 775 Nurse Role Practicum, Patient Care Management Section

3. Advanced Clinician (Two suboptions):
   Clinical Specialist in Adult Care
   Nurs 645 Management of Acute and Chronic Pain
   Nurs 770 Clinical Nursing Specialization (Secondary/Tertiary Care Section)
   Family Nurse Practitioner
   Nurs 771 Clinical Specialization (Care for FNP’s)
   Nurs 775 Nurse Role Practicum, (Advanced FNP Section)

Support Courses
Courses taken from other colleges and departments which support either the major and/or functional role.

Elective Courses
Courses taken either in nursing or other areas of study depending on student’s interests.

Two Options for Master of Science Degree
Option A requires a thesis (Nurs 790 Thesis in Nursing 5 credits)
Option B requires a research project (Nurs 792 Problems in Nursing Research 2 credits) and five (5) elective credits.
NURSING (Nurs)

Required Courses: Core

610 Theory and Conceptual Framework in Nursing
A systematic study and interpretation of nursing phenomena by critical examination of theoretical concepts and models. P or concurrent, Nurs 765, Nurs 766.

620 Pathophysiology Basis for Nursing Practice
Manifestations of complex clinical problems analyzed through physiological and pathological mechanisms with implications for nursing practice. Requires a basic knowledge of anatomy and physiology. P, or concurrent, Nurs 765, Nurs 766.

621 Developmental Physiology
Physiological development of the child from conception through adolescence and of pregnant women. Requires basic knowledge of anatomy and physiology. P, or concurrent, Nurs 765, Nurs 766.

623 Physiology for Family Nurse Practice
Normal developmental physiology and pathophysiology with emphasis on clinical nursing problems of the major body systems. Normal growth and development throughout the life span will be highlighted. Interruptions due to disease processes are emphasized. P, Undergraduate Anatomy and Physiology, Family Nurse Practitioner option.

694 Research Methods in Nursing
Components of the research process with emphasis on research in nursing and the health care system. P, statistics course; P, or concurrent, Nurs 610.

720 Leadership and Role Development
Opportunity for analysis and critical review of current issues regarding the nurse's role in delivery of health care services. P, or concurrent, Nurs 610, Nurs 760, or consent of instructor.

760 Concepts in Advanced Nursing I
The development of nursing practice by application of scientific principles, generalization and concepts to complex nursing problems. Particular attention directed toward management of client-relationship with the changed environment determined by his/her health status. P, regular graduate student status; P, or concurrent, Nurs 610, Nurs 620, 694.

765 Concepts in Advanced Nursing II
(Continuation of Nurs 760). See Nurs 760 for course description. P, Nurs 694, Nurs 760; P, or concurrent, Nurs 782, 720.

766 Concepts in Advanced Nursing of Families
Application of scientific principles, generalizations and developmental concepts to complex nursing problems of childbearing/childrearing families. Clinical applications focus on childbearing/childrearing families. P, Nurs 760, concurrent 782.

782 Communication for Advanced Nursing Practice
Seminar and supervised experiences with application of the therapeutic communication process to prevention, treatment, and rehabilitation of adults and/or families in health and illness. P, regular status; P, or concurrent Nurs 610, Nurs 760 or consent of instructor.

Required Courses: Within Role Options

645 Management of Acute and Chronic Pain
Provides opportunity to identify and discuss management principles of acute and chronic pain with noninvasive and invasive measures. P, graduate nursing student, other graduate students with instructor's permission.

710 Curriculum Development in Nursing
Principles of curriculum development and their application to nursing curricula. Selection, organization and evaluation of learning experiences. P, or concurrent Nurs 610, or consent of instructor.

725 Patient Care Management
Identification and analysis of management theories influencing middle management nursing roles in a variety of patient care situations. P, or concurrent Nurs 765, Nurs 782, or consent of instructor.

770 Clinical Nursing Specialization
Extension and refinement of professional expertise in a clinical field of the student's choice. P, Nurs 765.

771 Clinical Specialization for Family Nurse Practice
Clinical diagnostic and therapeutic knowledge and skill through application of preventive, epidemiologic, pharmaceutical and nursing theory in clinical practice with families. Case management of a variety of clients in a collaborative health care practice is examined through classroom and clinical experiences. Gerontology content and patient care experiences are included. P, Nurs 766 Family Nurse Practitioner option.

775 Nurse Role Practicum
Supervised experience in nursing role:
Nursing Education Section. Teaching in classroom and/or clinical services 4 (0,12). P, or concurrent Nurs 710, P, Nurs 765.

Patient Care Management Section. Nursing middle management in selected patient care settings 4 (0,12), P, or concurrent, Nurs 725, P, Nurs 765.

Advanced Clinical Practice Section. Application of clinical knowledge and skills in various health care settings by working interdependently with nurse and/or physician preceptors 12(0,36). P, Nurs 770.

Required Courses: Two Research Options

790 Thesis
P, Nurs 694; regular admission status; P, or concurrent Nurs 760.

791 Thesis Sustaining
P, or concurrent Nurs 760.

792 Problems in Nursing Research
Application of the nursing research process with particular emphasis on problems of inquiry in the health care system (Project or non-thesis option). P, Nurs 694; regular admission status, P, or concurrent Nurs 760 May be repeated up to three times for a maximum of two (2) credits.

795 Problems in Nursing Research Sustaining
P, or concurrent Nurs 760.

Elective Nursing Courses (Available on sufficient demand)

625 Human Sexuality in Health Care
Provides the opportunity to identify, study and discuss those areas in human sexuality which concern human interaction and in particular the work with clients and their families in health care. P, graduate student in nursing; graduate student in other disciplines with permission of instructor.

630 Nursing Science
Experience in systematic assessment of client/patients in the identification of nursing diagnoses with emphasis on evaluation of nursing intervention. P, consent.

633 Industrial Hygiene
Industrial hygiene deals with the scope, objectives and functions of occupational health programs, harmful exposure to chemicals and physical agents which may cause discomfort, stress, inefficiency or disease, emphasis on preventive measures to assure a reasonably healthful work environment.

635 Death and Dying: Principles and Practice of Care
Provides an opportunity to identify and discuss issues surrounding death and ways in which health professionals may provide appropriate care for the dying person and family.

640 Legal and Ethical Accountability in Health Care
Study of the ethical positions and legal factors influencing behavior and decision making in health care. Emphasis on developing a justifiable ethical framework with consequent rights, responsibilities and conflicts. P, graduate students in nursing and other health professionals with instructor permission.
655 Health and the Older Adult .............................. 2 (2.0)
Issues and factors affecting the older adult will be analyzed for their implications in planning and implementing health care for this group. A guided study approach to a conventional course. P, senior or graduate nursing student, graduate or senior student of other health disciplines or by consent of the instructor. (Required for Gerontology Emphasis).

665 Health Care for Victims of Abuse ...................... 3 (3.0)
Opportunities to study the historical perspectives of health care for the victim; to assess the current physical, psychological and emotional health care needs of the victim; to plan and implement intervention procedures and to evaluate the treatment modes in appropriate health care facilities. P, Psychology 101, Sociology 100, senior or graduate nursing student, graduate or senior student of health disciplines or by consent of instructor.

670 Issues in Health Care Delivery ......................... 3 (3.0)
Study of the organization and the political, economic and social aspects of international, national and regional health care systems.

690 Seminar: Guided Study in Nursing .................. 1-4
May be either seminar or laboratory or combination of these. Investigation of a selected problem in nursing theory or practice. May be repeated for two semesters for variable credit.

725 Nutrition and Human Performance .................... 3
This course is designed to develop an understanding of nutrition, based on knowledge of the biochemical and physiological process and functions of specific nutrients in meeting nutritional requirements. Emphasis will be placed upon the relationship of optimal nutrition and physical efficiency and performance.

734 Techniques in Nutrition Research .................... 3 (1.6)
Laboratory experience using methods, measurements and instruments for obtaining nutritional data. P, Chem 361 or consent.

760 Child Nutrition ............................................. 3
An intensive study of the nutrition of the human organism, beginning with prenatal nutrition and extending through adolescence. An evaluation of the factors affecting height and weight for age, muscle development, and the nutritional status. P, NFS 321 or consent.

761 Nutrition of the Aged ..................................... 3
Physiological and behavioral changes associated with the aged and their impact on nutrition. Effect of nutrition on aging and lifespan. Common health problems of the aged and their implications. P, 321 or consent.

792 Special Problems ............................................ 1-3 (as arranged)
Special studies in Nutrition and Food Science. Consent.

793 Current Topics ............................................. 1-3
Special course offerings on a topical basis stressing current state of knowledge on various topics.

724 Recent Development and New Approaches in Human Nutrition ............................................. 3 (3.0)
Emphasis on new concepts in nutrition and resultant impact of changing dietary patterns on health and behavior. Insights essential for recognition of dietary needs and practical educational techniques to evoke favorable changes in food consumption patterns.

DEPARTMENT OF NUTRITION AND FOOD SCIENCE
Professor Michael G. Crews, Head

The following Nutrition and Food Science courses are offered to support the Master of Science in Home Economics program (see College of Home Economics) as well as other graduate programs in the University.

Nutrition and Food Science (NFS)

603 Seminar in Food And Nutrition ......................... 1-2 (On sufficient demand)
Reports and discussion of current literature in various areas of food and nutrition. P, consent.

660 Maternal and Infant Nutrition .......................... 3
Fundamental principles of nutrition during pregnancy, lactation, infancy, and early childhood. Topics include stages of fetal development, maternal physiological and anatomical alterations, nutritional guidance in prenatal care, normal growth and development, food intake and its regulations. P, 321 or consent.

662 Sociocultural Aspects of Nutrition ................... 2
The study of diverse dietary patterns and their impact on nutritional health including food attitudes, socioeconomic structures, cultural patterns of food intake and their effect on nutrient composition of the diet. P, 221 or 321 or consent.

692 Special Problems ............................................ 1-3 (as arranged)

93 Current Topics ............................................. 1-3
Special course offerings on a topical basis stressing current state of knowledge on various topics.

724 Recent Development and New Approaches in Human Nutrition ............................................. 3 (3.0)
Emphasis on new concepts in nutrition and resultant impact of changing dietary patterns on health and behavior. Insights essential for recognition of dietary needs and practical educational techniques to evoke favorable changes in food consumption patterns.

725 Nutrition and Human Performance .................... 3
This course is designed to develop an understanding of nutrition, based on knowledge of the biochemical and physiological process and functions of specific nutrients in meeting nutritional requirements. Emphasis will be placed upon the relationship of optimal nutrition and physical efficiency and performance.

734 Techniques in Nutrition Research .................... 3 (1.6)
Laboratory experience using methods, measurements and instruments for obtaining nutritional data. P, Chem 361 or consent.

760 Child Nutrition ............................................. 3
An intensive study of the nutrition of the human organism, beginning with prenatal nutrition and extending through adolescence. An evaluation of the factors affecting height and weight for age, muscle development, and the nutritional status. P, NFS 321 or consent.

761 Nutrition of the Aged ..................................... 3
Physiological and behavioral changes associated with the aged and their impact on nutrition. Effect of nutrition on aging and lifespan. Common health problems of the aged and their implications. P, 321 or consent.

792 Special Problems ............................................ 1-3 (as arranged)
Special studies in Nutrition and Food Science. Consent.

793 Current Topics ............................................. 1-3
Special course offerings on a topical basis stressing current state of knowledge on various topics.

724 Recent Development and New Approaches in Human Nutrition ............................................. 3 (3.0)
Emphasis on new concepts in nutrition and resultant impact of changing dietary patterns on health and behavior. Insights essential for recognition of dietary needs and practical educational techniques to evoke favorable changes in food consumption patterns.

COLLEGE OF PHARMACY

Bernard E. Hietbrink, Dean
Professors Billow, Chappell, Dwivedi, Hougum, Omodt;
Assistant Professor Singh;
Emeriti Gross

660 Advanced Pharmacokinetics ......................... 3
Theory and application of compartmental models for the study of the time course of drugs in the body. P, Pha 441 or consent.
PLANNING

Professor Roger Sandness, Chairman and Coordinator

Graduate Minor:
Offered with Master’s degree and major in: Economics, Education, Engineering, Geography and Sociology (other colleges or departments by special arrangement).

Planning is an essential part of most private and public activities. Planning is a process which can be learned and applied to increase effectiveness of decision making and operations.

PLANNING (Plan)
691 Principles of State, Regional and Community Planning  3 F
Purpose, structure, and dynamics of the planning process. Identification of different types of planning. Interdependencies among persons who contribute to the planning process and are trained in separate academic disciplines. Introduction to basic techniques employed within different phases of the planning process. P; Enrollment within a minor in planning at the Master’s level or consent.

692 Techniques of State, Regional and Community Planning  3 S
Brief review of basic approaches, procedures and methods employed within different phases of the planning process. Coordination required among persons trained in separate academic disciplines in order to carry out these basic techniques. Exercises in the practical application of selected techniques, and review of their application in ongoing or completed planning efforts. P, Plan 691.

(See also: specialized courses in planning within departmental listings in Economics, Education, Engineering, Geography, Horticulture-Forestry, Political Science and Sociology).

DEPARTMENT OF PHYSICS

Professor W. Hein, Head;
Professors Graetzer, Quist;
Associate Professors Kitterman, Leisure, Rauber;
Emeriti Duffey, Miller, Williams

Graduate major offered:
Master of Science Teaching. See pages 55, 56, 59-60.

The following Physics courses are offered to support the Master of Science in Engineering program (see College of Engineering) as well as other graduate programs in the University.

PHYSICS (Phys)
633 Nuclear and Elementary Particle Physics ...............3
Radioactivity, nuclear spectra and structure, nuclear models, elementary particle theory and high energy physics. P, Phys 471 or consent.

635 Reactor Physics ........................................... 3 (3,0)
Fission process: moderation and diffusion of neutrons; critical equation; reactor control; environmental effects; nuclear fusion. P, 433 or consent.

637 Science of Solids ........................................ 3 (3,0) S
Topics covered will be chosen to satisfy student interests and will be chosen from areas such as magnetism, semi-conductors superconductors, ferroelectrics, and devices based on these aspects of solids. The role of defects in solids and strength of materials may also be included. P, Phys 439 or consent.

700 Seminar ..................................................0-1 F S
Current, state-of-the-art, topics in engineering and physics. All graduate students are required to take this course each semester in residence and no more than twice for credit. Students registering for zero credit will be required to attend all sessions. Students who register for one credit will be required to write a paper and make a presentation on a subject related to their research or design paper.

721 Electrodynamics .............................................3 (3,0)
Complex quantities, circuits, Maxwell’s equations, waves in general, planar, cylindrical, and spherical waves, approximation methods, plasmas. P, 421.

735 Theoretical Nuclear Physics .............................. 3 (3,0)
Quantative 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, 433.

743 Statistical Mechanics ......................................3 (3,0)

751 Theoretical Mechanics ....................................3 (3,0)
Further development of Lagrangian and Hamiltonian methods, canonical transformations, rigid body motion, relativistic mechanics. P, 351.
and control. Advanced laboratory research methods used in Plant diseases caused by viroids, viruses, bacteria and mycoplasmas — isolation, transmission, culture, purification, microscopy, serology and investigation of the nature and properties of important plant pathogens. P, consent. Alternate years.

761 Plasma Physics
Elementary processes in a plasma, trajectories of charged particles, collective effects, creation of plasma, plasma instabilities, applications. P, 421.

771 Quantum Mechanics
Hermitian operators, matrix methods, perturbation theory, Dirac wave equation, four-fermion interactions. P, 351, 471.

775 Tensors and General Relativity
Covariance in physics, basic tensor algebra and calculus, affine connections, the Riemann tensor, field equations, linear approximations. The Schwarzschild solution. P, 421 or consent.

779 Group Theory in Quantum Mechanics
Symmetry transformations, continuous groups, finite groups, applications to valence theory, Lorentz group, fundamental particles. P, 471.

DEPARTMENT OF PLANT SCIENCE (Agronomy, Entomology, Plant Pathology)

Professor Fred Cholick, Head;
Professors Arnold, Boe, Bucherau, Dybing (USDA), D. Eveson, P. Evenson, Kenefick, Kieckhefer (USDA), Kohl, Malo, McDaniel, Moore, Reeves, Smolik, Wicks; Associate Professors Carlson, Carter, Gallenberg, Rickerk, Schumacher, Fixen (Adjunct);
Assistant Professors S. Clay, D. Clay, Espinasse-Gellner, Fuller, Gelderman, Kephart, Riedell (USDA), Twidwell; Emeriti Brage, P. Carson, Derscheid, Fine, Gardner, Horton, Kantack, Kinch, Mankin, Semeniuk, Shank, Shubeck, Wahlstrom, Wells, Westin, White, Wood

Graduate majors offered:
Master of Science degree with a major in Agronomy, Entomology or Plant Pathology. Doctor of Philosophy degree with a major in Agronomy or Biological Sciences. See page 14.

Prerequisites for graduate study:
A Bachelor's degree plus prerequisites for the courses elected. The Master of Science degree with a major in Entomology requires at least 14 prior credits in entomology.

PLANT SCIENCE (PS)

643 and H0 611 Plant Breeding
Plant Breeding applied to field crops and horticultural varieties with particular emphasis on the relationship of genetics and allied subjects. P. PS 103, Bio 371.

653 Advanced Genetics
Procedures in genetic studies as they relate to molecular and classical genetic applications. Alternate years.

700 Special Topics
Advanced study of one or more selected topics:
1. Biometrical Genetics 8. Soil Genesis
2. Entomology 9. Soil Mineralogy
3. Mycology 10. Soil Physics
4. Saline and Sodic Soils 11. Virology
5. Phytophathology 12. Weed Science
6. Plant Breeding 13. Soil-Plant Modeling
7. Soil Chemistry 14. Teaching Experience

(2 Cr. maximum), P, consent for all Special Topics.

704 Virus and Bacterial Disease of Plants
Plant diseases caused by viroids, 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. Alternate years.

790 Thesis
5-7 (as arranged) F

791 Thesis Sustaining

792 Research or Design Paper
Conduct a research or design project and write a report on the work done using thesis format.

793 Special Topics
Special projects either from a theoretical or experimental approach. P, consent.

713 Host-Plant Pathogen Interactions
Physiology and genetics and host-parasite interactions. Disease resistance. P, consent. Alternate years.

721 Integrated Crop Pest Management
The biological and ecological basis of integrated pest management for midwestern crop insects and the understanding of economic thresholds are emphasized. Pest scouting techniques for major crop pests and simulated management decisions are discussed.

732 Field Studies in Pedology
Field Techniques used in soil classification will be learned by studying soils developed in a variety of geological materials and surface formations during a week-long field exercise. Soil genesis and land use applications will be investigated. The impact of soils upon agronomic management and research will be presented. Students will share transportation, room and board costs. The class may be repeated for a maximum of 4 credits. P, PS/Geo 310 or consent of instructor. Physiographic divisions used as study areas will be rotated so that activities are unique each year.

733 Advanced Soil Genesis
Detailed study of the processes of soil genesis and an examination of soil and ecosystems with respect to the soil forming factors of time, parent material, topography, climate and organisms. P, consent. Alternate years.

734 Plant Nematology
Nematode diseases of plants with emphasis on collection, isolation, preservation, symptomology, identification, life histories and control of plant parasitic nematodes. P, consent. Alternate years.

741 Crop Breeding Techniques
A techniques course where artificial hybridization of crop plants will be demonstrated and carried out. Background material will be offered with each crop. Both field and horticultural crops are included. Alternate years.

743 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 on applications in development and utilization of soil and water resources in a manner consistent with preservation of environmental quality. P, consent. Alternate years.

744 Soils and Plant Nutrition
Plant-soil nutrient relationships including nutrient sink development, uptake, transport to roots, labile soil sources, nutrient deficiencies, and their correction. Emphasis on nitrogen, phosphorus and potassium. P, consent. Alternate years.

745 Plant Secondary and Micronutrients
Forms and reactions of secondary and micronutrients in soils, their plant functions and requirements, as well as deficiency correction. P, consent. Alternate years.
751 Advances in Plant Pathology ........................................ 1 (1,0) F 1993
Presentation and in-depth discussion of current topics and controversies in plant pathology. Extensive use of the literature. Oral presentations and term paper required.

753 Genetics Plant Disease Resistance ................................ 2 (2,0) S 1994
Extensive study of genetics mechanisms in the host and pathogen that determine plant disease reactions and how these genetic systems interact; breeding plants for disease resistance; discussion of current topics in host-pathogen genetics. Alternate years.

754 Chemical Properties of Soils ....................................... 4 (4,0) F 1993
Chemical considerations of the dynamic interactions of soil-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.

761 Taxonomy of Insects .................................................. 3 (3,0) F 1992
Collecting, identification and classification of insects. Techniques of identifying the groups of economic insect pests that affect the production of feed, food and fiber. Alternate years.

763 Environmental and Physiological Aspects of Crop Production ........................................... 2 S 1993
Systems analysis of factors which limit or increase crop production and the potential for qualitative and quantitative adjustments. P, Bot 427 and consent of instructor. Alternate years.

771 Principles of Insecticide Use ....................................... 3 (2,2) F 1993
Insecticides and chemosterilants, their effects, antidotes, detection, and uses. Techniques of determining insecticide resistance in an insect population, insecticide residues, and radio-active tracers in laboratory and field populations. P, Ch 120. Alternate years.

773 Cytogenetics ............................................................ 3 (2,3) F 1993

780 Advanced Special Problems .................................... 1 or 2 FS Su
Advanced study and research in crops, plant pathology, and soils. P, consent.

781 Plant Science Seminar .................................................. 1 (1,0) F S
Reports and discussions of current investigations in crops, entomology, plant pathology, and soils. (2 credits required for M.S.; 3 credits for Ph.D.).

782 Research Problems ..................................................... 2 FS Su

783 Crop-Water Relationships ........................................... 2 (2,0) F 1993
An examination of the role of water on crop productivity with an emphasis on environmental and physiological factors affecting the absorption, movement and use of water in crops. Water associated stresses will be analyzed in terms of agronomic and physiological mechanisms of adaptation. P, Bot 427 and consent. Alternate years.

790 Thesis—M.S. ............................................................... 1

791 Thesis Sustaining—M.S. .................................................. 1

797 Soil and Plant Analysis .................................................. 3 (2,3) F 1993
The analysis of soil and plant material for constituent elements. Topics covered include: Material sampling and preparation, extraction and determination method, theoretical principles of analysis, accuracy and precision. Emphasis on common soil and plant test indices. P, consent. Alternate years.

890 Dissertation—Ph.D. ...................................................... Variable

891 Dissertation Sustaining—Ph.D. ....................................... Variable

892 Ph.D. Seminar ............................................................ 1

DEPARTMENT OF POLITICAL SCIENCE
Professor Bob Burns, Head,
Professors Cheever, Tolle;
Emeritus Hendrickson

Graduate major offered:
None

Graduate minor offered:
Political Science

Prerequisites for graduate study:
For the graduate minor a Bachelor’s degree with major or minor in Political Science

DEPARTMENT OF PSYCHOLOGY
Professor Allen Branum, Head

660 Topics in Psychology .................................................. 1-4
An intensive examination of significant political themes, issues, and problems. Topics will include, but are not limited to, the following: Republics and Self-Government; the Constitution and Civil Liberties; Parties, Elections and Campaigns; Presidential-Congressional Relationships.

692 Special Problems in Political Science.............................. 1-2-3 (1-2-3,0) F S Su
Individual guided research culminating in an informal research paper. May be repeated until 6 credits are earned.
DEPARTMENT OF RURAL SOCIOLOGY

Professor J. Satterlee, Head;
Professors Hess, Kayongo-Male, Mendelsohn, R. Wagner;
Associate Professor Stover;
Emeriti Dimii, Sauer

Graduate majors offered:
1. Master of Science Degree With Major in Rural Sociology. Three Options:
   - Option A: Thesis Option: requires a minimum of 30 semester credits including a thesis (5 credits) and comprehensive oral examination.
   - Option B2: Non-thesis Option: requires 32 hours with no thesis. Requires comprehensive written and oral examination. Designed for those wishing to extend their education without the research emphasis.

   All students must complete the core requirements plus sufficient additional graduate hours in this department, a minor in another department and/or supporting courses.

2. Doctor of Philosophy Degree with Major in Sociology. Areas of concentration include Social Theory, Research Methodology, Social Organization, Demography, Social Deviance.

Prerequisites for graduate study:
For the graduate major a Bachelor's degree with 24 credits in social science or consent of the department.

For the graduate minor consent of the department. (Send for Dept. Graduate Guide for more details).

ANTHROPOLOGY (Anth)
(See dept. for schedule of offerings)

690 Special Problems in Anthropology ..........................1-3 FS Su P, open to undergraduate and graduate students with sufficient background and consent.

697 Topics in Anthropology .................................1-3 (1-3,0) (On demand)
Selected topics pertaining to theory and methods in Anthropology. Subject areas will change from semester to semester. P, consent.

793 Seminars in Anthropology .................................1-4 FS Su (On demand)
1. Teaching of Anthropology
2. Advanced General Anthropology
3. Advanced Cultural Anthropology
4. Archaeological Techniques
5. Ethnology
6. Ethnography
7. Anthropological Theory & Social Thought

RURAL SOCIOLOGY (Soe)
(See dept. for schedule of offerings)

601 Social Deviance ............................................(3,0)
This course will examine the nature of negatively evaluated behaviors and the processes by which customs, rules and normative structures of society are constructed. A primary goal of the course is the development of a coherent interpretation of contemporary theories and empirical investigations of social deviance. P, consent.

615 Social Thought .............................................3 (3,0)
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, consent.

620 Social Organization ........................................3 (3,0)
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, consent.

621 Social Stratification ....................................3 (3,0)
Theories of social stratification. Relationship between social class and education, occupational choice, political preference religious affiliation and social mobility. P, consent.

630 Social Change .............................................3 (3,0)
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, consent.

633 Leadership and Group Organization ..................3 (3,0)
Emergence of and types of leaders. Analysis of community power structure. Emphasis on group dynamics, small groups and effective meetings. P, consent.

640 Rural Community Planning ..............................3 (3,0)
Structure, activities, problems, resources, and functions of the rural community; methods and techniques of community organization; institutional services and leadership with economic and social relationships of the small community to both open country and urban centers. P, consent.

709 Evaluation Research ....................................3 S
Focus on the conceptualization and design of evaluation studies of various governmental programs. Design includes clarification of objectives, selection of appropriate collection techniques, and specification of target groups. Alternate years.

710 Research Methods in Sociology .........................3 (3,0) S
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, consent.

711 Qualitative Research Methods ........................3 (3,0) F
Qualitative research methods of data collection, analysis, and presentation are examined; emphasis on fieldwork involving participant observation and intensive interviewing; includes consideration of the rationale, theoretical underpinnings and limitation of qualitative research. P, consent.

712 Sociological Theory I .....................................3 (3,0) F
Critical examination of the main schools of sociological theory beginning with the system of Auguste Comte and ending with World War II. P, 301 or consent.

713 Sociological Theory II ...................................3 (3,0) S
Sociological theories and issues from World War II to present. P, 301 or consent.

714 Theory Construction ....................................3 S
Focus on theory-building efforts; criteria for development of theories and general approaches to theory construction are covered. These general approaches are examined in depth; various critical approaches to theory development are reviewed. Alternate years.

716 Symbolic Interaction ....................................3 S
Focus on major micro-sociological perspective. Basic concepts, assumptions, and key propositions on development of this perspective. Recent applications and critiques of the perspective are examined. Alternate years.

720 Profession of Sociology ................................3 S
Course designed for those planning a career in teaching Sociology at the college/university level; course is applied with "hands-on" experiences in preparation for college teaching.

54
60 Advanced Demographic Theories and Techniques ... 3 (3,0)
An exploration of population theory and methods focusing upon
contemporary literature and the basic population processes of fertility,
mortality, and migration. P, 362 or consent.
62 Demographic Resources & Materials......................... 3 S
Focus on demographic publications and resources including Census
data material; areas included are population, housing, agriculture,
economics, vital statistics reports, special surveys and international
materials. Emphasis on a variety of applications across disciplines.
Alternate years.
64 Modern Demographic Theory .................................. 3 F
Overview of the explanatory factors and determinants related to
the population process of fertility, mortality and migration. Emphasis
on theoretical models that focus on developed and developing coun­
dies. Alternate years.
66 World Population Issues ........................................ 3 S
Focus on policy formulation and program evaluation as related to
population issues the political economy of national and international
efforts are considered; planning a micro- and macro-level decision­
making is examined; issues covered are population and resources,
the value of children, international migration and major health prob­
lems.
780 Special Problems in Sociology ......................... 1-3 (1-3,0) F S Su
Advanced work or special problems in such areas as population,
migration and family, rural sociology, criminology, social organization
or urban sociology. P, open to graduate students with sufficient
background and consent.

MASTER OF SCIENCE TEACHING

The Master of Science Teaching Degree is offered with the follow­
ing majors: biology, chemistry, mathematics, and physics.

Residence and Degree Requirements
Minimum residence requirement for the Master of Science Teaching
degree is 20 graduate credits. Transferred credits will be
reviewed by the student's advisor and approved by the MST Com­
mitee prior to inclusion in the Student's Plan of Study. Completion
of the degree requires a minimum of 35 credits of which 18 must
come from the major department course list.

Requirements for the Minor or Supporting Courses
Each student must include a minimum of 6 credit hours from two of
the following department course lists which are not in the stu­
dent's major department: biology, chemistry, mathematics, and physics.
An additional 5 credits must be taken from the fields of biology,
chemistry, education, mathematics or physics.

Plan of Study
During the first term of work, the graduate student should plan with
her/his advisor the Plan of Study for the Master of Science Teaching
degree. The plan is processed the same as for other masters degrees.

Admission to Candidacy
Admission to candidacy is processed the same as for other masters
degrees. Candidates should have a current teacher certificate.

Examinations
The students in the program may take challenge exams in selected
areas of each department course offerings. Upon successful com­
pletion of those examinations, students will be allowed to proceed
directly to more advanced courses.

Candidates must pass a comprehensive written examination over
the course work in their own program. A comprehensive oral exam­
nation will be held prior to final approval for graduation. All other
examination requirements are as described for other masters
degrees using option C.

890 Dissertation Ph.D. .......................................... 1-12
891 Dissertation Sustaining Ph.D. ................................. 1

Biology Major (MSTB):

Required courses:
Bio 701 Darwinism & Scientific Thought
Bio 703 Human Cell Physiology
Bio 709 Flora of the Northern Plains
Bio 710 Field Aquatic Ecology
Bio 711 Animal Development
Bio 713 Mendelism & the Chromosome Theory
Bio 715 Computer Applications in Biology
Bio 716 Recent Developments in Biology

Elective Courses:
Bio 702 Evolution and Evolutionary Theory
Bio 704 Human Cardiovascular
Bio 705 Human Hematology
Bio 706 Human Reproductive Physiology
Bio 707 Plant Form and Function
Bio 712 Cell Heredity
Bio 714 Developmental Genetics
Bio 717 Processes & Methods of Animal Behavior
Bio 718 Developing Values, Strategies in Biology
Bio 719 Advances in Biotechnology

Completion of the degree with a major in Biology requires a mini­
mum of 35 credits of which 18 must come from the above course
list. Each student must include a minimum of 6 credit hours from
each of two of the department course lists which are not in the stu­
dent's major department: Chemistry, math, and physics. An addi­
tional 5 credits must be taken from the fields of biology, chemistry,
education, math, or physics.

Chemistry Major:

Required Courses:
Chem 701 Concepts in Chemistry
Section 1 Atomic Structure and Bonding
A degree candidate must take a minimum of 18 credits from the sequences above with at least 2 credits in each of three areas. Prior to the final oral examination, comprehensive examinations must be passed in the three areas selected by the candidate. Students may test out of required courses.

**Physics Major:**

- **Required Courses:**
  - **MSTP**
    - Phys 701 Mechanics I
    - Phys 702 Mechanics II
    - Phys 703 Mechanics III
    - Phys 704 Vibrations and Waves I
    - Phys 705 Thermodynamics I
    - Phys 706 Electricity
    - Phys 707 Magnetism
    - Phys 708 Optics I
    - Phys 709 Relativity
    - Phys 710 Introduction to Quantum Theory
    - Phys 711 Quantum Mechanics and the Atom
    - Phys 712 Physics of Molecules and Solids
    - Phys 713 Nuclear and Radiation Physics

- **Elective Courses:**
  - Phys 714 Astronomy I (Classroom demonstrations in Physics)
  - Phys 716 Electrical Circuits
  - Phys 717 Phys Meteorology
  - Phys 718 Energy and the Environment
  - Phys 719 Solid State Physics
  - Phys 720 Solid State Electronics
  - Phys 721 Vibrations and Waves II
  - Phys 722 Thermodynamics II
  - Phys 723 Optics II
  - Phys 724 Computers in the Laboratory
  - Phys 725 Astronomy II
  - Phys 726 Careers in Science and Engineering
  - Phys 727 Recent Developments in Physics

The MST with a major in physics will require 18 hours of courses from the above list. Students may challenge and test out of the required courses. Requirements will also include a minimum of 6 hours of coursework from two of the departments biology, chemistry, education, or physics.

**Biology (MSTB)**

The following courses are designed for secondary school science teachers in the MST program. The primary emphasis will be on course content, laboratory experiments, and demonstrations useful in teaching at the secondary level. (Not open to students in M.S. programs)

**701 Darwinism & Scientific Thought**

This course covers an examination of Charles Darwin’s work and the impact on intellectual thought and its continuing influence as the most encompassing biological theory. Examination of the intellectual climate leading up to the introduction of Darwin’s explanation of the diversity of the natural world and the impact of his work on the scientific and non-scientific community will be discussed. Focus will be on Darwin’s conceptual breakthrough, namely, the origin of the species by natural selection.

**702 Evolution and Evolutionary Theory**

This course defines evolution in scientific terms. It examines the processes involved in change over time, i.e. variation, how adaptations are achieved and maintained, the role of natural selection, and origin of species. The concept of evolution as it is recognized by the scientific community, as the major explanatory and unifying concept in Biology, will be covered. P, MSTB 701.
703 Human Cell Physiology

The course will examine concepts of the cell in terms of structure, function, and its role at the organismal level. Membrane structure, transmembrane transport mechanisms, the concept and mechanisms of homeostasis, and homeostatic systems will be discussed. The cellular function of protein synthesis and energy production will be presented.

704 Human Cardiovascular Physiology

The course will examine the structure and functioning of the heart-blood circulation through the four chambers of the heart, impulse conduction, and the cardiac output and cycle. The characteristics of blood vessels, blood flow, and exchange at capillary level will be taught. The regulation of the cardiovascular system and the common major cardiac problems will be discussed.

705 Human Hematology

The course will examine major concepts of blood structure, synthesis, destruction and clotting. The role of blood, especially the blood elements (cells and proteins) in the immune systems of the body will be taught. Blood grouping and its medical importance will be stressed.

706 Human Reproductive Physiology

The course will examine major concepts of cell division (mitosis and meiosis) and male and female reproduction. Spermatogenesis and spermatozoan structure will be highlighted. In the female, oogenesis, menstrual cycle, fertilization, implantation, pregnancy, delivery, and lactation will be emphasized. The general aspects of reproduction like menopause, impotence, infertility, fertility, birth control, and ethics will be discussed.

707 Plant Form & Function

This course will emphasize the derivation of angiosperm morphologic and the structure-function relationships that exist in plant stems, roots, leaves, and reproductive components. The course gives considerable hands-on experience in studying the structure and function of stems, roots, leaves and plant reproduction.

708 Physiological Processes of Plants

Current ideas about how plants function will be presented with special emphasis in three aspects of plant development and behavior: (a) seeds and seed germination; (b) water relations; and (c) the role of light and hormones in plant growth and development. P, MSTB 707.

709 Flora of the Northern Plains

This is a study of the diversity of plant life in prairie, wetland, and woodland environments of the northern Great Plains. It includes practice in plant identification skills, field and laboratory techniques of collecting, and preparing specimens for a study collection.

710 Field Aquatic Ecology

This course is a study of the ecology of lakes, marshes, and streams, including nutrients, energy, and food chain relationships. Human impacts on the aquatic environment will be discussed. Field collection and identification of aquatic flora and fauna will be required. Laboratory techniques, experiments, and visual aids adaptable to public school usage will be presented.

711 Animal Development

Principles of animal developmental biology including gamete formation, fertilization, establishment of vertebrate body plan, and tissue/organ morphogenesis will be covered. Recent insights provided by recombinant DNA techniques will be discussed in relation to cellular/molecular events of embryonic induction, elaboration of unique gene products, and the regulation of cellular differentiation.

712 Cell Heredity

This is a study of the reproduction at the cellular level with emphasis on the molecular mechanisms by which genes control the growth and development of an organism. Chromosome structure and behavior are examined regarding the role they play in the inheritance of the biologically-expressed traits.

713 Mendelism & the Chromosome Theory

This course deals with the nature of observations, experiments, and hypotheses called the chromosome theory of inheritance. Discussion of the genetic mechanisms in cells, individuals, and populations will be included. Mendelian genetics will be stressed. P, MSTB 712.

714 Developmental Genetics

A comprehensive study of genetic mechanisms that direct and regulate fundamental processes of animal development will be covered. Topics of discussion will include but not limited to: (1) nature of DNA and techniques of DNA analysis, (2) transcription and RNA processing, and (3) molecular strategies of development in nematodes (C. elegans), Drosophila, and the mouse (Mus musculus). P, MSTB 712 and 713 or permission of the instructor.

715 Computer Applications in Biology

The general operation of a microcomputer in the biology classroom will be covered. The course will provide experience and examples of public domain and commercial programs found useful in instruction in biology and will include spreadsheets, databases, telecommunications, authoring programs, and graphics programs.

716 Recent Developments in Biology

Readings will be selected from Scientific American, Bioscience, American Scientist, Science News, and other professional journals to develop awareness of current topics in biology. Topics will include molecular biology, immunology, gene technology, and impact of humans on the global environment.

717 Processes & Methods of Animal Behavior

This course presents the innate patterns of behavior, learning, social behavior, and the evolution of behavior. Various approaches and viewpoints regarding the study of animal behavior will be studied. Emphasis will be on the concepts and processes that underlie behavior, the questions researchers ask about behavior, and the methods they use to answer these questions.

718 Developing Values Strategies in Biology

This course is designed to stimulate teachers (and through them, their students) to develop the ability to reflect intelligently on and understand the role of values in their lives. Teaching strategies will include molecular biology, immunology, gene technology, and impact of humans on the global environment.

719 Advances in Biotechnology

Background and hands-on laboratory experiences in the seemingly complex techniques and concepts that have revolutionized the biological sciences during the past decade will be covered. Class members will design develop, test and evaluate modern laboratory experiments suitable for use by high school science teachers.

CHEMISTRY (MSTC)

The following courses are particularly designed for secondary school science teachers. Although the primary emphasis will be the course content, particular attention will be focused on laboratory experiments and demonstrations useful in teaching at the secondary level.

701 Concepts in Chemistry

A course designed for secondary school science teachers. The course will consist of seven concept areas which may be taken independently, such as atomic structure and bonding; acids, bases, and salis, etc. Each unit carries a 1 or 2 credit value.

702 Environmental Chemistry

Effect of chemicals on the environment will be discussed. Emphasis will be placed on problems related to the atmosphere and water. Other topics to be included are pesticides and heavy metals. P, Chem 701 or permission.
703 Computers in Chemistry ........................................... 2
Primarily intended to introduce students to ways in which microcomputers may be used to supplement other teaching methods. No previous programming experience necessary. P, Chem 701 or permission.

704 Industrial Processes ........................................... 2
This course will emphasize the economically important inorganic and organic reactions employed in industrial processes. Important factors such as raw materials costs shipping costs and marketability will be discussed. P, Chem 701 or permission.

705 Instrumentation in Chemistry .................................. 2
Discussion of the role of instrumentation in chemical work including experiments appropriate for use in the secondary school classroom. P, Chem 701 or permission.

706 Biological Chemistry ............................................ 2
Application of chemical principles to biological processes of current importance including nitrogen fixation, photosynthesis and genetic expression. A study of the fundamental reactions and review of current status. P, Chem 701 or permission.

707 Inorganic Chemistry ............................................. 2
Modern inorganic chemistry concepts will be developed including topics such as bonding in coordination compounds; organometallic compounds; metal atom clusters; bioinorganic systems; inorganic polymers, etc. P, Chem 701 or permission.

708 Organic Chemistry ............................................... 2
Principles of organic chemistry that may be presented in high school programs will be presented. P, Chem 701 or permission.

709 Alternative Energies ............................................. 2
The chemistry of alternative energies will be discussed. The pros and cons of coal gasification, shale, tar sands, alcohol-based fuels, geothermal and solar energies will be emphasized. P, Chem 701 or permission.

710 Lecture Demonstrations ......................................... 2
The literature of reported lecture demonstrations will be reviewed. The class will practice selected demonstrations and work on their reliability and effectiveness. Each student will be asked to create a new demonstration. P, Chem 701 or permission.

711 Instructional Laboratories ..................................... 2
Design, development, testing and evaluation of laboratory experiments suitable for use by high school teachers. May include modification of current procedures and construction of new procedures compatible with time and facilities available. P, Chem 701 or permission.

712 Consumer Chemistry ............................................ 2
Topics of interest to the consumer will be discussed. Typical topics will include foods, food additives, polymers, soaps and detergents, cosmetics and drugs and chemistry on the farm. P, Chem 701 or permission.

MATHEMATICS (MSTM)
The following courses are particularly designed for secondary school science teachers. The primary emphasis will be the course content with emphasis on topics useful in teaching at the secondary level. All courses are two credits.

711 Functions and Permutations ................................... 2
This course deals with an in-depth study of functions defined on finite and infinite sets. The properties of addition, subtraction, multiplication, division and composition of functions will be examined as well as the necessary and sufficient conditions required for a function to be injective, surjective and bijective. Permutations and their properties as functions will also be discussed in detail. The relation of permutations to regular geometric figures will also be investigated.

712 Algebraic Structures ........................................... 2
This course includes definitions and examples, both finite and infinite, of the following algebraic structures: group (Abelian and cyclic), ring (commutative and commutative with unity) integral domain, skew field, field and well-ordered domain. The concept of a subgroup, subring, subdomain and subfield will also be discussed as will the topics of quotient fields and quotient rings. SDP, 711.

713 Properties of Algebraic Structures ......................... 2
This course covers such topics as the uniqueness of the identity, the inverse in an algebraic structure, which algebraic structures have cancellation and divisors of zero, what exponential rules hold in various structures, when are two structures basically the same (isomorphic) and how does one solve equations in different structures. P, 712.

714 Vector Spaces and Linear Transformations .................. 2
The topics covered in this course are: vector spaces, linearly independent and dependent sets of vectors, basis for a vector space, linear transformations and their relation to matrices, orthogonality, similarity, diagonalization, eigenvectors, eigenvalues, Gram Schmidt process and geometry of transformations. P, 713.

715 Applications of Algebra ....................................... 2
The purpose of this course is to show how the algebraic structures previously discussed are used to solve problems in graph theory, linear programming, probability and statistics, theory of games, differential equations and discrete mathematics. P, 714.

721 Analytic Geometry .............................................. 2
Analytic geometry of two and three dimensions including coordinate systems, lines, planes, conic sections, and rotation and translation of axes. P, College Algebra.

722 Functions, Limits and Continuity ............................. 2
A careful study of the theory of limits for sequences and functions and the general properties of continuous functions. P, Math 721 or a prior course in calculus.

723 Analysis of Algebraic Functions ............................... 2
Differentiation and integration of algebraic functions of one variable with emphasis on applications to graphing of functions and the solution of problems by the methods of calculus. P, Math 722 or consent of the instructor.
724 Analysis of Transcendental Functions ........................................ 2
A careful study of the trigonometric and exponential functions and their inverses with particular attention to the differentiation and integration of these functions. P, Math 723 or consent of the instructor.

725 Convergence ........................................ 2
A careful study of sequences and series of real numbers and functions with emphasis on how they are related to the algebraic and transcendental functions. P, Math 724 or consent of the instructor.

761 Foundations of Geometry ........................................ 2
A study of the axioms necessary to prove theorems in geometry and a systematic development of Euclidean geometry using these axioms. P, none.

762 Advanced Euclidean Geometry ........................................ 2
Special properties of triangles and circles, geometrical transformations, and inverse geometry. P, Math 761 or consent of the instructor.

763 Non-Euclidean Geometry ........................................ 2
An introductory study of hyperbolic geometry with an emphasis on models of hyperbolic geometry and its relationship to Euclidean geometry. P, Math 761 or consent of the instructor.

764 Projective Geometry ........................................ 2
A study of projective geometry as an extension of Euclidean geometry and an axiomatic development of projective geometry as a non-Euclidean geometry. P, Math 761 or consent of the instructor.

771 Mathematical Applications for the Classroom I ........................................ 2
An introduction to concepts of structured programming using the PASCAL language. Topics will include syntax, selection, looping, and procedures. P, Math 113.

772 Mathematical Applications for the Classroom II ........................................ 2
Structured programming using PASCAL. Topics will include data types, arrays, functions, and packed arrays. P, Math 771 or consent.

773 Mathematical Applications for the Classroom III ........................................ 2
The study of list, string and graph structures using the PASCAL language. P, Math 772 or consent.

774 Discrete Mathematics ........................................ 2
The study of sets and functions, binary relations including trees, state graphs and automata, discrete probability, recursion and algebra. P, FORTRAN or PASCAL.

775 Computer Applications ........................................ 2
Computer applications relevant to the high school curriculum will be studied. Problems will be solved using the PASCAL language. Topics from mathematics, sciences, business and the like will be used. P, Math 722 or consent.

781 Intro to Probability ........................................ 2

782 Statistics (one and two populations) ........................................ 2

783 Statistics (three or more populations) ........................................ 2

Physics (MSTP)
The following courses are particularly designed for secondary school science teachers. Although the primary emphasis will be the course content, particular attention will be focused on laboratory experiments and demonstrations useful in teaching at the secondary level. All courses are one credit.

701 Mechanics I ........................................ 1
A study of Newton’s laws and their application to the motion of bodies and the study of structures.

702 Mechanics II ........................................ 1
A study of the concepts of work, energy and momentum. These concepts will be applied to collisions, fluid statics and bodies in gravitational fields. P, MSTP 701 or consent.

703 Mechanics III ........................................ 1
A study of rotational and fluid dynamics. Topics will include circular motion, torques, angular momentum and Bernoulli’s equation applied to gaseous and liquid flow. P, MSTP 702 or consent.

704 Vibrations and Waves ........................................ 1
An introduction to waves in elastic media. Wave energy, the superposition principle and wave interference will be studied. Applications of these principles to audible, ultrasonic and infrasonic waves will be discussed. P, MSTP 703 or consent.

705 Thermodynamics ........................................ 1
A study of temperature scales and their relationship to the laws of thermodynamics. Thermal expansion, specific heats, heat conduction and the mechanical equivalent of heat will be studied. Applications to the first law of thermodynamics will be discussed. P, MSTP 702 or consent.

706 Electricity ........................................ 1
A study of electrostatics by use of Coulomb’s Law and Gauss’s Law. The concept of electric field and electric potential will be introduced and applied to capacitors and resistances. Sample circuits will be analyzed. P, MSTP 703 or consent.

707 Magnetism ........................................ 1
A study of the basic properties of the magnetic field and its interaction with currents. Faraday’s law will be discussed and applications made to generators, inductors and electric motors. Magnetic properties of matter will also be studied. P, MSTP 706 or consent.

708 Optics ........................................ 1
A study of geometric and physical optics. Applications of basic properties of light will be made to lenses, optical instruments and fiber optics. Diffraction and interference effects will be analyzed with both laser and incoherent light sources. P, MSTP 704 or consent.

709 Relativity ........................................ 1
An introduction will be made to both classical and Einstein relativity. The concepts of length contraction, time dilation simultaneity, relativistic mechanics and rest energy will be investigated. An introduction to general relativity and its relationship to the concept of the “black hole” will be discussed. P, MSTP 702 or consent.

710 Introduction to Quantum Theory ........................................ 1
Basic experiments and theory leading to quantum theory and the present model of the atom will be studied. The concept of “matter waves” and their probability interpretation will be discussed. P, MSTP 707 and 709 or consent.

711 Quantum Mechanics and the Atom ........................................ 1
Quantum mechanics will be studied in relation to the hydrogen atom and the many electron atoms. Quantum numbers, the Pauli Exclusion principle, the Stern-Gerlach experiment and Zeeman effect will be discussed. P, MSTP 710 or consent.

712 Physics of Molecules and Solids ........................................ 1
Quantum mechanics will be applied to molecular bonding and bonding in solids. Free electron theory and band theory will be applied to metals, insulators and semiconductors. An introduction to solid state electrical, optical and acoustical devices will be presented. P, MSTP 711 or consent.

713 Nuclear and Radiation Physics ........................................ 1
An introduction to nuclear structure and nuclear energy levels will be presented. Radioactivity, nuclear reactions, radiation detection and nuclear energy will be studied and applications to nuclear science will then be discussed. P, MSTP 709 and 710 or consent.
DEPARTMENT OF SPEECH (See Communications Studies & Theatre)

Professor Sandra Evers, Head; Emeriti Lund, Lyle, Semeniuk, Stoflet-Gouldin

The following Textiles, Clothing and Interior Design courses are offered to support the Master of Science in Home Economics degree program.

Interior Design (ID)
673 Travel Studies (crosslisted with TC 673) 1-3 Su Understanding the interrelationship of interior design, housing and applied aesthetics of a specific area of the world. Study of the historical, cultural and contemporary aspects.
692 Special Problems 1-3 Problems for advanced study selected according to a student's specific interest, needs, or current research with which student is familiar. Credit arranged by professor in charge. Can be repeated.
693 Current Topics 1-3 Study of contemporary issues and concerns in the field of interior design and housing. Focus on topics not included in other graduate courses in the department. P, consent. Can be repeated.
770 Seminar in Interior Design & Housing 1-2 (On sufficient demand) Reports and discussion of current literature in various areas of interior design.
792 Special Problems 1-3 Problems for advanced study selected according to student's specific interests, needs or current research with which student is familiar. Credit arranged by professor in charge. Can be repeated.

DEPARTMENT OF TEXTILES, CLOTHING & INTERIOR DESIGN

714 Astronomy I 1 An Introduction to astronomy and basic principles involved. The solar system will be discussed in relation to Kepler's laws and analysis performed. A general study of the universe as seen by an astronomer will be discussed. Observations of the sky by telescope will be carried out when possible.
715 Classroom Demonstrations in Physics 1 The literature of reported lecture demonstrations will be reviewed. The class will build selected demonstration equipment and work on the reliability and effectiveness of selective demonstrations. Each student will be asked to prepare and present a new demonstration. P, MISTP 702 or permission.
716 Electric Circuits 1 A continuation of material from Phys 706 related to circuit analysis. More complex DC circuits will be studied together with AC circuits. An introduction to electronics will also be presented. P, MISTP 707 or consent.
717 Meteorology 1 A study of the physical laws which determine the earth's weather patterns. Basic weather forecasting, weather map analysis and weather front analysis will be included. P, MISTP 705 or consent.
718 Energy and the Environment 1 A study of the available energy resources and the long-term effects of their use on the environment of the earth and its inhabitants.
719 Solid State Physics 1 A continuation of topics from MISTP 712 with emphasis on semiconductors and their applications. P, MISTP 712 or consent.
720 Solid State Electronics 1 A study of the application of solid state semiconductor devices in electronics. Specific electronic circuits will be analyzed. P, MISTP 719 or consent.
721 Vibrations and Waves II 1 A continuation of Vibrations and Waves I with emphasis on harmonic analysis of periodic wave forms, musical acoustics, room acoustics and applications to sound reproduction and recording.
722 Thermodynamics II 1 A continuation of topics from Thermodynamics I with emphasis to applications of the 1st and 2nd laws of thermodynamics. The concepts of entropy, enthalpy and free energy will also be studied. P, MISTP 705 or consent.
723 Optics II 1 A continuation of topics from Optics I with emphasis of more complex analysis involved in physical optics. P, MISTP 708 or consent.
724 Computers in the Laboratory 1 An introduction to the use of microcomputers in the laboratory for the acquisition of data, analysis of data and simulation experiments.
725 Astronomy II 1 A continuation of topics from Astronomy I with emphasis on the "Cosmos Series." Sky observations by telescope will be carried out when possible. P, MISTP 714 or consent.
726 Careers in Science and Engineering 1 Professional career opportunities in electrical, civil, mechanical and agricultural engineering, computer science, physics and mathematics will be explored, for advising high school students regarding career choices. Department visits and field trips to nearby industries will be arranged.
727 Recent Developments in Physics 1 Readings will be selected from Scientific American, Physics Today, American Journal of Physics, Physics Teacher and other professional journals, to develop awareness of current topics in physics and sources of information.
731 Current Topics 1-3 Study of contemporary issues and concerns in the field of interior design and housing. Focus on topics not included in other graduate courses in the department. P, consent. Can be repeated.

Textiles and Clothing (TC)
673 Travel Studies (crosslisted with ID 673) 1-5 Su Understanding the interrelationship of fashion, textiles and clothing of a specific area of the world. Study of historical, cultural and contemporary aspects.
692 Special Problems 1-3 Problems for advanced study selected according to student's specific interests, needs, or current research with which student is familiar. Credit arranged by professor in charge. Can be repeated.
693 Current Topics 1-3 Study of contemporary issues and concerns in the field of textiles, clothing and fashion retailing. Focus on topics not included in other graduate courses in the department. P, consent. Can be repeated.
770 Seminar in Textiles and Clothing 1-2 (On sufficient demand) Reports and discussion of current literature in various areas of textiles and clothing.
VETERINARY SCIENCE (Vet)

Associate Professor John Thomson, Head;
Professors Benfield, Francis, Johnson, Nelson, Swanson;
Associate Professor Zeman;
Emeritus Kirkbridge

The department offers several graduate research assistantship positions in microbiology, virology, and molecular biology for students majoring in other departments. Graduate training is supported by active research programs in diseases of food producing animals.

The Department of Veterinary Science participates in the Ph.D. program in Biological Sciences as well as several master's programs in other departments.

No other major or minor is offered in this department. The following courses may be used in the major or minor as supporting courses in the graduate program.

624 Virology

Basic course discussing the characterization, structure, replication of viruses and the pathogenesis of viral disease in man and animals. Laboratory exercises emphasize techniques in virus isolation, characterization, and detection by immunological assays. P, Micr 422 or consent. Cross-listed as Micr 524, 624.

690 Problems in Veterinary Science

Consent of Department Head.

DEPARTMENT OF WILDLIFE AND FISHERIES SCIENCES

Professor Charles Scalet, Head;
Professors Berry (USDI), Flake;
Associate Professors Higgins (USDI), Willis;
Assistant Professor Duffy (USDI);
Emeritus Linder

Graduate Majors Offered:
Master of Science with a major in Wildlife and Fisheries Sciences. There are two options available, the Wildlife Option and the Fisheries Option. Ph.D. Biological Sciences. See page 14.

Graduate minor offered:
Wildlife Biology

Prerequisites for graduate study:
For the graduate major in Wildlife and Fisheries Sciences 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 may not apply to the graduate program.

723 Systemic Physiology

Physiological aspects of tissue cells, hematolgy, neuroendocrine system, central and autonomic nervous systems, and myology. Discuss various interrelationships to body system functions and maintenance of homeostasis. P, Vet 323 or consent of instructor. Crosslisted as Bio 723.

725 Systemic Physiology

Continuation of Vet 723 involving principles learned in Vet 723 with their application to the functioning of the systems (cardiovascular, pulmonary, renal, gastrointestinal, etc.) to maintain homeostasis. P, Vet 723. Crosslisted as Bio 725.

792 Special Problems

Independent study in specialized areas of biomedical sciences including bacteriology, virology and pathology. Objectives, scope of work, and plan of study specified by the professor and student(s), P, consent of instructor and department.

793 Special Topics

Advanced studies including Techniques of Electron Microscopy and other related topics and techniques. Maximum: 1-3 credits per topic (course). 6 credit hours per degree.

BioS 890 Dissertation Ph.D.

BioS 892 Ph.D. Seminar
Big Game Ecology and Management* 3 (2,3) S (Even Years)
Big game life histories and distributions. Relationships of nutrition, reproduction, interspecific competition, and predation to management of big game habitat and harvest. Techniques for research and management of big game. P, WL 411, and consent of instructor. Alternate years.

Waterfowl Ecology and Management* 3 (2,3) F (Odd Years)

Special Topics in Wildlife and Fisheries* 1-3 (as arranged) F S Su
Graduate students may secure small group instruction in a variety of topics such as technical writing, stream ecology, eco-system analysis, wildlife habitat management, population regulation, and others. P, consent.

Aquatic Ecology* 4 (2,6) F (Odd Years)
Qualitative and quantitative measurements of aquatic populations including primary production of 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. P, WL 611 and consent. Alternate years.

Wetland Ecology and Management* 3 (2,3) S (Even Years)
Botanical, zoological, hydrological, pedological, and biogeochemical components of wetland systems are studied. Course includes management of wetlands for various functional values, government jurisdiction in wetland regulation, and wetland classification. North American wetland systems are discussed with emphasis on the northern glaciated prairie wetlands. P, consent of instructor. Alternate years.

Animal Population Dynamics* 3 (2,3) F (Even Years)
Methods of analysis and interpretation of vital statistics of animal populations. Current theories on natural regulation of animal populations. Particular emphasis on vertebrate species of economic and/or recreational importance. Comparison of environmental controls on populations of various animal groups. P, consent. Alternate years.

Fish Structure and Function* 3 (2,3) S (Odd Years)
Emphasis on anatomy, physiology, and histology of fishes and how these areas relate to fish management, water pollution, and fish culture. Economically important game and cultured species are stressed. P, consent of instructor. Alternate years.

Wildlife Research Design* 3 (2,3) S (Odd Years)
Use of the scientific method for designing wildlife research and developing proposals. Familiarization of field and laboratory methods and instrumentation. Practical experience with computer and statistical models for data analysis. P, consent of instructor. Alternate years.

Aquaculture* 3 (2,3) S (Even Years)
Extent and potential for aquaculture. Emphasis placed on culture methods of important commercial and sport fishes and invertebrates of North America. P, consent of instructor. Alternate years.

Thesis in Wildlife 1-7 (as arranged) F S Su
Thesis Sustaining 1 F S Su
Graduate Seminar 1 (1,0) F S
Research Problems 1-3 F S Su
Individualized instruction on specific research problems. P, consent of instructor.

Bio 890 Dissertation, Ph.D. 1-2 (as arranged)
BioS 891 Dissertation Sustaining
BioS 892 Ph.D. Seminar 1 (1,0) F S

*Field trips required in these courses may result in pro-rata charges to defray transportation costs.
ADAMS, MARY, Professor and Acting Dean of Nursing, 1990; B.A. University of South Dakota, 1946; B.S.N. John Hopkins University, 1949; M.A. Columbia University Teachers College, 1954; Ph.D. University of Minnesota 1962.


ANDERSON, GARY A., Assistant Professor of Agricultural Engineering, 1987; B.S., SDSU, 1975; M.S., Iowa State University, 1985; Ph.D., 1987.

ARNOLD, W. EUGENE, Associate Dean of the College of Agriculture and Biological Sciences, Director, of Plant Science, 1970; B.S., Oklahoma State University, 1965; Ph.D., North Dakota State University, 1970.

BAER, ROBERT J., Associate Professor of Dairy Science, 1982; B.S., University of Georgia, 1979; M.S., 1979; Ph.D., 1983.

BAHR, ANN MARIE B., Assistant Professor of Philosophy & Religion, 1988; B.A., Lawrence University, 1972; M.A., Stanford University, 1975; Ph.D., Temple University, 1989.

BELL, RODNEY, Professor and Head of History and Political Science, 1970; B.S., Jamestown College, 1955; M.A., University of Michigan, 1956; Ph.D., 1975.

BENFIELD, DAVID A., Professor of Veterinary Science, 1979; B.S., Purdue University, 1973; M.S., 1976; Ph.D. University of Missouri, 1979.


BERGUM, GERALD E., Head of Computer Science and Professor of Mathematics, 1970; B.S., University of Minnesota, 1958; M.S., University of Notre Dame, 1962; Ph.D., Washington State University, 1969.

BERRY, CHARLES, Associate Professor of Wildlife & Fisheries, (USFWS) 1985; B.A., Randolf Macon College; M.S., Forham University; Ph.D., Virginia Polytech & State University.


BILLOW, JOYE ANN, Professor of Pharmaceutical Sciences, 1972; B.S., Temple University, 1966; Ph.D., 1973.


BRANUM, ALLEN R., Professor and Head of Psychology, 1970; B.S., Montana State University, 1966; M.A., University of Montana, 1968; Ph.D., 1971.

BRANUM, JUDY, Assistant Professor and Acting Department Head of Human Development Child & Family Studies, 1980; B.S., SDSU, 1975; M.S., 1977.

BRYANT, DAVID A., Dean of the College of Agriculture and Biological Sciences; Professor of Animal and Range Science, 1987; A.A., Lower Columbia College, 1963; M.S., Texas Technical University, 1967; Ph.D., University of Arizona, 1971.

BUCHENAU, GEORGE W., Professor of Plant Science, 1959; B.S., New Mexico State University, 1954; M.S., 1955; Ph.D., Iowa State University, 1960.


CARLSON, CHARLES G., Associate Professor of Plant Science/Extension Specialist, 1978; B.S., Western Illinois University, 1969; M.S., SDSU, 1972; Ph.D., 1978.

CARTER, CATHERINE D., Associate Professor of Plant Science, 1989; B.S., George Peabody College, 1975; B.M.E., 1971; M.S., 1976; Ph.D., University of Kentucky, 1982.

CHAPPELL, GARY S., Professor and Head of Pharmaceutical Sciences, 1973; B.S., Ohio State University, 1963; Ph.D., University of Kansas, 1968.

CHASE, THOMAS E., Assistant Professor of Plant Science, 1990; B.S., Sunny C Environmental Sci-Fors, 1979; Ph.D., University of Vermont, 1986.

CHEESBROUGH, THOMAS M., Assistant Professor of Biology, 1990; B.S., University of Wyoming, 1976; M.S., 1978; Ph.D., Purdue University, 1982.

CHEEVER, JR., HERBERT E., Acting Dean of College of Arts & Science, Professor of Political Science, 1968; B.S., SDSU, 1960; M.A., University of Iowa, 1962; Ph.D., 1967.

CHEN, CHEN-HIO, Professor of Biology, 1960; B.S., National Taiwan University, 1954; M.S., Louisiana State University, 1960; Ph.D., SDSU, 1964.

CHOLICK, FRED, Professor and Department Head of Plant Science, 1981; B.S., Oregon State University, 1972; M.S., Colorado State University, 1975; Ph.D., 1977.

CHU, SHU TUNG, Professor of Agricultural Engineering, 1967; B.S., National Taiwan University, 1956; M.S., University of Minnesota, 1960; Ph.D., 1966.


CLAY, DAVID, Assistant Professor of Plant Science, 1989; B.S., University of Wisconsin, 1976; M.S., University of Idaho, 1984; Ph.D., University of Minnesota, 1988.

CLAY, SHARON A., Assistant Professor of Plant Science, 1989; B.S., University of Wisconsin, 1977; M.S., University of Idaho, 1982; Ph.D., University of Minnesota, 1986.

COSTELLO, W., Extension Meat Specialist, Distinguished Professor of Animal & Range Science, 1965; B.S., North Dakota State University, 1954; M.S., Oklahoma State University, 1960; Ph.D., 1963.

CREWS, MICHAEL, Professor and Head of Nutrition Food Science, 1984; B.S., Virginia Polytechnic Institute and State University, 1972; Ph.D., 1978.


DE BOER, DARRELL W., Professor of Agricultural Engineering, 1969; B.S., Iowa State University, 1963; M.S., 1964; Ph.D., 1969.

DeBOER, DELVIN E., Assistant Professor in Civil Engineering, 1978; B.S., SDSU, 1978; M.S., 1980; Ph.D., Iowa State University, 1990.

DOBBS, THOMAS L., Professor of Economics, 1978; B.S., SDSU, 1965; Ph.D., University of Maryland, 1969.

DUFFY, WALTER G., Adjunct Assistant Professor, 1988; B.S., Michigan State University, 1973; M.S., 1975; Ph.D., 1985.

DUGGAN, MARGARET, Professor of English, 1978; B.A., St. John's University, 1958; M.A., Columbia University, 1965; Ph.D., 1972.

DIDDLE, CHANDRADHAR, Professor of Pharmaceutical Sciences, 1987; B.S., Gorakhpur University, 1964; M.S., 1966; Ph.D., Lucknow University, 1972.

DYBING, C. DEAN, Professor of Plant Science, USDA, 1960; B.S., Colorado State University, 1953; M.S., 1955; Ph.D., University of California, 1959.


ELLERBRUCH, VIRGIL G., Professor and Head of Electrical Engineering, 1967; Registered, Professional Engineer (S.D.); B.S., University of Wyoming, 1960, M.S., 1961; Ph.D., 1969.

EMERICK, ROYCE J., Professor of Chemistry, Professor of Animal Science, 1957; B.S. Oklahoma State University, 1952; M.S., University of Wisconsin, 1955; Ph.D., 1957.


EVENSON DONALD, Professor of Chemistry, 1983; B.S., Augustana College, 1964; Ph.D., University of Colorado, 1968.

EVENSON, PAUL D., Professor of Plant Science and Statistics, 1959; B.S., University of Nebraska, 1957; M.S., SDSU, 1959.

EVERS, SANDRA J., Professor and Head of Department of Textiles, Clothing and Interior Designs, 1982; B.S., Iowa State University, 1960; M.A., University of Minnesota, 1964; Ph.D., Michigan State University, 1976.

EWING, JOHN L., Acting Coordinator Student Academic Affairs, Professor of Health, Physical Education and Recreation, 1983; B.S., Ashbury College, 1974; M.S., University of Kentucky, 1975; Ph.D., University of Minnesota, 1982.


FINCH, ROBERT G., Professor of Electrical Engineering, 1974; B.S., Michigan State University, 1958; M.S., 1960; Ph.D., Purdue University, 1974.

FITZGERALD, JOHN J., Professor of Chemistry, 1989; B.S., St. John's University, 1969; Ph.D., Illinois Institute of Technology, 1972.

FIXEN, PAUL, Adjunct Associate Professor of Plant Science, 1981; B.S., SDSU, 1975; M.S., 1977; Ph.D., Colorado State University, 1979.

FLAKE, LESTER D., Professor of Wildlife and Fisheries, 1972; B.S., Brigham Young University, 1963; M.S., 1966; Ph.D., Washington State University, 1971.

FOLAND, KAY, Assistant Professor of Nursing, 1982; B.S.N., South Dakota State University, 1980; M.S.N., University of Nebraska, 1982; Ph.D., University of Texas, 1989.

FRANCIS, DAVID H., Professor of Veterinary Science, 1978; B.S., University of Missouri, 1971; M.S., Brigham Young University, 1974; Ph.D., University of Missouri, 1978.

FROELICH, DONELL P., Head of Mechanical Engineering, P.E., Professor of Engineering, 1982; B.S., SDSU, 1972; M.S., 1973; Ph.D., Cornell University, 1976.

FULLER, BILLY W., Assistant Professor of Plant Science, 1989; B.S., Auburn University, 1976; M.S., Clemson University, 1982 M.Ed., Auburn University, 1978; Ph.D., Louisiana State University, 1987.


GALLENBERG, DALE J., Extension Specialist, Director of PDC, Associate Professor of Plant Science, 1984; B.S., University of Wisconsin-Madison, 1978; M.S., Cornell University, 1982; Ph.D., 1984.

GAMBILL, NORMAN, Professor and Head, Visual Arts, 1984; B.A., Emory University 1962; M.A., University of Iowa, 1966; Ph.D., Syracuse University, 1976.

GARTNER, F. ROBERT, Director, West River Research & Extension Center, Professor of Animal Science, 1956; B.S. University of Wyoming, 1950; M.S., University of California, 1956; Ph.D., University of Wyoming, 1967.

GASPAR, PHYLLIS M., Associate Professor of Nursing, 1979; B.S.N., University of Nebraska, 1976; M.S.N., 1979; Ph.D., Case Western Reserve University, 1986.

GASPAR, TIMOTHY M., Associate Professor and Head of Nursing, 1981; B.S., SDSU, 1977; M.S.N., University of Nebraska, 1981; Ph.D., University of Utah, 1989.

GEHRKE, JR., HENRY, Professor of Chemistry, 1964; B.S., Oklahoma State University, 1958; M.S., University of Iowa, 1962, Ph.D., 1964.

GELDERMAN, RONALD H., Manager Soil Lab and Assistant Professor of Plant Science, 1973; B.S., SDSU, 1972; M.S., 1976; Ph.D., NDSU, 1987.

GHAZI, HASSAN S., P.E., Professor of Mechanical Engineering, 1984; B.S., Purdue University, 1954; M.S., Ohio State University, 1956; Ph.D., 1962.

GIBBONS, WILLIAM RAY, Associate Professor of Microbiology, 1980; B.S., SDSU, 1980; M.S., 1982; Ph.D., 1987.

GILBERT, HOWARD A., Professor of Economics, 1966; B.A., Central Bible Institute, 1957; B.S., Washington State University, 1961; M.A., 1962; Ph.D., Oregon State University, 1967.

GOLD, STEPHEN J., Associate Professor of Electrical Engineering, 1966; B.S., University of Utah, 1964; M.S., University of Idaho, 1967; Ph.D., University of Utah, 1971.

GRAETZER, HANS G., Professor of Physics, 1956; B.A., Oberlin College, 1952; M.S., Yale University, 1953; Ph.D., 1956.

GRANHOLM, NELS, Professor of Biology 1971; B.A., University of Massachusetts, 1964; Ph.D., Iowa State University, 1968.
GREENBAUM, HARRY, Professor of Economics, 1961; B.S., Texas A&M University, 1955; M.S., Ohio State University, 1956, Ph.D., 1961.

GRITZNER, CHARLES F., Professor of Geography, 1980; B.A., Arizona State University, 1958; M.A., Louisiana State University, 1969; Ph.D., 1969.


HAERTEL, LOIS, Professor of Biology, 1969; B.S., University of Illinois, 1961; M.S., 1963; Ph.D., Oregon State University, 1969.

HAMIDZADEH, HAMID R., Professor of Mechanical Engineering, 1986; B.S., Arya Meher University, 1974; M.S., Imperial College (University of London), 1975; Ph.D., 1978.


HASSOUN, M. NADIM, Professor of Civil Engineering, 1980; B.S., Cairo University, 1956; M.S., University of Michigan, 1966; Ph.D., 1968.

HATFIELD, WARREN G., Professor and Head of Music, 1961; B.A., University of Northern Iowa, 1952; M.A., University of Iowa, 1959, Ph.D., 1967.

HECHT, HARRY G., Professor of Chemistry, CITE Program Associate, 1973; B.S., Brigham Young University, 1958, M.S., 1959; Ph.D., University of Utah, 1962.

HEGGE, MARGARET, Distinguished Professor and Head Advanced Studies 1977; B.A., Gustavus Adolphus College, 1969; M.S., University of Minnesota, 1984; Ed.D., University of South Dakota, 1983.

HEIN, WARREN W., Professor and Head of Physics, 1979; B.S., University of Wisconsin, 1966; Ph.D., Iowa State University, 1970.

HELLECKSON, MYLO, Associate Dean & Director Cooperative Extension Service; Professor of Agricultural Engineering, 1969; B.S., North Dakota State University, 1964; M.S., 1966; Ph.D., West Virginia University, 1969.

HESS, DONNA J., Professor of Rural Sociology, 1974; A.B., Marquette University, 1965; M.A., State University of New York, 1971; Ph.D., Michigan State University, 1974.

HIETBRINK, BERNARD E., Dean of College of Pharmacy, Professor of Pharmaceutical Sciences, 1964; B.S., SDSU, 1958; Ph.D., University of Chicago, 1961.

HIGGINS, KENNETH F., Adjunct Associate Professor of Wildlife and Fisheries Sciences, 1985; B.S., Colorado State University, 1965; M.S., SDSU, 1968; Ph.D., North Dakota State University, 1981.

HILDERBRAND, DAVID C, Professor and Head of Chemistry, 1974; Director of International Programs, B.A., Southwest Baptist College, 1967; M.A., University of Missouri, 1969; Ph.D., 1971.

HILDRETH, MICHAEL, Associate Professor of Biology, 1987; B.A., Westminster College, 1977; Ph.D., University of Louisiana, 1983.


HOGAN, EDWARD P., Assistant Vice President for Academic Affairs and Professor of Geography, 1967; B.S., St. Louis University, 1961, M.A., 1962, Ph.D., 1969.

HOUGLUM, JOEL E., Professor of Pharmacy, 1979; B.S., University of Minnesota, 1972; Ph.D., University of Wisconsin, 1979.

HURLEY, DAVID J., Assistant Professor of Microbiology, 1989; B.A., University of Wisconsin, 1977; Ph.D., Pennsylvania State University, 1988.

HUTCHESON, JR., HARVIE L., Professor of Biology, 1965; B.S., Oklahoma State University, 1960, M.S., 1963; Ph.D., University of Oklahoma, 1965.

JANSEN, LARRY, Professor of Economics, 1978; B.S., University of Nebraska, 1971; M.S., Oklahoma State University, 1974; Ph.D., University of Nebraska, 1978.

JENSEN, DARRELL M., Dean of Education, Professor of Education, 1971; B.S., Northwest Missouri State, 1959; M.A., Drake University, 1965; Ph.D., University of Iowa, 1971.

JENSEN, WILLIAM P., Professor of Chemistry, 1967; B.S., University of Minnesota, 1959; M.S., University of Iowa, 1962, Ph.D., 1964.

JOHNSON, JAMES L., Professor of Speech, Director of Theatre, 1973; B.S., Kansas State University, 1960; M.A., University of South Dakota, 1961; Ph.D., University of Kansas, 1973.


JOHNSON, W. C., Professor and Head of Horticulture, Forestry, Landscape and Parks, 1989; B.S., Augustana College, 1968; Ph.D., North Dakota State University 1971.

JORGENSEN, JERRY D., Associate Professor of Communication Studies and Theatre, 1979; B.S., SDSU, 1978, M.S., 1984; Ph.D., University of Nebraska, 1990.


KAYONGO-MALE, DIANE, Professor of Rural Sociology, 1985; B.S., State University College-Buffalo, 1979; M.A., Michigan State University, 1972; Ph.D., 1974.

KAYONGO-MALE, HENRY, Associate Professor of Biology, 1986; B.S., Makerere University, 1969; M.A., Michigan State University, 1972, Ph.D., 1974.

KENFICK, DONALD G., Professor of Plant Science, Professor of Station Biochemistry, 1959; B.S., University of Wisconsin, 1951; Ph.D., Michigan State University, 1959.

KENNEDY, MARK S., Associate Professor of Civil Engineering, 1991; B.S., University of Nebraska-Lincoln, 1977; M.S., University of Wisconsin-Madison, 1979; Ph.D., University of Purdue, 1984.

KEPHART, KEVIN, Assistant Professor of Plant Science, 1986; B.S., Montana State University, 1979; M.S., University of Wyoming, 1982; Ph.D., Iowa State University, 1986.

KIECKHEFER, ROBERT W., Associate Professor of Plant Science, USDA, 1963; B.S., University of Wisconsin, 1955; M.S., University of Minnesota, 1958; Ph.D., University of Wisconsin, 1962.


KITTERMAN, JOHN H., Associate Professor of Physics, 1983; B.S., Kansas State University, 1959, M.S., 1961; Ph.D., Colorado State University, 1970.

KNABACH, WAYNE E., Professor of Electrical Engineering, 1957, Registered Professional Engineer (S.D.); B.S., SDSU, 1949, M.S., 1961.

KOEPSELL, PAUL L., Professor of Civil Engineering, 1957, Registered Professional Engineer (S.D.); B.S., SDSU, 1952; M.S., University of Washington, 1954; Ph.D., Oklahoma State University, 1965.

KOHL, ROBERT A., Professor of Plant Science, 1975; B.S., Purdue University, 1958; M.S., Utah State University, 1960, Ph.D., 1962.


LAMBERTON CHARLES, Professor of Economics, 1974; B.B.A., University of Minnesota, 1960; M.S., University of Wyoming, 1970; Ph.D., Iowa State University, 1975.

LARSON, GARY E., Professor of Biology, 1979; B.S., Kearney State College, 1972; Ph.D., North Dakota State University, 1980.

LEE, RICHARD W., Professor and Head of Journalism and Mass Communications, 1978; B.S., University of Illinois, 1956; M.A., Southern Illinois University, 1964; Ph.D., University of Iowa, 1972.

LEISURE, O. W., Professor of Physics, 1963; B.S., SDSU, 1960, M.S., 1966.

LEWIS, DAVID E., Associate Professor of Chemistry, 1989; B.S., University of Adelaide (Southern Australia), 1972, B.S., 1973, Ph.D., 1980.


LIDSTONE, JAMES E., Associate Professor of HPER, Graduate Coordinator, 1983; B.A., Queen's University, 1976; M.S., University of North Carolina, 1979; Ed.D., 1982.


LUNDEEN, ARDELLE A., Professor and Head of Economics, 1976; B.S., SDSU, 1970, M.S., 1971; Ph.D., Iowa State University, 1976.

MALES, JAMES R., Professor and Head of Animal & Range Sciences, 1988; B.S., Pennsylvania State University, 1967; M.S., Michigan State University, 1969; Ph.D., Ohio State University, 1973.

MALO, DOUGLAS D., Professor of Plant Science, 1975; B.S., Iowa State University, 1971; M.S., North Dakota State University, 1974, Ph.D., 1975.

MARSHALL, DONALD M., Associate Professor of Animal and Range Science, 1984; B.S., University of Missouri, 1979; M.S., Oklahoma State University, 1981, Ph.D., 1984.

MARSHALL, JON C., Coordinator of the West River Graduate Center, Associate Professor of Education; B.S., University of Kansas, 1962, M.S., 1963, Ed.D., 1966.

MATTHEWS, DUANE R., Professor of Chemistry, 1980; B.A., Augsburg College, 1972; Ph.D., University of Maryland, 1978.

MCBRENN, WILLIAM J., Associate Professor in Nursing, Head of Research and Special Services, 1980; B.S.N., Mt. Marty College, 1976; M.S.N., University of Nebraska Medical Center, 1978; Ph.D., University of Texas, 1989.

MCDANIEL, BURRUS, Professor of Plant Science, 1966; B.A., University of Alaska, 1953; M.S., Texas A&M University, 1961, Ph.D., 1965.


McMullen, Charles R., Professor of Biology and Head of Biology-Microbiology, 1966; B.S., Northern State College, 1966; M.S., SDSU, 1969, Ph.D., 1974.


Miller, Herley L., Associate Professor of Animal Science 1973; B.S., Purdue University, 1969, M.S., 1971, Ph.D., 1973.


Miron, Douglas, Associate Professor of Electrical Engineering, 1979; B.E., Yale University, M.E., 1963; Ph.D., University of Connecticut, 1977.


Moore, Raymond A., Associate Dean of Agriculture and Biological Sciences, Director of Agricultural Experiment Station, Professor of Plant Science, 1956; B.S., SDSU, 1951, M.S., 1958; Ph.D., Purdue University, 1963.


Myers, Gerald A., Professor of Biology, 1958; B.A., Kearney State College, 1951; M.A., University of Northern Colorado, 1957; Ph.D., SDSU, 1963.


Oien, Fred M., Professor and Head of HPER, 1979; B.S., SDSU, 1972 M.S., 1975; Ed.D., University of Massachusetts, 1979.

Omodt, Gary W., Professor of Pharmaceutical Science, 1958; B.S., University of Minnesota, 1953, Ph.D., 1959.

Opheim, Lee A., Professor of Geography, 1969; B.S., University of Minnesota, 1952; M.A., St. Louis University, 1959, Ph.D., 1971.


Parsons, John G., Professor and Head of Dairy Science, 1968; B.S., University of Manitoba, 1961, M.S., 1963; Ph.D., Pennsylvania State University, 1968.

Peterson, Carol J., Vice President for Academic Affairs, 1987; Professor of Nursing, 1977; Diploma, Methodist-Kahler School of Nursing, 1960; B.S., University of Minnesota, 1963; M.Ed., 1964, Ph.D., 1969.

Peterson, Evelyn, Professor of Nursing, 1954; B.S., University of Washington, 1951, M.S., 1958; D.N.S., University of California, 1975.

Peterson, Gary, Professor of Biology, 1973; B.S., University of Utah, 1965; M.S., Emporia Kansas State College, 1969; D.A., University of Northern Colorado, 1971.

Pflueger, Burton, Extension Specialist and Associate Professor of Economics, 1989; B.S., University of Nebraska-Lincoln, 1979, M.S., 1981; Ph.D., University of Illinois, 1985.
POWERS, RICHARD W., Vice President for Administration, 1986; B.A., Allegheny College, 1958; Ph.D., Indiana University 1969.

PRASHAR, D. PAUL, Professor of Horticulture-Forestry, 1960; B.S., Government Agricultural College (Ludhiana, India), 1952; M.S., University of Minnesota; 1955, Ph.D., University of Missouri, 1960.


PRUITT, RICHARD J., Associate Professor of Animal and Range Sciences, 1983; B.S., Pennsylvania State University, 1973; M.S., Kansas State University, 1980, Ph.D., 1983.


RANGER, RICHARD J., Dean of Libraries, Professor of Library Science, 1972; B.S., University of Central Arkansas, 1960; M.S. Louisiana State University, 1962; Ph.D., Indiana University, 1972.

RAUBER, JOEL D., Associate Professor of Physics, 1985; B.S., Emory University, 1978; Ph.D., University of North Carolina, 1985.


RICKERL, DIANE H., Associate Professor of Plant Science, 1986; B.S., Iowa State University, 1972, M.A., 1976; M.S., Auburn University, 1984, Ph.D., 1986.


ROLLAG, DWAYNE A., Professor and Head of Civil Engineering, 1965; Registered Professional Engineer (S.D., Iowa Minn.); B.C.E., University of Minnesota, 1959; M.S., SDSU, 1966; Ph.D., Purdue University, 1971.


RUE, ROLLAND R., Professor of Chemistry, 1962; B.A., Macalester College, 1957; Ph.D., Iowa State University, 1962.


SALEHNI, ALIREZA, Assistant Professor of Computer Science, 1989; B.A., Tehran University, 1975; M.B.A., Central State University, 1977; Ph.D., University of Missouri-Columbia, 1989.

SANDER, DUANE E., Dean and Professor of Electrical Engineering, 1967; Registered Professional Engineer (S.D., Minn.); B.S., South Dakota School of Mines and Technology, 1960; M.S., Iowa State University, 1962, Ph.D., 1964.

SANDNESS, ROGER K., Associate Professor and Head of Geography, 1971; B.S. University of North Dakota, 1967, M.S., 1968; Ph.D., University of Iowa, 1986.

SATTERLEE, JAMES, Professor and Head of Rural Sociology, 1963; B.S., SDSU, 1962, M.S., 1963, Ph.D., 1970.


SCHINGOETHE, DAVID J., Professor of Dairy Science, 1969; B.S., University of Illinois, 1964, M.S., 1965; Ph.D., Michigan State University, 1968.

SCHLELSSMANN, MICHAEL R., Professor and Head of Speech, 1974; B.S., SDSU, 1973, M.S., 1974; Ph.D., University of Kansas, 1981.

SCHUMACHER, THOMAS E., Associate Professor of Plant Science, 1983; B.A., Bluffton College, 1972; M.S., Michigan State University, 1979, Ph.D., 1982.

SELIM, ALI A., Professor of Civil Engineering, Director of Transportation Technology Transfer Service, 1977; B.S., Ain Shams University, Egypt, 1967; M.S., University of Missouri, 1974, Ph.D., 1976.

SHANE, RICHARD C., Professor of Economics, 1977; B.S., SDSU, 1969; M.S. University of Arizona, 1971; Ph.D., Washington State University, 1978.


SINGH, YADHU NAND, Associate Professor of Pharmacy, 1988; B.S., University of Otago, 1966; M.S., University of Strathclyde, 1974, Ph.D., 1979.

SLYTER, ARTHUR LOWELL, Professor of Animal Science, 1970; B.S., Kansas State University, 1964; M.S., University of Nebraska, 1966; Ph.D., Kansas State University, 1969.


SMOKIK, JAMES D., Professor of Plant Science, 1975; B.S., South Dakota State University, 1965; M.S., 1969, Ph.D., 1973.

SORENSON, DIANNA L., Assistant Professor of Nursing, 1990; B.S., South Dakota State University, 1977, M.S., Montana State University, 1983; Ph.D., University of Arizona, 1990.

SPINAR, LEO H., Professor of Chemistry, University ERCO, 1966; B.A., University of South Dakota, 1951; M.S., University of Wisconsin, 1953, Ph.D., 1958.
STEINLEY, GARY L., Professor of Education, Acting Head of Undergraduate Teacher Education, 1979; B.S., Black Hills State College, 1963; M.A., California State University, 1967; Ph.D., University of Utah, 1970.


SWANSON, ROBERT, Professor of Veterinary Science, University Veterinarian, 1965; B.S., Fort Hays State College, 1953; D.V.M., Kansas State University, 1960, M.S., 1960, Ph.D., 1964.

SWEENEY, JERRY, Professor of History 1970; A.B., Fort Hays State College, 1962; M.A., Kansas State University, 1967; Ph.D., Kent State University, 1970.

SWORD, CHRISTOPHER P., Dean of Graduate School, Director of Research, Professor of Microbiology, 1976; B.S.; Loyola University, 1951; Ph.D., University of California, 1959.

TAYLOR, DONALD, Professor of Economics, 1980; B.S., Cornell University, 1959; M.S., 1964, Ph.D., 1965.


TUCKER, W. LEE, Experiment Station Statistician, Professor of Statistics 1963; B.S., University of Kentucky, 1952; M.S., North Carolina State University, 1957, Ph.D. 1963.

TWIDWELL, ED, Assistant Professor of Plant Science, Extension Agronomist, 1987 B.S., Kansas State University, 1982; M.S., Purdue University, 1984, Ph.D., 1987.

UTECHT, RONALD E., Assistant Professor of Chemistry, 1988; B.S., Iowa State University, 1983, Ph.D., 1986.


WERNER, HAL D., Extension Specialist, Associate Professor of Agricultural Engineering, 1971; B.S., SDSU, 1970, M.S., 1971; Ph.D., University of Minnesota, 1984.


WEST, THOMAS P., Associate Professor of Chemistry, 1988; B.S., Purdue University, 1974; M.S., Texas A&M University, 1976, Ph.D., 1980.

WESTBY, CARL A., Professor of Microbiology, 1973; B.A., University of California, 1958, Ph.D., 1965.

WESTFALL, HELEN N., Associate Professor of Microbiology, 1985; B.S., West Virginia University, 1971; M.S., Old Dominion University, 1974, Ph.D., 1980.

WHALEN, RICHARD H., Professor of Biology, 1967; B.S., College of St. Thomas 1954; M.S., University of Illinois, 1958; Ph.D., Purdue University, 1965.

WICKS, III, ZENO W., Professor of Plant Science, 1980; B.A., University of Vermont 1971; M.S., University of North Dakota, 1976, Ph.D., 1979.


WILLIS, DAVID W., Associate Professor of Wildlife and Fisheries Sciences, 1987, B.S. University of North Dakota, 1977, M.S. 1978; Ph.D., Colorado State University, 1980.


WOODARD, CHARLES, Professor of English, 1975; B.S., Dakota State College, 1964; M.A., University of Nebraska, 1967; Ph.D., University of Oklahoma, 1975.


YOCOM, KENNETH L., Professor and Head of Mathematics, 1962; B.S., South Dakota School of Mines and Technology 1960; M.S., University of Wyoming, 1962, Ph.D., 1972.

ZEMAN, DAVID H., Associate Professor of Animal Disease & Diagnostic Lab, 1986; B.S., North Dakota State University, 1976; D.V.M., Oklahoma State University, 1980; Ph.D., Louisiana State University, 1986.
GRADUATE FACULTY EMERITI

AANDERUD, WALLACE G., Professor Emeritus of Economics, 1963; B.S., North Dakota State University, 1950, M.S., 1960; Ph.D., Oklahoma State University, 1964.

ALEXANDER, RUTH A., Professor Emeritus of English, Coordinator of General Studies in Humanities, 1952; B.A., Michigan State University, 1945; M.A., University of Missouri, 1947; Ph.D., Michigan State University, 1952.

BAILEY, JR., HAROLD, Vice President for Academic Affairs Emeritus, Professor Pharmacy, 1951; B.S., Massachusetts College of Pharmacy, 1944, M.S., 1948; Ph.D., Purdue University, 1951.

BAKER, ROSCOE J., Professor Emeritus of Dairy Science, Professor of Microbiology, 1950; B.S., Iowa State University, 1942, M.S., 1947, Ph.D., 1950.

BARNES, ALLEN R., Regental Professor Foreign Languages/Dean Emeritus, College of Arts and Science, 1961; A.B., Hastings College, 1948; M.A., University of Idaho, 1951; Ph.D., University of Madrid, 1953; Certificate, University of Vera Cruz (Mexico), 1955.


BRAGE, BURTON, Associate Dean Emeritus of Agriculture and Biological Sciences, Director of Resident Instruction, Professor Emeritus of Plant Science, 1950; B.S., University of Minnesota, 1946, Ph.D., 1950.

BRANDWEIN, BERNARD J., Professor Chemistry, 1955; B.S., Purdue University, 1948, M.S., 1951, Ph.D., 1955.

BRIGGS, HILTON M., President Emeritus, Distinguished Professor of Agriculture, 1958; B.S., Iowa State University, 1933; M.A., North Dakota State University, 1935; Ph.D., Cornell University, 1938; D.Sc., (Honorary) North Dakota State University, 1963; Doctor of Higher Education Administration (Honorary), University of South Dakota, 1974.


BUSH, LEON F., Associate Professor Emeritus of Animal Science, 1954; B.S., University of Kentucky, 1950, M.S., 1951; Ph.D., Cornell University, 1954.

CARLSON, WENDELL, Professor of Animal Science, Leader of Poultry Research and Extension Section, 1948; B.S., Colorado State University, 1942; M.S., Cornell University, 1948, Ph.D., 1949.

CARSON, PAUL, Professor Emeritus of Plant Science, 1948; B.S., Northwest Missouri State University, 1941; M.S., Iowa State University, 1947.

CHRISTIANSON, KENNETH D., Professor of Mechanical Engineering, 1955; B.S., SDSU, 1949, M.S., 1958.

CRACBS, GERALDINE, Associate Professor Emeritus of Health, Physical Education and Recreation, 1953; B.A., University of Northern Iowa, 1933; M.S., University of Colorado, 1958.

DENTON, CLARENCE E., Professor Emeritus of Speech, 1956; B.S., University of Nebraska, 1950; M.A., Louisiana State University, 1954; M.F.A. University of Minnesota, 1965.

DERSCHEID, LYLE A., Professor Emeritus of Plant Science, 1946; B.S., SDSU, 1943, M.S., 1948; Ph.D., Iowa State University, 1951.

DIMIT, ROBERT M., Professor Emeritus of Rural Sociology, 1952; B.A., Pennsylvania State University, 1948, M.S., 1949; Ph.D., Iowa State University, 1954.

DINKEL, C. A., Professor Emeritus of Animal Science, 1951; B.S., Iowa State University, 1948; M.S., SDSU, 1949; Ph.D., Iowa State University, 1953.

DORNBUSCH, JAMES N., Professor Emeritus of Civil Engineering, 1949, Registered Professional Engineer (Minn.) 1949; B.S., SDSU, 1949; M.S., University of Minnesota, 1959; D.Sc., Washington University, 1962.

DRACY, ARTHUR E., Professor Emeritus of Biological Engineering, 1948; B.S., University of Minnesota, 1943, M.S., 1946, Ph.D., 1949.

DUFFEY, W. GEORGE, Professor of Physics, 1945; A.B., Cornell College, 1942; A.M., Princeton University, 1944, Ph.D., 1945.

EMBRY, LAWRENCE B., Professor Emeritus of Animal Science, 1950, 1960; B.S., University of Kentucky, 1942; M.S., Cornell University, 1948, Ph.D., 1950.


FINE, LAWRENCE O., Professor Emeritus of Plant Science, 1946; B.S., North Dakota State University, 1938; Ph.D., University of Wisconsin, 1941.


GARDNER, WAYNE S., Professor Emeritus of Plant Science, 1967; B.S., Utah State University, 1950, M.S., 1951; Ph.D., University of California, 1967.


GROSS, GUILFORD C., Professor Emeritus of Pharmacy, 1940; B.S., SDSU, 1939, M.S., 1940; Ph.D., University of Florida, 1952.

HALVERSON, ANDREW W., Professor Emeritus of Station Biochemistry, 1949; B.S., SDSU, 1943; M.S., University of Wisconsin, 1947, Ph.D., 1949.

HELFINSTINE, REX D., Associate Dean Emeritus of Graduate School, Professor Emeritus of Economics, 1960; B.S., Iowa State University, 1932, M.S., 1947; Ph.D., University of California, 1958.

HENDRICKSON, JOHN P., Professor of Political Science, 1954; B.A., University of Iowa, 1947; M.A., University of Minnesota, 1949; Ph.D., University of Iowa, 1952.


HORTON, MAURICE L., Professor Emeritus of Plant Science, 1964; B.S., Purdue University, 1953, M.S., 1959; Ph.D., Iowa State University, 1962.

HSIA, FELIX H., Professor of Economics 1963; B.S., University of Nanking (China) 1942; M.S., University of Wisconsin, 1953, Ph.D., 1960.

HUGGINS, ERVIN, Professor Emeritus of Biology, 1952; B.S., Baylor University, 1943; M.S., Texas A&M University, 1949; Ph.D., University of Illinois, 1952.

JOHNSON, ELMER R., Professor Emeritus of Chemistry, 1946; B.S., SDSU, 1933; Ph.D., University of Wisconsin, 1940.

JOHNSON, GENEVIEVE B., Professor Emeritus of Nursing, 1956; B.S., SDSU, 1944; M.S., Vanderbilt University, 1945; Ed.D., Columbia University, 1955.

KAMSTRA, LESLIE D., Professor Emeritus of Animal Science, 1951; B.S., SDSU, 1947, M.S., 1951; Ph.D., Ohio State University, 1955.

KANTACK, BENJAMIN H., Professor Emeritus of Plant Science, 1962; B.S., Kansas State University, 1951; M.S., Oklahoma State University, 1954; Ph.D., University of Nebraska, 1963.

KINCH, RAYMOND, Professor Emeritus of Plant Science, M.S., University of Nebraska, 1936.

KIRKBRIDE, CLYDE A., Professor Emeritus of Veterinary Science, Associate Professor of Microbiology, 1967; D.V.M., Oklahoma State University, 1953; M.S., SDSU, 1970.

KLUG, HARLAN L., Professor Emeritus of Chemistry, 1947; B.S., SDSU, 1930; M.S., University of South Dakota, 1944; Ph.D., University of Wisconsin, 1949.

KOHLER, PAUL H., Professor of Animal Science, 1950; B.S., SDSU, 1949, M.S., 1950; Ph.D., University of Minnesota, 1959.

KOHLMEYER, WILLIAM, Professor Emeritus of Animal Science and Economics, 1944; B.S., Iowa State University, 1928; M.S., Purdue University, 1938.

KRANZLER, ALBERT W., Professor Emeritus of Mathematics, 1943, B.S. University of North Dakota, 1937; M.S., University of Minnesota, 1950.

LAIRD, RUTH, Associate Professor Emeritus of Journalism, 1966; B.A., Cornell College, 1935; M.A., University of Iowa, 1966.

LEWIS, JAMES K., Professor Emeritus of Animal Science, 1950; B.S., Colorado State University, 1948; M.S., Montana State University 1950.

LINDER, RAYMOND L., Professor Emeritus of Wildlife and Fisheries Sciences B.S., University of Nebraska, 1953; M.S. Iowa State University, 1955; Ph.D., University of Nebraska, 1964.

LUND, LILLIAN O., Professor Emeritus of Textiles, Clothing, and Interior Design, 1944; B.A., St. Olaf College, 1930; M.S., University of Minnesota, 1944.


LYLE, MARY FRANCES, State Home Demonstration Leader Emeritus, Ph.D. University of Wisconsin, 1958.

LYTLE, WILLIAM E., Associate Professor Emeritus of Agricultural Engineering, 1961; Registered Professional Engineer (Ill. & S.D.); B.S., University of Illinois, 1939, B.S., 1940, M.S., 1948.

MANKIN, CLEON J., Professor Emeritus of Plant Science, 1953; B.S., New Mexico Highlands University, 1938; M.S., New Mexico State University, 1950; Ph.D. Washington State College, 1953.


McCARTY, J. WALTERS, Professor Emeritus of Animal Science, Director of International Programs, 1948, B.S., SDSU 1947; M.S., University of Minnesota, 1948.

McCONE, WILLIAM C., Associate Emeritus Professor of Animal Science, 1947; B.S., SDSU, 1943, M.S., 1950.


MILLER, BRUCE L., Professor Emeritus of Physics, 1955; B.S., SDSU, 1948; M.S., University of Kansas, 1951, Ph.D., 1953.

MINYARD, JOSEPH A., Extension Livestock Specialist, Professor Emeritus of Animal Science, 1953; B.S., West Texas State University, 1951; M.S., SDSU, 1959.


MORGAN, JR., WALTER C., Professor Emeritus of Animal Science, Professor Emeritus of Biology, 1954; B.S., University of Connecticut, 1946; M.S., George Washington University, 1949; Ph.D., University of Connecticut, 1953.

MYERS, MAX, Professor Emeritus of Economics, 1946; B.S., SDSU, 1938; M.S., Cornell University, 1942, Ph.D., 1950.

OLSON, OSCAR E., Professor Emeritus of Chemistry, 1937 B.S., SDSU, 1936, M.S., 1937; Ph.D., University of Wisconsin, 1948.


PENGRA, ROBERT M., Professor Emeritus of Microbiology, 1957; B.S., SDSU, 1951, M.S., 1953; Ph.D., University of Wisconsin.

PETERSON, RONALD M., Professor of Horticulture-Forestry, 1953; B.S., Colorado State University, 1947; M.S., University of California, 1949; Ph.D., University of Minnesota, 1953.

ROBINSON, GLENN, Professor Emeritus of HPER, 1957; B.A., Monmouth College, 1932; M.A., Columbia University, 1942.

SANDFORT, JOHN F., Professor Emeritus of Mechanical Engineering, 1958; B.M.E., Ohio State University, 1933, B.S., 1934; M.S., Iowa State University, 1948.

SAUER, HOWARD M., Professor Emeritus of Rural Sociology, 1938; B.A., Des Moines University, 1929; M.A., Iowa State University, 1931.


SEMENIUK, GEORGE, Professor Emeritus of Plant Science and Microbiology, 1952; B.S., University of Alberta, 1932, M.S., 1934; Ph.D., Iowa State University, 1938.

SHANK, D. BOYD, Professor Emeritus of Plant Science, 1946; B.S., University of Nebraska, 1935; Ph.D., Iowa State University, 1941.

SHUBECK, FRED E., Professor Emeritus of Plant Science, 1951; B.A., SDSU 1940; Ph.D., University of Minnesota, 1951.


SPURGEON, KENNETH R., Professor Emeritus of Dairy Science, 1958; B.S., Purdue University, 1942, M.S., 1948; Ph.D., University of Wisconsin, 1951.

STINE, LAWRENCE C., Professor Emeritus of Speech, Director Emeritus of Theatre, Associate Dean Emeritus of Arts and Science, 1952; A.B., Butler University, 1947; M.A., University of Iowa, 1951, Ph.D., 1962.
STOFLET, DOROTHY, Professor Emeritus of Textiles, Clothing and Interior Design, 1963; B.A., Coe College, 1933; M.S., Iowa State University, 1948.

STORRY, JUNIS O., Amdahl Distinguished Professor of Engineering; Director, Engineering Experiment Station; Director, Engineering Extension, 1946; B.S., SDSU, 1942; Ph.D., Iowa State University, 1967.

SUNDET, STANLEY A., Director Emeritus of Placement, Professor Emeritus of Education, 1946; B.S., SDSU, 1935; M.S., Iowa State University, 1939; Ph.D., University of Minnesota, 1955.

TAYLOR, CHARLES A., Professor Emeritus of Botany, 1949; B.S., Cornell University 1935, M.S., 1939.

THOMPSON, JOHN E., Professor Emeritus of Economics, 1952; B.S., University of South Dakota, 1950; M.S., South Dakota State University, 1953; Ph.D., University of Wisconsin, 1960.


WAHLSTROM, RICHARD C., Professor of Animal Science, 1952; B.S., University of Nebraska, 1948; M.S., University of Illinois, 1950, Ph.D., 1952.

WALSTROM, ROBERT J., Professor of Plant Science, 1955; B.S., University of Nebraska, 1947, M.S., 1949; Ph.D., Iowa State University, 1955.

WEBSTER, VICTOR, Professor Emeritus of Chemistry, 1936; B.A., Iowa State University, 1930, M.S., 1931, Ph.D., 1933.

WELLS, DARRELL G., Professor Emeritus Plant Science, 1962; B.S., SDSU, 1941; M.S., Washington State University, 1943; Ph.D., Iowa State University, 1949.

WENTZY, WOODROW P., Associate Professor Emeritus of Journalism, Supervisor Emeritus of Instructional TV, 1938; B.S., SDSU, 1938; M.A., University of Oklahoma, 1950.

WESTIN, FREDERICK C., Professor Emeritus of Plant Science, 1947; B.S., University of Wisconsin, 1941, M.S., 1947, Ph.D., 1952.


WHITEHEAD, EUGENE I., Professor Emeritus of Station Biochemistry, 1941; B.S., SDSU, 1939, M.S., 1941.

WIESMA, JOHN, Professor Emeritus of Agricultural Engineering, Director of Water Resources Institute, 1943; Registered Engineer (S.D.); B.S., SDSU, 1943, M.S., 1950, Ph.D., University of California, 1970.

WILLIAMS, PERRY W., Professor Emeritus of Physics, 1936; B.A., Dakota Wesleyan University, 1936; M.S., SDSU, 1940.

WILLIAMSON, WARREN, Professor of Health, Physical Education, and Recreation, Coordinator of Intramurals and Recreation, 1956; B.S., SDSU, 1951, M.S., 1954.

WILLS, RENA, Professor Emeritus of Nutrition and Food Science, 1952; B.S., Iowa State University, 1940, M.S., 1946.

WOOD, LEON S., Extension Plant Pathologist, Professor Emeritus of Plant Science, 1955; B.S., Kent State University, 1949; M.S., Ohio State University, 1951; Ph.D., University of Minnesota, 1958.
INDEX

A
Abbreviations, 19
Academic Calendars, 3
Accreditation, 6
Administration, officers of, 5
Admission, 7-8, 12
change of status, 8
conditional, 8
departmental requirements, 7
Master's program, 12
Non-degree (Special Student), 8
Ph. D. program, 14
post-doctoral study, 8
Provisional (conditional), 8
readmission, 8
requirements, 7
special student, 8
status, 8
to candidacy, 13
to the Graduate School, 7-8
unconditional, 8
Advisory committee, 12
Agricultural economics, 12-28
education, 12, 30
engineering, 12, 19-20, 35
Agriculture, mechanized, 20
Agronomy, 12, 20, 52
Animal Science, 12, 20, 21
Anthropology, 54
Application, 75
Assistantship, 11
Attendance at commencement, 11
Auditor fees, 10

B
Bioengineering, 35
Biology, 12, 21-22
Board of Regents, 5
Botany, 12, 21, 22

C
Calendars, 3
Campus Map, 2
Candidacy, admission to, 13
Doctoral programs, 14
Master's programs, 12
Cap, gown, hood rental, 11
Change of admission status, 8
Check list for
Doctor of Philosophy, 16
Master's Degree, 14
Chemistry, 12, 23-24
MST program, 55-56, 57-58
Child Development and Family Relations, (see Human Development, Child and Family Studies), 42, 43-44
Civil Engineering, 25-26
Clothing, Textiles, Interior Design, 42, 60-61
Commencement, attendance, 11
Communication
General, 26, 45
Mass, 45
Radio, TV, Film, 26

D
Dairy Science, 12, 28
Deans, 5
Degrees and fields of study, 7, 12-16
Doctoral programs, 14
Master's programs, 12
Master of Science Teaching, 12, 55-60
Departments offering Master's Degrees, 12
Agricultural Engineering, 12, 19-20, 35
Animal & Range Sciences, 12, 20-21
Biology, 12, 21-22
Chemistry, 12, 23-24
Child Development and Family Relations, (see Human Development, Child and Family Studies), 42, 43-44
Civil Engineering, 25-26
Computer Science, 27
Dairy Science, 12, 28
Economics, 12, 28
Education and counseling—College of, 30-34
Engineering, 12
Electrical Engineering, 36-37
Engineering Mechanics, 38
English, 12, 37-38
Foreign Languages, 38
General Engineering, 39
Geography, 12, 40
Health, Physical Education and Recreation, 12, 41-42
History, 42
Home Economics, 12, 42
Home Economics Education, 27
Journalism & Mass Communications, 12, 44-45
Mathematics, 12, 45-46
Mechanical Engineering, 46-47
Microbiology, 12, 21-22
Nutrition & Food Science, 42, 50
Physics, 12, 51-52
Planning, (minor), 51
Plant Science, 52-53
Political Science, 24
Psychology, 53
Rural Sociology, 12, 54-55
Science Teaching (Master of), 55
Speech, 12, 26
Textiles, Clothing & Interior Design, 42, 60-61
Veterinary Science, 61
Wildlife & Fisheries Sciences, 12, 61-62
Zoology, 12, 21-22
Deposit, general, 10
Dissertation, 9
fees, 10
sustaining, 9
Doctor of Philosophy degree, 15-16
checklist, 16

E
Economics, J.D./M.S., 12, 28
Education, administration, 12, 32
adult higher, 30
agricultural, 30
elementary, 33
evaluation and research, 32
foundations, 32-33
health, 41
home economics, 27
physical, 41-42
psychological, 33
secondary, 33-34
vocational, 34
Engineering, 12
agricultural, 12, 19-20, 35
civil, 25-26
electrical, 36-37
general, 39
mechanical, 46-47
mechanics, 38
English, (M.A.) 12, 37-38
Entomology, 12, 52
Evening courses, 9
Examinations (see also, obsolete course work), 13
Graduate Record, 7
Extension and evening students, 9

F
Faculty,
Graduate listings, 65-70
Emeritus listings, 71-73
Fees and Tuition, 10
Fellowships and Assistantships, 11
Financial and other information, 11
Food Science, Nutrition and, 42, 50
Family Relations, Child Development, (see Human Development, Child and Family Studies), 42, 43-44
Fees and tuition, 10
Fellowships and assistantships, 11
Final examinations, 13
Financial and other information, 11
Food Science, Nutrition and, 42
Foreign Languages, 38
Foreign students (see also, International students), 7, 11

G
General
deposit, 10
engineering, 39
communication, 26
information, 5-19
university fee, 10
Geography, 12, 40
Grades for thesis and seminars, 10
Graduate assistantships, 11
Council, 5
courses, summer, 8
credit for seniors, 10
college, 65-70
record examination, 7
study by University staff, 10
Graduation application, 11

H
Health education, 41
Health, Physical Education and Recreation, 12, 41-42
History, 42
Home Economics, 12, 42
Home Economics Education, 27
Floods for graduation, 11
Housing facilities, 11
Horticulture, Forestry, Landscape and Parks, 43
Human Development, Child and Family Studies, 42, 43-44

I
Industrial Management, 12, 35, 36
Information, general, 5-19
Interior Design, 42, 60-61
International Students, 11

J
Journalism & Mass Communications, 12, 44-45
L
Language requirements (see departments for specifics), 13
Master's degree, 7, 13
Doctoral, 7
Lifelong Learning & Outreach, 9
Letters of recommendation, 7
Linguistics, 38
Living costs, 11

M
Major
Doctoral programs, 14, 15
Master's programs, 12
Management, Industrial, 12, 35, 36
Mass Communication, 12, 44-45
Master's Degree checklist, 14
Master of Arts degree, 12
Master of Education degree, 12
Master of Science degree, 12
Mathematics, 12, 45-46
Minimum credit loads, 9
Mechanical Engineering, 46-47
Mechanized Agriculture, 20
Microbiology, 12, 21, 22
Minors (see all departments)
Botany, 21
Doctor of Philosophy degree, 15
Health, physical Education and recreation, 41
History, 42
Master of Arts degree, 12
Master of Education, 12
Master of Science, 12
Master of Science Teaching, 12
Planning, 51
Political Science, 53
Music, 47

N
Non degree student, 8
Non thesis option, 7, 12, 14
Normal and maximum credit loads, 8
Nursing, 12, 48-50
Nutrition and Food Science, 42, 50

O
Obsolete
coursework, 13, 16
program, 13, 16
Officers of administration, 5
Options, 12
Other information, financial and, 11

P
Pharmacy, 50
Ph. D. degree, 7, 14
Agricultural Engineering (co-operative program), 12, 19-20, 35
Agronomy, 12, 20, 52
Animal Science, 12, 20-21
Chemistry, 12, 23-24
Sociology, (Rural), 12, 54-55
Physical education, 42
Physics, 12, 51-52
Master of Science Teaching, 56, 59-60
Plan of study, 12, 14
Planning, 51

Plant Pathology, 12, 52
Plant Science, 52-53
Political Science, 53
Post-doctoral study, 8
Problems courses, 9
Psychology, 53
   Educational, 33
   Purposes, 5-6

R
Radio, TV, Film, 26
Readmission procedure, 8
Recreation, 42
Regents, Board of, 9
Registration, 9
Requirements (see all departments)
language, 13
report, 13
research problem, 13
research tool, 15
residence, 12
Residence and credit requirements, 7
doctoral, 14-15
master's, 13-14
Rural Sociology, 12, 54-55

S
Scholastic requirements, 8
Secondary education, 33-34
Sociology, Rural, 12, 54-55
Speech 12, 26
Special student, admission as, 8
Summer session, 8
tuition and fees, 11
Supporting courses
doctoral program,
master's program,
Sustaining, thesis
tuition and fees, 9
registration, 9

T
Textiles, Clothing & Interior Design, 42, 60-61
Theatre, 26
Thesis, 13
tuition and fees, 10
Time limit,
doctoral program, 16
master's program, 13
Transcript, 7
Transfer of credits
doctoral program, 14-15
master's program, 9

U
Unconditional admission, 8

V
Veterinary Science, 61
Vocational Education, 34

W
Wildlife & Fisheries Sciences, 12, 61-62
Workshops, 9

Z
Zoology, 12, 21, 22
Application for ADMISSION or READMISSION
Graduate School, Box 2201, South Dakota State University, Brookings, SD 57007

1. Name  
   (Last) (Other or Former Name, if any) (First) (Middle)

2. Permanent Mailing Address
   Street, RFD, or Box
   City State or Country Zip Code Phone

3. Current Mailing Address

5. Date of Birth ___ / ___ / ___  
5a. Place of Birth City State or Country

6. Citizen of what country ___  
7. Legal Resident of ___ / ___  
8. Name of person to be notified in case of emergency
   Address Relationship Phone

9. Degree received (if none, state when bachelor's degree will be earned and remaining requirements. Baccalaureate degree or equivalent from an accredited institution is a prerequisite for pursuing graduate work.) Official transcripts of ALL academic work must be submitted.
   All institutions attended and addresses
   Degrees earned (if any) Dates attended

10. Standardized admissions tests taken (GRE, MAT, TOEFL). TOEFL required for international students
   Standardized admission test Latest date taken Score

11. Degree sought (check one) □ None □ Master of Arts □ Master of Science Teaching □ Master of Science □ Master of Education □ Doctor of Philosophy OR Readmit to: □ Non Degree □ Degree

12. Major department Area of interest

13. Term graduate work will begin: □ Fall □ Spring □ Summer Year  
14. Indicate where you will enroll initially: □ On campus □ Lifelong Learning & Outreach

15. Required for Civil Rights/Affirmative Action Reporting:
   Sex: □ Male, □ Female
   Ethnic Group: □ White, □ Black, □ Asian, □ American Indian, □ Hispanic
   Citizenship: □ Native-born, □ Naturalized, □ Alien, □ Resident Alien Visa Status
   Handicapped: □ Audio, □ Visually, □ Learning Disabled, □ Mobility—Ambulatory, □ Mobility—Wheel Chair

16. I hereby certify that I am registered with the Selective Service pursuant to the Military Selective Service Act, 50 USC 453, as amended and in effect on January 1, 1988, or for a reason specified in 50 USC 453, I am not required to be registered.

Signature of Applicant________________________ Date ______________

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