# DEADLINE DATES

For those who expect to receive the Master's degree or Doctor of Philosophy degree on:

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<tbody>
<tr>
<td>Filing GS4, Admission to Candidacy for a degree and diploma order</td>
<td>June 8, 1973</td>
<td>September 6, 1973</td>
<td>January 24, 1974</td>
<td>June 7, 1974</td>
<td>September 5, 1974</td>
<td>January 22, 1975</td>
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<td>(Optional) Preliminary review of completed (signed) theses, prior to printing, by the Graduate Dean</td>
<td>July 27, 1973</td>
<td>December 6, 1973</td>
<td>April 26, 1974</td>
<td>July 27, 1974</td>
<td>December 5, 1974</td>
<td>April 25, 1975</td>
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</tbody>
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MEMORANDUM

TO: All Department Heads

FROM: Farrell B. Brown
Assistant to the Graduate Dean

DATE: August 8, 1973

RE: Errata in the 1973-1974 Graduate Catalogue

Please note the following corrections and pass this information along to all faculty, staff, and graduate students in your department who may consider the corrections of significance.

Page 27, second sentence under Academic Standards should read as follows:

Nonetheless, a graduate student is expected to do superior work and the only satisfactory grades for graduate students are A and B.

Page 55, first line in description of Environmental Science should read:

Degrees are not awarded in Environmental Science. The courses listed below.

Page 80, sentence at top of page should end as follows:

areas of English, history and government, mathematics, and natural science.

Page 98, sentence at top in dark print should read:

In addition to the three 600 level courses listed above, the following bioengineering courses are offered:

Page 102, third line under description of Chemical Engineering, Special program should read Special programs.

Page 147, first sentence in second paragraph of the description of the College of IM & TS should end as:

Textile Science, Textile and Polymer Science, and Textile Chemistry.

Page 175, line 5 under For the Doctor of Philosophy degree should read:

one each from physical and organic.

ccs: All Academic and Administrative Deans
CHECK LIST ON GRADUATE SCHOOL PROCEDURES

The graduate student should carefully note this check list as well as deadline dates on inside front cover.

1. Select in consultation with the appropriate Department Head a major advisor and advisory committee. (See pages 24, 25)

2. Submit Plan for Graduate Study (GS Form 2). (See page 25)

3. If necessary, submit request for changes in Plan for Graduate Study. Minor changes may be accomplished by memorandum signed by the advisory committee, department head and college dean.

4. Satisfy any prescribed language requirement and qualifying examination prerequisite to admission to candidacy. (See pages 33, 37, 38, 39)

5. Apply for admission to candidacy for a degree (GS Form 4) after completing at least half the prescribed course work. (See page 26)

6. Submit completed thesis (if required) or dissertation to advisory committee chairman and arrange for final examination by the advisory committee. (See pages 30, 31, 33, 40)

7. Pay binding fee to the Bursar and submit approved copies of thesis to the Graduate School. Doctoral candidates pay for abstract publication in Dissertation Abstracts. (See page 31)

The final responsibility for following Graduate School procedures rests with the graduate student. Special problems should be referred to the Graduate Dean.
Clemson University offers equal educational opportunity to all person without regard to sex, race, creed, color or national origin. This policy applies in all matters including:

1. Admission and education of students.

2. Availability of student loans, grants, scholarships and job opportunities.

3. Employment and promotion of teaching and non-teaching personnel.

4. Student and faculty housing situated on premises owned or occupied by the University.

5. Off-campus housing not owned by the University but listed with the University for referral purposes.

6. Activities conducted on premises owned or occupied by the University.
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## DESCRIPTION OF GRADUATE COURSES

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*The courses listed in this Bulletin in the 600 series are described in the general University Catalog, but as 300 and 400 level courses. A copy of the general Catalog may be obtained from the Director of Admissions. Graduate credit can be earned only for courses numbered 600 or above.
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*The Master of Business Administration degree is offered jointly by Furman University and Clemson University. Courses in this program are taught on the Furman University campus, Greenville, S. C., by the faculty of both universities. Requests for information concerning this program should be addressed to the Director, Clemson-Furman MBA Program, Furman University, Greenville, S. C. 29613.*
# UNIVERSITY CALENDAR
## SESSION 1973-74
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<td>August 22</td>
<td>Wednesday</td>
<td>Registration, all students</td>
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<tr>
<td>August 23</td>
<td>Thursday</td>
<td>Late registration</td>
</tr>
<tr>
<td>August 24</td>
<td>Friday</td>
<td>Late registration fee applies</td>
</tr>
<tr>
<td>August 24</td>
<td>Friday</td>
<td>Classes begin, regular schedule</td>
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<tr>
<td>August 30</td>
<td>Thursday</td>
<td>Last day for registration</td>
</tr>
<tr>
<td>August 30</td>
<td>Thursday</td>
<td>Last day to add a subject</td>
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<tr>
<td>September 6</td>
<td>Thursday</td>
<td>Last day to order diploma for mid-year graduation</td>
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<tr>
<td>September 20</td>
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<td>Last day to drop a subject without record of drop</td>
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<tr>
<td>October 15</td>
<td>Monday</td>
<td>Preliminary reports due</td>
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<tr>
<td>November 12-16</td>
<td>Monday-Friday</td>
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<td>November 14</td>
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<td>Last day to withdraw without having grades recorded</td>
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<td>November 14</td>
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<td>Last day to drop a subject</td>
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<td>November 21</td>
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<td>Thanksgiving holidays begin after last class</td>
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<td>November 26</td>
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<td>Classes resume</td>
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<td>December 10</td>
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<td>January 9</td>
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<td>Late registration</td>
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<td>January 10</td>
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<td>Late registration fee applies</td>
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<td>January 16</td>
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August 21 — Wednesday — Registration, all students
August 22 — Thursday — Late registration
August 23 — Friday — Late registration fee applies
August 23 — Friday — Classes begin, regular schedule
August 29 — Thursday — Last day for registration
August 29 — Thursday — Last day to add a subject
September 5 — Thursday — Last day to order diploma for mid-year graduation
September 19 — Thursday — Last day to drop a subject without record of drop
October 14 — Monday — Preliminary reports due
November 11-15 — Monday-Friday — Preregistration
November 13 — Wednesday — Last day to withdraw without having grades recorded
November 13 — Wednesday — Last day to drop a subject
November 27 — Wednesday — Thanksgiving holidays begin after last class
December 2 — Monday — Classes resume
December 9 — Monday — Examinations begin
December 19 — Thursday — Mid-year graduation
SECOND SESSION
January 6 — Monday — Orientation, new students
January 7 — Tuesday — Registration, all students
January 8 — Wednesday — Late registration
January 9 — Thursday — Late registration fee applies
January 9 — Thursday — Classes begin, regular schedule
January 15 — Wednesday — Last day for registration
January 15 — Wednesday — Last day to add a subject
January 22 — Wednesday — Last day to order diploma for May graduation
February 5 — Wednesday — Last day to drop a subject without record of drop
March 3 — Monday — Preliminary reports due
March 14 — Friday — Spring holidays begin after last class
March 24 — Monday — Classes resume
April 4 — Friday — Last day to withdraw without having grades recorded
April 4 — Friday — Last day to drop a subject
April 9 — Wednesday — Honors and Awards Day — classes suspended at 12 noon
April 14-18 — Monday-Friday — Preregistration
April 28 — Monday — Examinations begin
May 9 — Friday — Commencement
SUMMER SESSIONS 1975
FIRST SEMESTER
(Classes meet Monday-Friday)
May 19 — Monday — Registration
May 20 — Tuesday — Classes begin
June 25, 26 — Wed., Thurs. — Examinations
SECOND SESSION
(Classes meet Monday-Friday except as indicated)
June 30 — Monday — Orientation, new students
July 1 — Tuesday — Registration
July 2 — Wednesday — Classes begin
August 2 — Saturday — Classes meet
August 6, 7 — Wed., Thurs. — Examinations
August 9 — Saturday — Graduation
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Arnold E. Schwartz, Ph.D., Professor of Civil Engineering and Dean of Graduate Studies and University Research, Chairman, ex-officio

Robert M. Allen, Ph.D., Professor of Forestry, and Head, Department of Forestry, 1973

Claude W. Bolen, Ph.D., Professor of History, 1973

Joel V. Brawley, Ph.D., Professor of Mathematical Sciences, 1973

N. Dwight Camper, Ph.D., Associate Professor of Plant Pathology and Physiology, 1974

Benjamin C. Dysart, III, Ph.D., Associate Professor of Environmental Systems Engineering, 1975

Chester R. Freeze, Ed.D., Professor of Education, 1974

Hugh H. Macaulay, Ph.D., Alumni Professor of Economics and Industrial Management, 1975

George C. Means, M.Arch., Professor of Architecture, 1974

Student Representatives:

Leslie W. Brusse, B.S., Department of Recreation and Parks Administration, 1973

Henry R. Mushinsky, M.S., Department of Zoology, 1973
GENERAL INFORMATION

INTRODUCTION

Clemson is the land-grant university of South Carolina, and is fully accredited by the Southern Association of Colleges and Schools. The graduate curriculums under the Colleges of Agricultural Sciences, Engineering, Architecture, Education, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, and Physical, Mathematical and Biological Sciences form a background of education for the hundreds of occupations which Clemson graduates enter.

The government of the University is vested in a Board of Trustees. In accord with the Thomas G. Clemson will, the Board includes six members elected by the Legislature and a self-perpetuating group of seven life members. The function of the Board is legislative. The Board determines the general policy of the University and directs the expenditure of its funds.

The President of the University is the chief executive and administrative officer.

The Dean of Graduate Studies and University Research coordinates all graduate programs and University research. He advises the Dean of the University on all matters pertaining to graduate study and research. His duties include the enforcement of graduate admissions policies, the approval of graduate student programs, and the authority to approve the granting of graduate degrees. He chairs the Graduate Council and is administratively responsible for the University Computer Center.

The Academic Deans are responsible for the programs and personnel of their individual colleges. In the matter of programs and projects, they report administratively regarding graduate studies and research to the Dean of Graduate Studies and University Research.

Graduate Council. This council consists of the Dean of Graduate Studies and University Research, ex officio, one faculty member from each college having a graduate program, one officially designated alternate from each college who will attend and vote
in the regular council member's absence, and two graduate stu-
dents. The faculty members are nominated by the dean of the
college and appointed by the Dean of the University for a term of
three years. The graduate students are nominated by the Graduate
Dean and appointed by the Dean of the University for a term
of one year. The Dean of Graduate Studies and University Re-
search serves as chairman.

All policies and regulations affecting graduate curricula and re-
quirements leading to graduate credits, certification, and degrees
are approved by the Graduate Council and recommended to the
Dean of the University.

The Graduate Council also serves as an appeal board for de-
cisions regarding admission and/or degree requirements or other
policy decisions affecting the welfare of graduate students. The
appeal must be presented in writing to the Graduate Dean or to
any member of the Graduate Council. Graduate students and
faculty members who are not members of the council may be in-
vited to attend its meetings.

THE GRADUATE SCHOOL

The Graduate School exists to formulate policies and standards,
and to unify administrative procedures concerning all graduate
work at Clemson.

The aims of graduate programs at Clemson are to provide com-
prehensive training in special fields, to offer instruction in the
methods of independent investigation, and to foster the spirit of re-
search scholarship. Graduate study is much more than a continu-
ation of undergraduate work. Its true spirit is one of inquiry and
the desire to add to human knowledge. Graduate study should
therefore be contemplated only by students who have already dem-
onstrated in their undergraduate programs unusual intellectual at-
tainments and the power of independent thought and investigation.

THE UNIVERSITY LIBRARY

The Robert Muldrow Cooper Library is essentially a consolidation
of special libraries, agricultural and biological sciences, science
and technology and carefully selected smaller collections in the social sciences and the humanities. The collection consists of 500,000 volumes of books, periodicals and government publications. In addition to the main library there are departmental libraries.

Forty-six newspapers and 9,000 serial titles—periodicals, reports, bulletins and the like—are received regularly. Microfilm and microcard readers are provided for consulting material in microtext.

Library service is maintained in the Main Library as indicated below. With the exception of adjustments in the schedule during holiday periods, the library hours are as follows:

- Monday through Friday: 7:45 a.m. to 11:00 p.m.
- Saturday: 8:00 a.m. to 6:00 p.m.
- Sunday: 1:00 p.m. to 11:00 p.m.

The new library building which was occupied in 1966 is modern in every respect and was designed for quiet reading, convenient reference service and easy access to research materials.

The library policy governing undergraduate students applies to graduate students also. However, a graduate student may be granted the privilege of indefinite loan for one semester subject to recall. In the application of this privilege the following points are important:

1. The privilege is not given automatically but must be requested for each book—otherwise a two-week due date will be stamped in the book.
2. The date stamped in the book indicates the date the book is due. After that date overdue fines apply. Since overdue notices are sent as a favor to the borrower, failure to receive such a notice does not excuse him from the payment of fines. Circumstances may prevent the library from sending overdue notices.
3. If a book is recalled, regulations apply the same as for undergraduate students.
4. The privilege applies only to those books in which his major research is concentrated. This privilege should be used with a very great deal of discretion.
THE COMPUTER CENTER

The Clemson University Computer Center operates an IBM System/370 Model 155 with one megabyte of core storage, which is available to graduate students for course work and research. The office of the Center, located in the basement of the Plant and Animal Science Building, is open from 7:45 a.m. to 11:00 p.m., Monday through Friday, 8:00 a.m. to 6:00 p.m. Saturday, and 2:00 p.m. to 11:00 p.m. Sunday. Shorter hours are observed during holiday periods. Every effort is made to provide rapid turnaround to users. Processing of short student jobs is accomplished within three minutes; turnaround for all but the very longest jobs is completed within a few hours. Programming assistance is available at the Center when needed. The Center supports FORTRAN, COBOL, PL/I, ALGOL, and a number of simulation and special-purpose languages. A large library of statistical and mathematical routines is available to users.

STUDENT HEALTH SERVICE

Student Health Service: Cost per Semester $35.00. Payment of the Student Health Service fee is required of all students living in University residence halls and all full-time students even though they do not reside in University housing.

The Student Health Service is housed in the Redfern Health Center and is complete with outpatient department and a 34-bed hospital. The staff consists of three full-time physicians, including the director, a psychiatrist, thirteen full-time registered nurses, a full-time registered laboratory technician, a full-time registered X-ray technician, and a full-time registered pharmacist. In addition, a sufficient number of nurses’ aides, secretarial workers, orderlies and maids for 24-hour-a-day operations are employed. The best of modern equipment is available for student use. Regular office hours are maintained, plus the services of the nursing staff for minor ailments after hours. One physician is on call at night for emergencies whenever the school is open. The Health Service is closed between semesters.

The Student Health Service at Clemson University has several important functions. All of these are aimed at keeping the student
in good health so that he may effectively pursue his school work. There is, of course, the basic function of medical care for the ill and injured. This is a vital part of its work. In addition to this, the Student Health Service attempts to put strong emphasis on health rather than illness. This begins with the entrance medical form. In laying out this form an attempt is made to get information, examinations, and preventive medical procedures carried out to better equip the staff in protecting the student from illness and to serve as a guide for the care of preexisting medical problems.

As the student progresses through his academic experiences, other procedures may be required or highly recommended. These are primarily an effort to teach the individual self-responsibility for maintenance of his own health, protection of the health of those around him, and locate possible hidden diseases. The Health Service also has the position as the source of medical information as well as responsibility for indicated medical action: diagnostic, therapeutic, and preventive.

The medical fee paid by each student covers the services of the University physicians, the health service staff, and equipment for most illnesses and injuries occurring on or around the campus. This coverage is given under conditions similar to that of one's own physician.

The fee does not cover routine physical examinations for employment or transportation to another school, fees for routine physicians when called in for consultation, medical or surgical services performed away from the University, or for accidents occurring off the campus.

A complete pharmacy is maintained, and dispenses medication to students as prescribed by the staff physicians. No charge is made for medication, except for chronic illness lasting more than two weeks.

Ambulance transportation to a general hospital for serious illnesses or injuries occurring on campus will be arranged, however, expenses for this service is the responsibility of the student. Transportation for less urgent ailments and routine visits can be arranged through the Health Service at the expense of the student.
The Student Government with full approval of the administration, offers a plan of accident and sickness insurance to full-time students. Each year prior to the beginning of the fall semester, complete information on this insurance plan will be sent to students. This insurance is inexpensive and is designed to cover major medical expense not covered by the Health Service. It is highly recommended.

HOUSING

Residence Halls. Residence halls located on the main campus provide excellent accommodations at economical rates for graduate and undergraduate students. All rooms are equipped with clothes lockers, study desks, chairs, and single or convertible bunk beds with inner spring mattresses. Two students are assigned to a room.

Graduate students interested in residence hall accommodations should write directly to the Residence Halls Office, Clemson University, Clemson, South Carolina 29631, to obtain information regarding assignments. Applications must be received not later than June 1 for the fall semester, and December 1 for the spring semester.

For official holidays which occur during the course of a semester, the University reserves the right to close certain halls and to require students remaining on the campus to move to another hall for the duration of the holiday period. For the period between semesters the University reserves the right to close the dormitories.

Clemson House. The University operated Clemson House Hotel has rooms available for resident graduate students. Rates are comparable to those of the dormitories provided two students share a room. No deposit is required, however, the room fee is payable in advance on a monthly basis. Rooms are available upon the arrival of the student and are not subject to holiday closings, whereas dormitory residents may be required to move during these periods. Unmarried students who intend to remain on campus between semesters are particularly urged to reside at the Clemson House in preference to the dormitories.
Married Student Housing. Clemson provides comfortable and economical housing for its married students. There are three housing areas consisting of 139 single Prefab units, 100 East Campus apartments contained in 50 duplex buildings, and 50 Littlejohn apartments in 11 buildings.

All married student housing units have two bedrooms, living room, kitchen and bath. East Campus apartments are the newest and are equipped with stove and refrigerator. The Littlejohn apartments and Prefabs are not equipped with stoves and refrigerators.

Booklets describing these facilities are available and will be furnished upon request by the Housing Office of the University. Monthly rental fees are: Prefabs, $41; Littlejohn, $56, for interior and $54 for end units; East Campus, $74.

Graduate assistants and graduate fellows are given priority over undergraduate students in assignments to married student housing. To qualify for this priority their applications must be received at the Housing Office before April 20 for first semester housing; before November 1 for second semester housing; or before March 1 for summer housing.

STUDENT FOOD SERVICE

The University Dining Halls provide several food service plans for the students:

(1) A 5-Day Board Plan (15 meals) Monday through Friday — holidays excluded. The fee for this plan is $440 per year and may be paid in two installments — one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

(2) A 7-Day Board Plan (21 meals) Monday through Sunday — holidays excluded. The fee for this plan is $550 per year and may be paid in two installments — one-half at the beginning of the first semester and the remainder at the beginning of the second semester.

Both the 5-Day and 7-Day Board Plans will begin the first day of classes and end on the day which is scheduled for graduation.
(These dates are listed in the University Calendar appearing in this catalog.) Individual meals may be obtained in the student dining halls prior to the day classes begin.

(3) Students who are not on a board plan may purchase tickets for individual meals at prevailing prices. Except on special occasions, a la carte service will not be offered in the Student Dining Halls.

GRADUATE EXPENSES

Full-Time Students. The 1973-1974 semester charges for regular full-time graduate students are shown below:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition</td>
<td>$75.00*</td>
</tr>
<tr>
<td>Matriculation Fee (non-refundable)</td>
<td>5.00</td>
</tr>
<tr>
<td>University Fee</td>
<td>205.00</td>
</tr>
<tr>
<td>Medical Fee</td>
<td>35.00</td>
</tr>
<tr>
<td>Room Fee</td>
<td>165.00-220.00</td>
</tr>
<tr>
<td>Board</td>
<td>220.00-275.00</td>
</tr>
<tr>
<td>Total for Semester</td>
<td>$705.00-815.00*</td>
</tr>
</tbody>
</table>

Part-Time Students. Graduate students taking less than 12 credit hours during a semester will be charged for each of the items in the following schedule:

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuition (per semester hour)</td>
<td>$6.00</td>
</tr>
<tr>
<td>Matriculation Fee (non-refundable)</td>
<td>5.00</td>
</tr>
<tr>
<td>University Fee* (per semester hour)</td>
<td>14.00</td>
</tr>
<tr>
<td>Medical Fee (optional for non-dormitory students)</td>
<td>35.00</td>
</tr>
</tbody>
</table>

Students who elect not to pay the hospital fee are responsible for arranging their own medical care.

Graduate Assistants and Staff. Graduate assistants and staff members will pay a total charge of $10.00 per semester hour. These charges are in lieu of tuition, matriculation, maintenance, activity and library fees. Graduate assistants receive medical treatment by

*Subject to increase.
paying the medical fee of $35.00. A graduate assistant is defined as a student with a baccalaureate degree from an approved institution who is enrolled in a degree program and devotes a minimum of ten working hours per week to the University for at least a full semester.

All graduate students, with the exception of full-time employees must enroll as full-time equivalent students in order to qualify for any financial aid from the University. Those pursuing Master's degrees are required to enroll for a minimum of 9 credit hours and those enrolled in Ph.D. programs must register for a minimum of 6 credit hours in order to be classified as full-time equivalent students. The University reserves the right to withdraw financial aid at any time due to failure to meet this requirement.

Graduation Fees. The thesis binding fee, diploma fee, fee for rental of cap and gown, and fee for publication of dissertation abstract are not included in the above charges. Fees for these items are listed on pages 30 and 31.

Athletic Contests and University Concerts. Part-time students taking less than 12 hours and graduate assistants may be admitted to home athletic games upon payment of the faculty rate and to the University concerts upon purchase of a student season ticket.

Settlement of University Fees. The entire semester's expenses are due and payable at the beginning of each semester, and no student is officially enrolled until all semester expenses have been satisfied. In special cases the University will accept at the beginning of a semester a non-interest bearing promissory note for a portion of the semester residence-hall rent and semester-plan board fee. Amounts up to $75 for room rent and $110 for board fee may be included in the note. In such cases, a note for the first semester charges will be due October 10, and a note for the second semester charges will be due March 1.

A $75 advance payment of room rent is required for a room reservation for the fall semester. This payment must be made by cash, check or money order and should be sent to the Residence Halls Manager's Office with the completed “Student Application
for Room Reservation card not later than July 1. The $75 advance payment of room rent will be deducted from the amount otherwise due for the first semester's expenses. All other transactions relating to payments should be conducted with the Accounting Division. All checks and money orders should be made payable to Clemson University. A personal check given in payment of University expenses which is returned by the bank unpaid, immediately creates an indebtedness to the University.

The University reserves the right to adjust charges to current costs.

**Past Due Student Accounts.** Any indebtedness to the University which becomes past due immediately jeopardizes the student's enrollment, and no such student will be permitted to graduate or register for a subsequent semester or summer school term. Further, any student who fails to pay all indebtedness to the University may not be issued an honorable discharge, transcript, or diploma.

**Reservation of Right to Change Fees and Regulations.** The University reserves the right to make changes in its fees, charges, rules and regulations.

**REGULATIONS AND PROCEDURES**

Every graduate student and every prospective graduate student is expected to make himself thoroughly familiar with these regulations and the requirements for degrees. Failure to follow the regulations and requirements almost inevitably results in complications which cause a great deal of inconvenience to the student.

In addition to the general regulations, the candidate for an advanced degree will comply with the specific requirements of the department in which he is pursuing his advanced studies.

The University and its various colleges and departments reserve the right to change the rules regulating the admission to, instruction in, and graduation from the University or its various divisions, and any other regulations affecting the student body. Such regulations become effective whenever the proper authorities
may determine and will apply not only to prospective students but also to those who may at such time be matriculated in the University. The University also reserves the right to withdraw courses, to change instructors, or to change fees at any time.

Except as they apply to undergraduate students only, graduate students are subject to the usual procedures and regulations of the University and to those outlined on the following pages.

MEDICAL EXAMINATIONS

Completion of a medical history and physical examination record is required of all new students entering Clemson University for the first time. This examination must be completed by the student and the student's own physician or the health service of the school from which he graduates or transfers. This examination must be reported on a special form provided for this purpose by the University and mailed directly to the Director of Student Health Service. This should be received at least four weeks prior to matriculation to give time for processing; otherwise registration may be delayed. Incomplete forms will be returned.

The University requires that all new students have a current tetanus toxoid series or booster (within ten years) and also immunization against poliomyelitis. The oral (Sabin) type vaccine is preferred. All new students are also required to have a skin test for tuberculosis within one year prior to admission. If this test is positive, a chest X-ray is also required. All positive reactors will then be required to have an annual chest X-ray. These follow-up X-rays after admission will be done at the Student Health Service at no additional charge for those who have paid the Health Service fee.

GENERAL REQUIREMENTS FOR ADMISSION

For enrollment in the University's graduate programs, a student must hold the Bachelor's degree from an institution whose scholastic rating is satisfactory to the University and must have the approval of the head of the department in which the major work is planned. A satisfactory score on the Graduate Record Examina-
tion is also required for admission to all M.A., M.S., and Ph.D. programs and some advanced professional programs. This examination is required of all international students prior to enrollment regardless of the program they plan to enter. The Graduate School reserves the right to require additional quantitative and aptitude examinations as well as personal interviews and/or oral examinations prior to reaching an admission decision.

Admission in all programs is restricted to those students whose academic records clearly indicate that they are prepared to benefit from graduate study. Neither an academic record exceeding minimum requirements nor satisfactory scores on the Graduate Record Examination alone will assure a student’s admission. Rather, the total record must indicate the likelihood of successful graduate study.

Notice of admission is frequently given to applicants prior to graduation from their undergraduate institution; however, all requirements for the Bachelor’s degree must be completed before enrolling in a graduate program. Applicants who do not enroll in courses within one year after the date of their acceptance will normally be required to reapply for admission. Credentials submitted for admission become the property of the University and are not returned.

Students enrolled for a master’s degree who wish to continue their studies in a Ph.D. program must submit a new application (GS Form 1) and receive a recommendation from their graduate advisory committee chairman and department head or other faculty designated by the Graduate Dean who are associated with the applicant’s present or proposed programs.

Students holding both Bachelor’s and Master’s degrees from Clemson University are usually encouraged to pursue doctoral programs at other institutions.

Applications for admission should be submitted at least four weeks prior to the first date for matriculation listed in the general University catalog.

The Director of Admissions and Registration will not permit enrollment in courses of the 600 series or above until the student has been officially admitted to the Graduate School.
Enrollment in any course is subject to approval by the department offering the course.

ADMISSION CLASSIFICATIONS

Admission to a Degree Program. This is the ordinary classification of acceptable students and must become the eventual status of anyone receiving an advanced degree from Clemson University. In addition to the minimum requirements for degree programs listed under “Degrees”, the student must also meet any special departmental requirements.

Admission as a Non-Degree Student. Admission in this category is restricted primarily to public school teachers who are required to complete graduate courses for certification or recertification and to other applicants whose profession may require additional study at the graduate level. No degrees are awarded while the student is in this status. Should the student subsequently be admitted to a Master’s degree program, no more than 12 hours taken as a non-degree student can be applied toward the degree. In all cases the non-degree student must receive permission from the head of the department before enrolling in courses. This classification is not to be interpreted as a temporary one for those found ineligible for admission to a degree program and is not open to international students.

Admission of Clemson University Seniors. An undergraduate student lacking less than a full semester of work to complete the requirements for his baccalaureate degree may apply for admission to a graduate program and, if admitted, be allowed to enroll in courses for graduate credit. These courses must be over and above those required for his Bachelor’s degree and should not cause his total load of course work to exceed 18 semester hours.

Students with a cumulative grade-point ratio of 3.0 or higher may enroll in 700 and/or 800 level courses during their senior year and may choose to use these courses to meet requirements for the Bachelor’s degree. However, courses used for this purpose may not later be counted toward an advanced degree. Alternatively, students who take such courses in excess of the requirements for
their undergraduate degrees may request that these courses be included as a part of their graduate program if they are subsequently admitted to the Graduate School at Clemson.

Enrollment in any graduate course is subject to approval by the department offering the course and the Graduate Dean. This approval is required prior to registration and may be obtained by completing and returning the appropriate form (GS Form 6) available at the Graduate School.

**Admission as a Transient Graduate Student.** A student who has been admitted to a degree program at another institution and who wishes to take courses for transfer to that institution may be admitted on receipt of the Certification of Transient Graduate Admission (GS Form 8) which may be obtained from the Graduate School at Clemson University. This form and a completed application form must be presented prior to registration. A student may earn no more than 12 total semester hours while in transient status.

**Admission of University Employees to Pursue Graduate Study.** With the approval of his Dean or Director, a qualified employee of Clemson University may pursue graduate work for credit. However, no member of the faculty or staff who has a rank higher than Instructor or its equivalent may be considered as a candidate for an advanced degree at this institution. Limitations on the number of hours taken per semester are explained in the section entitled “Credit Loads.”

**PROGRAM OF STUDY**

As soon as a student enrolls he should acquaint himself thoroughly with the degree requirements and the regulations of the Graduate School published in the graduate catalog **particularly** the **deadline dates.** Each advisor and student should by all means have a current copy of the graduate catalog.

**The Major Advisor.** Before the student registers he must, with the aid and approval of the department head, select a major ad-
visor. In departments with large faculties it may be advisable to assign all new graduate students to one professor until the student decides upon his particular interest. This advisor recommends and approves courses to be taken during the student's first semester. The course work selected should be of a fundamental or "core" nature so that the advisory committee will have maximum flexibility to formulate the remainder of the student's programs of study.

The Advisory Committee. An advisory committee will approve the student's preliminary study plans, supervise his graduate program, administer his preliminary and/or final comprehensive examination, and initiate the recommendation for the awarding of the degree. One member of the committee will be designated as chairman and normally he will direct the student's dissertation or thesis, if required. This committee is selected by the department head and student. Prior to the submission of a plan of study, the department head will forward his recommendations to the dean of his college, who will, if he approves, then transmit the recommendation to the Graduate Dean. A minimum of three faculty members shall be selected for a student seeking a Master's degree and a minimum of four faculty members shall be selected for a student seeking a Ph.D. degree. Qualifications of faculty for membership on the advisory committee should be discussed with the college dean. The student and faculty members are notified of the committee appointments by the Graduate Dean.

Filing of Preliminary Study Plan. Preliminary study plans (GS Form 2) must be filed with the Graduate School by those students who are in degree programs. Since fixed curriculums normally do not exist for graduate degrees, the preliminary plan of study represents the formulation of an individual student's curriculum as recommended by the advisory committee. It must adhere to departmental as well as Graduate School policies. Courses taken in excess of those required by the advisory committee for the degree should not be listed on the plan of study. Graduate credit is received only for courses numbered 600 or above and no student shall receive both undergraduate and graduate credit for the same course.
Candidates for master's degrees should submit the plan of study by the middle of their second semester* and Ph.D. candidates no later than the beginning of their second year* of study. Before a plan of study is approved, it must be reviewed and signed by the advisory committee. The plan of study is then submitted to the college dean for his approval and is forwarded to the Graduate Dean for appropriate distribution of copies.

**Admission to Candidacy for a Degree.** Admission to the Graduate School does not qualify a student as a candidate for an advanced degree. Such candidacy depends upon the acceptance by the Graduate Dean of a written request for admission to candidacy. This request (GS Form 4) may be filed by the student as follows: for the Master's degree, after he has completed fifteen hours of course work; for the Doctoral degree, after he has completed a major share of his course work and has successfully completed his preliminary examinations.

All students desiring admission to candidacy must have received full status admission to the Graduate School, have a satisfactory academic standing, and have on file an approved preliminary plan of study.

**Multiplication of Higher Degrees.** The duplication of higher degrees is discouraged on the same basis as the duplication of the Bachelor's degree. Thus a student holding a Master's degree may not as a rule become a candidate for another Master's degree of the same designation, regardless of the field of study; nor may the holder of an M.A. or M.S. degree in a given field, received at another institution, become a candidate for a different Master's degree in the same field at Clemson.

**Continuous Enrollment.** Graduate students are expected to pursue their graduate degree program on a continuous basis. Only students who are enrolled are eligible to utilize University facilities and/or receive any form of financial aid.

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*An academic semester is defined as a minimum of nine credit hours of course work taken during a given semester. An academic year is defined as the total of two academic semesters.
**Credit Loads.** University upper limits on graduate student loads per semester are:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Short Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons employed full time</td>
<td>6 credits</td>
</tr>
<tr>
<td>Graduate assistants (half time)</td>
<td>12 credits</td>
</tr>
<tr>
<td>Graduate assistants (quarter time)</td>
<td>15 credits</td>
</tr>
<tr>
<td>Full-time students</td>
<td>18 credits</td>
</tr>
</tbody>
</table>

A person employed full time is defined as anyone employed 5 full working days per week regardless of the employer(s). Half-time and quarter-time graduate assistants are defined, respectively, as those who contribute 20 and 10 clock hours per week, or equivalent, of service to the University. Graduate students employed less than 10 hours per week by the University are not classified as graduate assistants.

**Academic Standards.** Graduate students are graded on the same A-B-C-D-F scale as undergraduates. Nonetheless, a graduate student’s permanent record. Only credit hours for which a grade of grades for graduate students are A and B. Thesis and dissertation research grades are on a “Pass-Fail” basis only and are not included in the academic average; however, they are recorded on the student’s permanent record. Only credit hours for which a grade of “Pass” is achieved will apply toward the number of research credit hours required for the degree.

A minimum grade of C must be made on all course work to obtain graduate credit. An average grade of B must be achieved on all work taken exclusive of languages or ROTC while enrolled in the Graduate School before a student can become a candidate for an advanced degree. Candidates who fail to maintain a “B” average become ineligible for graduation and are placed on probation. Students who remain on probation for two consecutive semesters will not be permitted to continue a graduate program without the written approval of the Graduate Dean.
A grade lower than the specified minimum can be raised to count toward an advanced degree only by repetition of the course. A re-examination is not permitted.

A graduate student must understand that he can be dropped from the Graduate School at any time for failure to maintain an adequate academic status.

Incomplete Graduate Course Work. The grade of "I" may be given for incomplete work for any graduate course in which work remains undone and the student is unable to fulfill all requirement because of circumstances beyond his or her control. This grade is not given in lieu of unsatisfactory or failing grades (for completed courses) with an opportunity of improving the grade later and is received and recorded only by the following procedure.

Within ten days after the deadline for submitting final grades for the semester in which the course was taken, the instructor must present to the student, either personally or by registered mail, written notification stating the specific deficiency which exists and describing the work required for completion of the course. Furthermore, this notification must indicate the student's current performance as satisfactory (A or B), unsatisfactory (C), or failing (D or F). Finally, a copy of the notification must be signed by the department head and dean of the college and forwarded to the Graduate Dean at the time the student is notified.

The grade "I" will be valid for only forty-five days after the deadline for submitting final grades. Within this period, (1) the student must complete his or her work, or (2) the student must request approval from the Graduate Dean for an extension of time by means of a petition which has been endorsed by the instructor, department head, and college dean which states the reason for the request and the length of time needed. Only one request for an extension of time for each grade of "I" will be considered by the Graduate Dean.

A graduate student will not be permitted to repeat any portion or reregister for any course for which the grade of "I" has been given or register in any other course for the purpose of removing the grade of "I". Should any work remain incomplete at the time
the deadlines described above expire, a grade of "F" will be recorded on the student's permanent record. Although the Graduate Dean will attempt to bring the above deadlines to the attention of the student and department head, it is the sole responsibility of the graduate student to comply with these regulations.

Students who receive a grade of "Incomplete" while enrolled in the Graduate School at Clemson University remain ineligible until the incomplete work has been made up and a letter grade submitted to the Office of Admissions and Registration.

**Auditing by Graduate Students.** A regularly enrolled student may audit one additional course a semester, provided approval is obtained from the professor offering the course, the head of the department, and dean of the school in which the course is offered. Forms for requesting such approval are available at the Office of Admissions and Registration. Graduate assistants, and those graduate students who enroll for at least six hours, will not be charged for auditing. Other part-time students will be charged (1) one-half tuition fee and one-half maintenance and activity fee or one-half summer school fee (where applicable), and (2) full library fee.

Audited courses do not carry credit and the fact that a course has been audited is not noted on the graduate student's official record. Audited courses do not count against allowable credit-hour loads.

Graduate auditors are not required to stand tests or examinations. However, the professor, at his own discretion, may demand or deny the auditor's participation in class to whatever extent he deems desirable.

A graduate student may not by audit satisfy a stated prerequisite for a graduate course. Additionally, a graduate student may not establish credit through examination in any course for which he was previously registered as an auditor.

**Acceptance of Transfer Credit.** On the recommendations of the student's major advisor and the approval of the Graduate Dean, a student may earn in any accredited institution other than Clemson University up to 12 semester credit hours in campus
courses toward one of the Master's degrees and as many as 48 semester credit hours toward a Doctor's degree.

Credit may be transferred for work completed at off-campus centers of accredited institutions provided such courses are accepted in degree programs at those institutions. Transfer credit will not be accepted for courses in which a grade lower than B, or its equivalent, has been received.

No credit toward graduate degrees may be obtained by correspondence or extension study. All transfer credits must be verified by an official transcript from the institution at which the work was done.

Transcripts certifying to graduate courses completed at another institution must be received in the Graduate School Office prior to the date of filing application for the degree. The degree will not be conferred at the close of the term during which the student has been registered elsewhere.

Theses and Dissertations. Each candidate for an advanced degree in each curriculum requiring a thesis must prepare this thesis under the direction of a major advisor. Six hours of credit are required for the research leading to the required Master of Science or Master of Arts thesis. Fifteen hours of credit are required for theses in the Master of Architecture, Master of City and Regional Planning, and Master of Fine Arts degrees. Eighteen hours of research credit are required for the Doctor of Philosophy degree.

Three copies of the thesis must be presented to the chairman of the student's advisory committee in sufficient time for the chairman to arrange for a final examination to be held at least three weeks prior to the date on which the degree is expected. A doctoral dissertation must be completed and delivered to the student's advisory committee at least two weeks prior to the final examination. Three copies of the master's thesis and four copies of the doctoral dissertation must be submitted to the Graduate School by the deadline for the date on which the degree is conferred. A binding fee of $15.00 must be paid to the Bursar and the Bursar's receipt submitted to the Graduate School Office at the time the thesis or
dissertation is submitted. If the student desires, he may have additional copies bound for himself at a cost of $5.00 a copy. The responsibility for placing the thesis in proper final form rests with the student and the chairman of his advisory committee. A statement of special procedures for writing a thesis or dissertation at Clemson University may be obtained from the Graduate School Office.

The student will prepare two additional copies of the abstract and title sheet to be submitted to the Graduate School. Ordinarily this abstract should not exceed five hundred words in length. It should be written and edited in such a way that it will be suitable for publication.

Doctoral students must pay a fee of $25.00 to the Bursar for publication in Dissertation Abstracts. An additional fee of $15.00 is required if copyright is desired.

**Restriction on Use of Theses and Dissertations.** Unpublished theses and dissertation submitted to the Graduate School in partial fulfillment of the requirements for graduate degrees and deposited in the University Library are, as a rule, open to the public for reference purposes. However, extended quotations or summaries may be published only with the permission of the author and the Graduate Dean.

**Application for a Diploma.** A formal application for a diploma is placed by the student with the Dean of Admissions and Registration at the time he is admitted to candidacy for a degree.

**Graduate Degrees and Teachers' Certificates.** Prospective students should understand that the material in this bulletin applies only to requirements for graduate degrees and has no direct relation to certificates for public school teachers. The Graduate School gives no assurance that a program for a graduate degree and a program for a certificate will coincide. Students interested in certificates should, at the outset of their work, confer with the Dean of the College of Education.
DEGREES

Courses are offered leading to the Master of Arts, Master of Science, and Doctor of Philosophy degrees.

In addition, courses are offered leading to the professional degrees of Master of Agriculture, Master of Agricultural Education, Master of Architecture, Master of City and Regional Planning, Master of Education, Master of Fine Arts, Master of Forestry, Master of Industrial Education, Master of Nutritional Sciences, and Master of Recreation and Park Administration. The Master of Business Administration degree is offered jointly by Furman University and Clemson University.

REQUIREMENTS FOR THE MASTER OF SCIENCE AND MASTER OF ARTS DEGREES

To receive the Master of Science degree a student must complete at least 9 semester credit hours on the Clemson University campus during one academic semester of his program. All course work which is to be credited toward a Master of Science or Master of Arts degree must have been completed not more than six calendar years prior to the date on which the degree is to be awarded; except that when approved by the student's department head and the Dean of Graduate Studies and University Research, as many as six semester hours of course work completed outside the six-year limit of time may be validated by written re-examination. Such examination will be under the direction of the department regularly offering the course or courses for which the student seeks validation. Course work completed outside the six-year limit of time at an institution other than Clemson University may not be transferred to Clemson for graduate credit.

Course Work Required. In addition to such supplementary or supporting courses as may be required, the degree program will consist of a minimum of thirty semester hours, including six semester hours of research which will provide the basis for the thesis if a thesis is required. Of the remaining required semester hours, at least half must come from courses 800 or above. A minimum of twelve hours must be in the student's major field.
**Language Requirement.** A reading knowledge of one approved foreign language is a departmental requirement for all Master of Arts degrees and certain Master of Science degrees. The required reading knowledge is equivalent to that provided by two years of study of the language at the college level. The procedures for satisfying this language requirement are identical to those for the Ph.D. degree except that a “broadening area” may not be used as a substitute.

**Study in Absentia.** Although thesis research is normally performed at Clemson University, it is recognized that Clemson University may not have on its campus certain specialized equipment or facilities which would be desirable for advanced training at the Master’s level. Thus, for those cases in which theses or other advanced study is required and the facilities to pursue such study are not available on the Clemson University campus, permission may be granted for study in absentia. The requirements to be satisfied in such cases are identical to those listed under: “ REQUIREMENTS FOR THE DOCTOR OF PHILOSOPHY DEGREE, Residence Requirements,” with the exception that the off-campus research supervisor need not hold the Ph.D. degree so long as he is qualified and certified for his supervisory position by the department and college involved and by the Graduate Dean.

**Final Examination.** Each candidate for the Master’s degree, after the completion of the thesis, if required, and at least three weeks before the degree is to be awarded, must pass an examination as may be required by the student’s advisory committee. The examination, which may be oral and/or written will ascertain the general knowledge of the candidate with particular reference to the major and minor subjects and the thesis or research report. The Graduate School will be notified of the time and place of the examination at least ten days prior to the time scheduled. Included with those members of the faculty and staff invited to attend the examination will be the members of the Graduate Council and the Graduate Dean. Immediately after the examination the examining committee will notify the Graduate Dean of the findings. This notification will be made on the appropriate form (GS Form 7).
REQUIREMENTS FOR
THE PROFESSIONAL DEGREES

Requirements for the professional degrees include all those for the Master of Science except the foreign language proficiency and the submission of a thesis. Residency shall be satisfied if 2/3 of a 30-semester credit hour program are Clemson University courses. A minimum of thirty semester hours of course work must be completed with at least half of the required hours selected from courses numbered 700 or above.* Additional requirements for the professional degrees are listed in sections describing specific colleges which offer the degree.

REQUIREMENTS FOR
DOCTOR OF PHILOSOPHY DEGREES

Work leading to the Doctor of Philosophy degree is planned in such a way as to give the student a comprehensive knowledge of his fields of specialization and a mastery of the methods of research. The degree is not awarded solely on the basis of course work completed, residence or other routine requirements. The final basis for granting the degree will be the student's grasp of the subject matter of a broad field of study, his competency to plan and conduct research, and his ability to express himself adequately and professionally in oral and written language.

The advisory committee will aid the student in planning his course work to achieve the required competence. This planning work in the minor field or fields should normally consist of from 12 to 24 hours in courses carrying graduate credit. If the direction of the student's study or research interest should change as his work progresses, he may request the appointment of a new major advisor.

Residence Requirements. Doctoral work, dealing with research and study as it does, requires an intense dedication and devotion

*Applies to courses taken after August 15, 1970. Courses taken prior to that date must be numbered 800 or above to satisfy this requirement. will include the selection of specific courses, and their sequence.
of the subject of inquiry. The desired level of concentration and concern cannot be achieved where the student holds throughout the period of his study, full-time employment not concerned with research in this field. In special circumstances, however, full-time employment may be combined with a portion of the doctoral research.

**Doctoral research is normally to be conducted on the Clemson University campus,** and the following minimum requirements and/or conditions must be met in order that the student receive the Doctor of Philosophy degree:

a. The student must complete at least twelve semester credit hours in consecutive academic semesters on the Clemson University campus.

b. No credit toward the doctoral degree may be obtained by correspondence or extension study.

c. All transfer credits must be verified by an official transcript from the institution at which the work was done. Transfer credit will not be allowed for courses in which a grade lower than B has been received.

**Under special circumstances, it may appear desirable that doctoral research be conducted external to the Clemson University campus.** If such research is to be performed under the immediate direction of a Clemson University faculty member acting as dissertation advisor and supervisor, then in order to accommodate the student as well as to exercise proper and necessary control over this most important phase of doctoral study, the following additional requirements will be made:

a. The student must have the written consent of his university dissertation advisor, full advisory committee, department head, college dean, and the Dean of Graduate Studies and University Research. Prior to his departure from the campus, the student must submit in writing to his committee for their approval a plan for his research effort. Such plan should include a discussion of his problem and the intended scope of his investigation and should be structured in terms of a specific time frame.
b. The advisory committee may require a statement from an appropriate officer of the organization at which the student will be located agreeing to one or all of the following: 1) the student's plan to complete dissertation research using the organization's equipment and facilities, 2) the apportioning of at least 25 percent or other appropriate amount of the student's employment hours to his dissertation research, and 3) the release of patent rights or copyrights by the organization, arising from discoveries or concepts which evolve during the course of the student's doctoral research.

c. The student may be required to travel to Clemson University, not at the expense of Clemson University, to meet with his dissertation advisor and advisory committee as often as is deemed necessary by the committee. Further, the student may, at the discretion of his dissertation advisor and advisory committee, be required to return to the Clemson University campus subsequent to the performance of the mechanics of his research for the purpose of comprehensive review and analysis of his research.

d. The student must maintain continuous enrollment at Clemson University each semester while the research is in progress. It will be his responsibility to make suitable arrangements with his department to maintain this continuous registration. Normally the student will not be required to register for summer sessions; however, he must be registered for the term which involves the review of his completed dissertation and/or his final examination.

If doctoral research is to be conducted external to the Clemson University campus, but under the immediate direction of a dissertation supervisor who is an employee of an organization other than Clemson University; then in order to accommodate the student, as well as to exercise proper and necessary control over this most important phase of doctoral study, the following requirement (additional to those above) will be made:

a. An employee, having an earned Ph.D. and engaged in the general subject area of the student's research, must be designated by an officer of the organization to supervise the student's research work and recommended for appointment as an adjunct professor of Clemson University. A resume of the research supervisor must be submitted to the student's full advisory committee for their review and recommendation to the Graduate Dean.
b. The research supervisor will be required to submit a final statement regarding the dissertation research, as well as interim reports, if the committee deems such as being necessary. It is to be emphasized that the off-campus research supervisor cannot serve as the student's dissertation advisor.

**Time Limit.** All work for a Doctor of Philosophy degree must be completed within a period of seven years. If a student begins his doctoral program after receiving the Master's degree, all work above the Master's level must be completed within a six-year period.

**Language Requirement.** The normal language requirement for the Ph.D. degree is a command of two approved languages equivalent to that provided by two years study of each language at the college level. Languages accepted by all departments are French and German; under certain conditions Spanish, Russian, or the classical languages may be accepted. A combination of two Romance languages is not normally acceptable. Upon the recommendation of the Head of the Department of Languages, use of other languages may be approved provided (a) adequate justification can be presented, (b) the language is not native to the student, and (c) a proper testing procedure can be established. Any expense incurred in obtaining off-campus assistance in testing must be paid by the student.

**Knowledge of each language is determined as follows** (effective July 1, 1973):

**Option 1.** The student may complete the basic reading knowledge requirement by attaining the 30th percentile on the Graduate School Foreign Language Tests (GSFLT).

**Option 2.** Upon the recommendation of the Head of the Department of Languages, students who have completed, within the last five years, the equivalent of 12 semester hours of study of a language at an accredited college with average grades of B will be exempted from examination in that language.
Option 3. The student may elect to enroll on a pass-fail basis in French 151 or 152, or German 151 or 152. This sequence is designed to prepare graduate students to read technical material in their particular academic discipline. To receive a grade of pass, the student must present a satisfactory score as determined by the Language Department from either the College Entrance Examinations Board test (CEEB), the GSFLT (see option 1), or a locally prepared Translation Exam similar to the GSFLT, otherwise, a grade of incomplete (I) will be reported. A passing score achieved at the end of 152 will automatically eradicate an incomplete in 151, but university procedures must be followed in order to change the incomplete (I) to pass (P).

A student may repeat each course only once but may audit an unlimited number of times. An auditor does not qualify to take the CEEB. He may, however, take either the GSFLT or the Translation Exam.

A grade of pass (P) in 151 or 152 merely indicates that a student has attained a proficiency equivalent to the basic reading knowledge requirement; it does not indicate that he has fulfilled his Graduate School requirement. The Graduate School, based on information provided by the Department of Languages, will notify the student when he has completed his requirement.

An alternative to this requirement, one of two other plans may be chosen, subject to approval by the advisory committee:

1. Command in depth of a single approved language, as evidenced by a score above the 60 percentile on the GSFLT (ETS). Students who have completed a sequence of the equivalent of 18 semester hours of study in a language with average grades of B, at least half of it within the previous five years, may be exempted from this examination upon the recommendation of the Head of the Department of Languages. Command in depth may also be evidenced by superior performance in the 151-152 sequence offered by the Language Department. The locally prepared Translation Exam, however, may not be used for this purpose.

2. Command of one approval language plus at least six (6) semester hours of approved courses in a “broadening area” select-
ed in consultation with the student’s advisory committee and approved by his college dean and by the Graduate Dean. The term “broadening area” is defined for this purpose as a single well-defined area of the humanities or social sciences, and the courses selected are to be sufficiently related to provide a unified pattern of study. They must be at the graduate level, the 400 level, or by special permission of the Graduate Dean at the 300 level. They must be taken for credit and must be passed with grades of B or better; however, they carry no credit toward a graduate degree. Courses taken while an undergraduate may not be used to satisfy this requirement. Courses to be presented in satisfaction of this requirement are to be listed in the student’s preliminary plan of study (GS Form 2).

The Graduate School Foreign Language Tests of the Educational Testing Service (GSFLT-ETS) are administered at Clemson by the University Testing Center according to the national schedules set by ETS.

All language requirements must have been satisfied prior to the student’s preliminary or qualifying examination and prior to his admission to candidacy for the degree.

**Qualifying Examinations Before Admission to Candidacy.** The student must undertake such preliminary or qualifying examinations as may be prescribed by his department before he applies for admission to candidacy for his degree. These examinations may be written, oral, or a combination of both. The function of the examinations is to obtain objective evidence of an adequate intellectual mastery of the areas of major and minor specialization.

Immediately after the examination, the examining committee will notify the Graduate School of its findings. The student’s performance on these examinations will determine whether the committee recommends acceptance of his application for admission to candidacy.

Should the student fail to pass his preliminary examinations, he may be given the opportunity to undergo the examinations a second time. A second failure shall result in the student being declared ineligible for the Doctor of Philosophy degree at Clemson University.
Some departments have both qualifying and comprehensive examinations. Information about these examinations may be obtained from the individual departments.

**Final Doctoral Oral Examination.** The candidate for the Doctor of Philosophy degree must pass a final oral examination at least three weeks prior to the time of the convocation at which he plans to obtain the degree. The examination will be conducted by the student’s advisory committee, and all faculty members are invited to participate. The Graduate School will be notified of the time and place of the examination at least ten days prior to the time scheduled.

This final examination demands a broad and penetrating interpretation by the student of his research project and conclusions. It may include examination of the student in his major and minor fields of specialization.

**FINANCIAL AID FOR GRADUATE STUDY**

All graduate students, with the exception of full-time employees must enroll as full-time equivalent students in order to qualify for any financial aid from the University. Those pursuing Master’s degree are required to enroll for a minimum of 9 credit hours and those enrolled in Ph.D. programs must register for a minimum of 6 credit hours in order to be classified as full-time equivalent students. The University reserves the right to withdraw financial aid at any time due to failure to meet this requirement.

**Research and Teaching Assistantships** are available to outstanding graduate students. Teaching assistantships are normally awarded for the academic year* while research assistantships may be granted for longer periods. Stipends range from $3,000 to $5,400 and tuition is reduced. Application forms are obtainable from the Graduate School or from departmental heads and should be completed and filed early in the academic year before the student expects to enroll. Recipients of assistantships are selected by the

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*Teaching assistants are usually awarded stipends during the summer months for performance of departmental duties provided they continue to work towards their degree.
respective academic departments and will be notified by the department.

**Graduate Fellowships and Grants-in-aid** are also available. All fellowship awards are made by the heads of departments concerned. Information about grants-in-aid is obtainable from the Graduate School.

**Other Funds:** Limited assistance may also be available from the Clemson Foundation, Clemson Student Loan Funds, and National Defense Student Loan Programs. Contact the Student Aid Office prior to June 1 for further information.
In addition to the Master of Science and Ph.D. degrees, the College of Agricultural Sciences offers post-baccalaureate degree programs that are designed primarily to meet the continuing education needs of individuals whose interests lie outside of a research-oriented profession. Individuals who are interested in such professional training and development include extension service personnel; vocational agriculture teachers; technical education center teachers; and management, executive, sales, and service personnel of agri-business firms.

These programs are designed to fulfill the following objectives:
(a) provide university graduate level professional training of a non-research-oriented nature, and (b) provide a program of continuing education adapted to the needs of agriculture.

Professional degrees are awarded with majors in the following areas of study:

- Agricultural Economics
- Agricultural Education**
- Agricultural Engineering***
- Agricultural Mechanization
- Agronomy — Crops and Soils
- Animal Science
- Dairy Science
- Entomology
- Horticulture
- Nutritional Sciences
- Plant Pathology
- Poultry Science

A minimum of 30 semester hours is required. At least one-half of the credit hours in the student’s program must come from courses numbered 700 or above.* The student’s program of study must be approved by his advisory committee.

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*Applies to courses taken after August 15, 1970. Courses taken prior to that date must be numbered 800 or above to satisfy this requirement.

**Jointly administered by the College of Agricultural Sciences and the College of Education.

***Jointly administered by the College of Agricultural Sciences and the College of Engineering.
Both a major field of study of at least 12 semester hours and minor field of at least 6 semester hours are required.

All candidates for the degree of Master of Agriculture, Master of Agricultural Education, or Master of Nutritional Sciences will be required to take a course in applied statistics, if such a course has not been a part of the student's undergraduate degree program. In addition, a knowledge of research methods will be required and may be acquired through a research methods or a special problems type course.

AGRICULTURAL ECONOMICS

W. J. Lanham, Department Head

Courses are offered leading to the Master of Agriculture, Master of Science, and Doctor of Philosophy degrees.

Graduate work in agricultural economics is of increasing importance since it enables the student to attain a higher degree of specialized professional competence and to secure a greater mastery of techniques for applying quantitative economic analysis to agricultural firm and industry problems. Industry, government, and universities offer challenging opportunities in research, development, education, management and other related areas for persons with advanced training in agricultural economics.

In addition to applicants from undergraduate programs in agricultural economics and other related agricultural programs, the department encourages applications from other students with Bachelor's degrees in fields that provide a well rounded background in general economics. In many cases, such students may be admitted to full graduate status without prerequisites other than those required of all graduate students. Special emphasis in the program of graduate study is placed on the economics of agricultural production and marketing, economic development, analysis of programs and policies affecting agriculture, and statistical techniques used in solving economic problems of the agricultural industry.

Ag Ec 602—ECONOMICS OF AGRICULTURAL PRODUCTION—3 cr. (3 and 0) F

Ag Ec 603—LAND ECONOMICS—3 cr. (3 and 0)

Ag Ec 651—AGRICULTURAL COOPERATION—2 cr. (2 and 0) S

Ag Ec 652—AGRICULTURAL POLICY—(3 and 0) F, S

Ag Ec 656—PRICES—3 cr. (3 and 0) F, S
Ag Ec 660—AGRICULTURAL FINANCE—2 cr. (2 and 0) F, S

Ag Ec 701—AGRIBUSINESS MANAGEMENT PRINCIPLES—
3 cr. (3 and 0) F

A survey of concepts and principles of management of agribusiness firms. Included are such topics as decision theory, information systems, systems analysis and organization theory with special applications of these concepts to the organization, administration, and management of agriculturally-related businesses.

Ag Ec 802—AGRICULTURAL PRODUCTION ECONOMICS PROBLEMS—
3 cr. (3 and 0)

An advanced study of production theory and its quantitative application including consideration of factors promoting change in input and output combinations on farms and among areas; relationship of economic theory to analysis of production activity; alternative approaches to explanation of input-output relations. Prerequisite: Permission of instructor.

Ag Ec 804—WATER RESOURCE POLICIES—3 cr. (3 and 0)

A study of the economic, social and legal aspects of the control, use, development and management of water resources, with special emphasis upon public policies relating thereto.

Ag Ec 805—SEMINAR IN MARINE RESOURCES MANAGEMENT AND POLICY—3 cr. (3 and 0)

A seminar devoted to the study of the economic, institutional and legal aspects of the control and management of common-property, marine resources. Special attention is given to the study of management systems for the resources of the coastal zone and continental shelf.

Ag Ec 806—ECONOMIC DEVELOPMENT IN AGRICULTURAL AREAS—
3 cr. (3 and 0)

A critical examination of the theories of economic growth and development and their application to areas or regions. Also, a survey of methods of regional economic analysis with emphasis on both the macro- and microeconomic aspects.

Ag Ec 807—MARKET STRUCTURE IN AGRICULTURAL INDUSTRIES—
3 cr. (3 and 0)

A study of market structure and other approaches as they relate to agricultural marketing. Students will undertake individual assignments in the field of their interest. Prerequisite: Permission of instructor.

Ag Ec 808—APPLIED QUANTIFICATIONS IN AGRICULTURAL ECONOMICS—3 cr. (3 and 0)

A survey of the mathematical tools requisite for concise description on the principles in the economics of agriculture. Models are formulated as media for empirical research. Microeconomic theory under the assump-
tions of perfect competition is emphasized. The relations among demand, supply, cost, revenue, and productivity are examined in a framework for agriculture. **Prerequisite:** Permission of instructor.

**Ag Ec 809—PROBLEMS IN THE ECONOMICS OF WASTE DISPOSAL AND MANAGEMENT—3 cr. (3 and 0)**

Supervised study of the economic problems of management and disposal of liquid, gaseous, and solid waste of firms and communities in non-urban areas. The student is expected to read extensively in the literature of the field and to prepare written and oral reports.

**Ag Ec 814—CONTEMPORARY ECONOMIC PROBLEMS—3 cr. (3 and 0)**

A critical review of the nature of contemporary economic problems, the background out of which they developed, the remedies which have been applied, and possible alternatives. Special emphasis will be given to problems relating to agriculture and rural life.

**Ag Ec 851—SEMINAR IN RESEARCH METHODOLOGY—1 cr. (1 and 0)**

A survey of logic and the scientific method; the formulation, initiation and carrying out of research problems in economics and business; methods and problems of obtaining and analyzing economic data; the role of electronic computers and data processing systems, and group discussions of the proposed thesis problems of individual students. (Required of all graduate students who have not already had a comparable course.)

**Ag Ec 881—INTERNSHIP IN COMMUNITY AND RESOURCE DEVELOPMENT—1-6 cr.**

Professional employment under competent supervision in an approved agency dealing with socio-economic aspects, community development and/or natural resource management. During the internship the student will submit monthly reports covering his experience. **Prerequisite:** 18 semester hours graduate credit.

**Ag Ec 891—RESEARCH—Credit to be arranged.**

**Ag Ec 904—SEMINAR IN RESOURCE ECONOMICS—3 cr. (3 and 0)**

Study of special problems and recent periodical literature relating to the control, management, development and use of land and water resources in the United States and in other parts of the world. **Prerequisite:** Ag Ec 603 or 804.

**Ag Ec 906—SEMINAR IN AREA ECONOMIC DEVELOPMENT—3 cr. (3 and 0)**

A study of recent research developments in the field of economic development, including a review of research publications, journal articles, and other literature, with special emphasis given to a critical examination of objectives, analytical techniques and procedures used in area or regional development efforts. **Prerequisite:** Ag Ec 806.
Ag Ec 907—AGRICULTURAL MARKETING PROBLEMS—3 cr. (3 and 0)

An advanced study in the theory of, and the research related to consumer behavior; economic consequences of individuals’ and firms’ decisions upon supply and demand; general interdependency among economic variables. **Prerequisite:** Ag Ec 807.

Ag Ec 991—DOCTORAL RESEARCH—Credit to be arranged.

(See also courses listed under Economics.)

**AGRICULTURAL MECHANIZATION**

A. W. Snell, Head, Department of Agricultural Engineering

Courses are offered leading to the Master of Agriculture degree.

The Master of Agriculture degree with a major in Agricultural Mechanization is designed to prepare at an advanced level individuals with agricultural and related backgrounds to pursue leadership in technical services, mechanized production and agribusiness responsibilities to modern agriculture. Students with undergraduate backgrounds in agricultural mechanization, other agricultural curriculums or related curriculums from non-agricultural universities are eligible to enroll in this program.

The individual program of the student will be arranged to include courses both in the agricultural mechanization specialty and in supporting courses throughout the University. Emphasis is placed on the development of a coherent program to satisfy student objectives.

Ag M 605—ADVANCED INTEGRATED SHOP—3 cr. (2 and 3)

Ag M 652—FARM POWER—3 cr. (2 and 3)

Ag M 660—FARM AND HOME UTILITIES—3 cr. (2 and 3)

Ag M 712—FARM MACHINERY MANAGEMENT—3 cr. (2 and 3)

A course dealing primarily with the section, functional analysis, and maximum utilization of existing and developing farm machinery. Computer application to the programming of field operations is stressed. Factors such as available capital and labor machine size, critical field operations, growing degree days, and weather are considered. Maintenance equipment, procedures, and scheduling are emphasized.

Ag M 733—ANALYSIS OF AGRISTRUCTURES—3 cr. (3 and 0)

The study of materials and their function in farm buildings, aesthetic values and rational selection of individual components are stressed. Additional topics include farmstead planning, space and environmental considerations, crop processing, materials handling, and waste disposal.
Ag M 781—SPECIAL TOPICS IN AGRICULTURAL MECHANIZATION—3 cr. (3 and 0)
This course is intended to develop in depth the student’s area of particular interest.

AGRONOMY
G. R. Craddock, Department Head

Courses are offered leading to the Master of Agriculture, Master of Science, and Doctor of Philosophy degrees.

Opportunities exist for B.S. or B.A. degree graduates with majors in chemistry, biology, plant science, physics, geology, general science or soils. Graduate programs include courses in soil chemistry, soil physics, soil genesis, soil fertility, soil microbiology, plant breeding and genetics as well as fundamental research problems relating to these subjects. Facilities include X-ray diffraction, differential thermal analysis equipment, a cytogenetics laboratory, controlled environmental chambers, and graduate student laboratories in an air-conditioned building.

Teaching in undergraduate courses is a departmental requirement of all graduate students in Agronomy.

Agron 601—FERTILIZERS—3 cr. (3 and 0) F
Agron 602—LAND POLLUTION CONTROL—3 cr. (3 and 0) S
Agron 603—SOIL CLASSIFICATION—2 cr. (1 and 3) F
Agron 605—PLANT BREEDING—3 cr. (2 and 2) S
Agron 607—PRINCIPLES OF WEED CONTROL—3 cr. (2 and 2) F
Agron 608—SOIL AND PLANT ANALYSIS—3 cr. (1 and 6) S
Agron 610—COTTON AND OTHER FIBER CROPS—2 cr. (2 and 0) F, odd numbered years.
Agron 611—GRAIN CROPS—2 cr. (2 and 0) F, even numbered years.
Agron 612—TOBACCO AND SPECIAL USE CROPS—2 cr. (2 and 0) S, even numbered years.
Agron 620—FORAGE AND PASTURE CROPS—3 cr. (3 and 0) S
Agron 622—FORAGE CROPS LABORATORY—1 cr. (0 and 2) S
Agron 652—SOIL FERTILITY AND MANAGEMENT—2 cr. (2 and 0) S
Agron 655—SEMINAR—1 cr. (1 and 0) F
Agron 656—SEMINAR—1 cr. (1 and 0) S

Agron 801—CROP PHYSIOLOGY AND NUTRITION—3 cr. (3 and 0) F, odd numbered years.

The application of basic concepts and physiologic aspects of growth and culture to crop management practices.

Agron 802—PEDOLOGY AND SOIL CLASSIFICATION—3 cr. (2 and 3) S, odd numbered years.

Deals with the factors of soil genesis, soil morphology, and soil classification. A study is made of such factors of soil formation as parent material, topography, climate and organisms. Particular attention is given to the classification of Southeastern soils.

Agron 804—THEORY AND METHODS OF PLANT BREEDING—3 cr. (3 and 0) F, even numbered years.

Concepts and principles of plant breeding and genetics as applied to the development and maintenance of improved crop varieties. Theoretical considerations of the various breeding methods are emphasized.

Agron 805—SOIL FERTILITY—3 cr. (3 and 0) S, even numbered years.

A study of the essential nutrients in the soil-plant system with emphasis on mechanisms of retention and transport; supplies and availability; reactions and interactions; deficiency diagnosis and remedies. Concepts and techniques for evaluating soil fertility problems will be studied.

Agron 806—SPECIAL PROBLEMS—Credit to be arranged.

Accumulation of up to 3 semester hours permitted at a rate of 1, 2 or 3 hours per semester for 3, 6 or 9 hours of lab work per week, at the discretion of the major professor. Mechanics and strategy of research is stressed.

Agron 807—SOIL PHYSICS—3 cr. (2 and 3) F, even numbered years.

A study of fundamental principles of soil physics, methods of physical analysis of soils, and applications of soil physics in Agriculture.

Agron 808—SOIL CHEMISTRY—3 cr. (2 and 3) F, even numbered years.

Principles and theories concerning the structure and chemical properties of soil colloids, ionic exchange and membrane phenomena, chemical equilibria, soil acidity, oxidation-reduction relations, soil chemistry of plant nutrients.

Agron 812—CROP ECOLOGY AND LAND USE—3 cr. (3 and 0) F, even numbered years.

Basic concepts of, and factors affecting, the adaptation and distribution of crop plants. Study of the microclimate and crop response to environmental factors, with modifications of microclimate by agricultural operations. Interactions among crop plants, and between woods and crop plants under field conditions.
Agron 820—PESTICIDE RESIDUES IN THE ENVIRONMENT—3 cr. (3 and 0) S, odd numbered years.

A study of the accumulation, decomposition and/or attenuation of pesticides in man's environment. Includes pesticide structures and properties; sorption-desorption by soil; diffusion and transport in water; volatility, and diffusion in air; and chemical-, bio- and photodegradation, Prerequisites: Introductory courses in organic and physical chemistry or permission of instructor.

Agron 825—SEMINAR—1 cr. (1 and 0) F, S

Presentation and discussion of special topics and original research in the field of agronomy. (Credit may be earned for more than one semester by doctoral candidates.)

Agron 891—RESEARCH—Credit to be arranged. F, S

Agron 991—DOCTORAL RESEARCH—Credit to be arranged. F, S

ANIMAL PHYSIOLOGY

B. D. Barnett, Chairman
J. F. Dickey, Program Coordinator

Courses are offered leading to the Doctor of Philosophy degree.

The graduate program in Animal Physiology utilizes the facilities of the departments of Animal Science, Dairy Science, Entomology and Economic Zoology, Poultry Science, and Zoology. Physiological processes of both vertebrates and invertebrates are considered. Areas of greatest research emphasis are reproduction, endocrinology and environment.

Students enrolling in Animal Physiology should have a strong background in the biological sciences, and at least one course in organic chemistry.

The student will organize his program of study from the courses listed below and from supporting fields as deemed proper by the advisory committee.

An Ph 801—ELECTRON MICROSCOPY OF ANIMAL AND PLANT TISSUES—3 cr. (1 and 6) S, F

Theory of and practice in: preparing animal, plant and microbial specimens for electron microscope observations; thin-sectioning; section staining; operating the electron microscope; photographing, developing and printing micrographs; interpreting electron micrographs. Emphasis will be placed on a special problem in which the student selects a tissue of interest, studies it with the electron microscope, prepares and interprets electron micrographs.
An Ph 802—DIGESTIVE AND EXCRETORY PHYSIOLOGY—3 cr.  
(2 and 3) F, even numbered years.
A study of the physiology of food intake, gastrointestinal secretions, digestion, absorption and excretion in ruminant and monogastric animals. Basal metabolism and temperature regulation will be discussed.

An Ph 803—CARDIOVASCULAR AND RESPIRATORY PHYSIOLOGY—4 cr. (3 and 3) F, odd numbered years.
The study of the physiology of blood cell formation, clotting mechanism, immune response, hemostasis, cardio-vascular relationships, acid-base balance, lymphatic and interstitial fluid dynamics, fluid excretion, and respiration and gaseous exchange in mammals and birds. The effects of environmental stresses on respiration and circulation will be discussed.

An Ph 804—MUSCLE AND NERVE PHYSIOLOGY—4 cr. (3 and 3) S, even numbered years.
A study of the physiology of muscles (striated, smooth and cardiac), nerve responses (transmitting, processing and receiving signals), hearing, seeing, tasting, smelling and feeling. Also, the functions of skin and bones will be discussed.

An Ph 805—PHARMACOLOGY—3 cr. (2 and 3) S, even numbered years.
The action of drugs upon the various biological systems of the mammal will be described. Drugs will be discussed by classes and discussions will include methods of action, uses, general dosage levels, and toxicity. The laboratory exercises will demonstrate the actions of drugs upon the mammalian systems. Both classroom and student experimentation will be employed.

An Ph 806—EXPERIMENTAL ANIMAL PHYSIOLOGY—3 cr. (1 and 6) F, odd numbered years.
Demonstration and practice of research methodology in animal physiology. Emphasis is on the scientific approach for using animals or specific organs of intact animals as experimental units. The selection and use of animal techniques and practices, including surgical procedures for altering physiological and endocrinological activities with large and small animals. Prerequisite: Zool 660 or equivalent.

An Ph 807—SPECIAL PROBLEMS IN ANIMAL PHYSIOLOGY—1-3 cr., F, S, SS
Original investigation of special problems in animal physiology not related to a thesis and designed to provide experience and training in research. This may include a comprehensive review of literature which relates to a research project.

An Ph 808—MAMMALIAN AND AVIAN ENDOCRINOLOGY—3 cr.  
(3 and 0) S, odd numbered years.

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A study of the interrelationships of the nervous and endocrine systems as they influence growth and development, body metabolism, body regulatory mechanisms, behavior, and reproduction in mammals and birds, and lactation in mammals. Emphasis will be on the integrating actions of hormones as they affect production. The theoretical and practical aspects of exogenous administration of hormones (natural and synthetic) on body functions will be discussed.

An Ph 851—ANIMAL PHYSIOLOGY SEMINAR I—1 cr. (1 and 0) F
Major topics will be current research and developments in animal physiology. Student and faculty research will be discussed as well as the literature on animal physiology.

An Ph 852—ANIMAL PHYSIOLOGY SEMINAR II—1 cr. (1 and 0) S
This course is a continuation of An Ph 851 and will include further discussion of current research and literature on topics selected by instructor and students.

An Ph 991—DOCTORAL RESEARCH—Credit to be arranged.

Bioch 606—PHYSIOLOGICAL CHEMISTRY—4 cr. (3 and 3)

Bioch 817—CHEMISTRY AND METABOLISM OF HORMONES—2 cr. (2 and 0)

Bioch 819—INTERMEDIARY METABOLISM—3 cr. (3 and 0)

Dy Sc 653—ANIMAL REPRODUCTION—3 cr. (3 and 0)

Dy Sc 655—ANIMAL REPRODUCTION LABORATORY—1 cr. (0 and 3)

Dy Sc 803—PHYSIOLOGY OF REPRODUCTION AND MILK SECRETION—3 cr. (3 and 0)

Ent 670—INSECT PHYSIOLOGY—3 cr. (2 and 3)

Ent 870—ADVANCED INSECT PHYSIOLOGY—3 cr. (2 and 3)

Micro 811—BACTERIAL CYTOLOGY AND PHYSIOLOGY—4 cr. (4 and 0)

Micro 813—BACTERIAL CYTOLOGY AND PHYSIOLOGY LABORATORY—2 cr. (0 and 6)

Zool 658—CELL PHYSIOLOGY—3 cr. (2 and 3)

Zool 660—GENERAL PHYSIOLOGY—3 cr. (2 and 3)

Zool 661—ANATOMY—3 cr. (3 and 0)

Zool 675—GENERAL ENDOCRINOLOGY—3 cr. (2 and 3)
ANIMAL SCIENCE
R. F. Wheeler, Department Head

The Department of Animal Science offers the Master of Agriculture and Master of Science degrees.

The Department participates in Interdepartmental Ph.D. programs in Animal Physiology and Nutrition.

An Sc 601—BEEF PRODUCTION—3 cr. (3 and 0)
An Sc 603—BEEF PRODUCTION LABORATORY—1 cr. (0 and 3)
An Sc 608—PORK PRODUCTION—3 cr. (3 and 0)
An Sc 610—PORK PRODUCTION LABORATORY—1 cr. (0 and 3)
An Sc 652—ANIMAL BREEDING—3 cr. (3 and 0)
An Sc 802—TOPICAL PROBLEMS—1-3 cr. (1-3 and 0)
A critical study of animal science experiments and interpretation of their results.
An Sc 803—MEAT TECHNOLOGY—3 cr. (3 and 0)
Biochemistry, histology and microbiology of fresh, frozen, cured, smoked, and processed meats. Quality of meats, and meat products, processing methods, nutritive value, and research techniques will be given emphasis. Prerequisites: An Sc 353 and 355.
An Sc 804—METHODS IN ANIMAL BREEDING—3 cr. (3 and 0)
Gene and zygotic frequency; systems of mating; heritabilities; genetic consequences of selection; and criteria for evaluating improvement in beef cattle, swine, and sheep. Prerequisite: An Sc 452/652.
An Sc 805—NUTRITION OF MEAT ANIMALS—3 cr. (3 and 0)
Deals with the metabolism of carbohydrates, lipids, proteins, inorganic elements, and vitamins in the nutrition of beef cattle, swine and sheep; the nutrient requirements of meat animals with special emphasis on the properties and functions of nutrients. Prerequisite: Nutr 401.
An Sc 891—RESEARCH—Credit to be arranged.
DAIRY SCIENCE
W. A. King, Department Head

Courses are offered leading to the Master of Agriculture and Master of Science degrees. The Doctor of Philosophy degree is offered in Animal Physiology and in Nutrition on an interdepartmental basis.

Dy Sc 602—DAIRY MANUFACTURES—4 cr. (3 and 3)
Dy Sc 604—PLANT MANAGEMENT—3 cr. (2 and 3)
Dy Sc 606—THE CHEMICAL AND PHYSICAL NATURE OF MILK—3 cr. (2 and 3)
Dy Sc 607—MARKET MILK—3 cr. (2 and 3)
Dy Sc 652—DAIRY CATTLE FEEDING AND MANAGEMENT—3 cr. (2 and 3)
Dy Sc 653—ANIMAL REPRODUCTION—3 cr. (3 and 0)
Dy Sc 655—ANIMAL REPRODUCTION LABORATORY—1 cr. (0 and 3)
Dy Sc 801—TOPICAL PROBLEMS—1-3 cr.

Topics of interest to the graduate students. The course is designed to give experience with problems in dairying not covered by thesis research. Credit varies with the problems selected.

Dy Sc 802—GENETICS OF DAIRY CATTLE IMPROVEMENT—3 cr. (3 and 0)

Topics include a study of inheritance in dairy cattle; improvement of economic characters through selection; results of experiments on mating systems; methods of evaluating the transmitting ability of bulls and cows; evaluating the genetic potential of young animals; and evaluation of breed association and governmental programs for the improvement of dairy cattle.

Dy Sc 803—PHYSIOLOGY OF REPRODUCTION AND MILK SECRETION—3 cr. (3 and 0)

The effects of hormones on gametogenesis, fertilization, embryological development, pregnancy and lactation. Comparative anatomy of mammary glands and physiology of lactation in various species will be considered. Emphasis will be placed on critically evaluating the most recent scientific literature in these areas for content, experimental methods, and authors' conclusions; and on selecting a problem, reviewing related literature and writing a research proposal for solving the problem.

Dy Sc 805—NEWER KNOWLEDGE OF DAIRY NUTRITION—3 cr. (3 and 0)
The application of the latest information on digestion, metabolism and the nutritional requirements of dairy cattle.

Dy Sc 807—FERMENTED DAIRY PRODUCTS—3 cr. (2 and 3)

The biological and chemical changes involved in the processing and aging of cheese and fermented dairy products.

Dy Sc 808—INDUSTRIAL DAIRY SCIENCE—3 cr. (3 and 0)

Provides advanced managerial training for operating dairy and food plants. Managerial policy and decision making are emphasized.

Dy Sc 891—RESEARCH—Credit to be arranged.

ENTOMOLOGY

S. B. Hays, Department Head

Courses are offered leading to the Master of Agriculture, Master of Science, and Doctor of Philosophy degrees.

Ent 601—FIELD CROP AND STORED PRODUCT INSECTS—3 cr.

(2 and 3)

Ent 602—FRUIT, NUT, AND VEGETABLE INSECTS—3 cr. (2 and 3)

Ent 605—INSECT MORPHOLOGY—4 cr. (3 and 3)

Ent 610—INSECT TAXONOMY—3 cr. (1 and 6)

Ent 655—MEDICAL AND VETERINARY ENTOMOLOGY—3 cr.

(2 and 3)

Ent 658—PEST CONTROL—3 cr. (2 and 3)

Ent 668—INTRODUCTION TO RESEARCH—2 cr. (1 and 3)

Ent 670—INSECT PHYSIOLOGY—3 cr. (2 and 3)

Ent 680—INSECT PATHOLOGY—3 cr. (2 and 3)

Ent 808—TAXONOMY OF IMMATURE INSECTS—3 cr. (1 and 6)

Identification of immature insects with particular emphasis on the Holometabola. Each student will make and submit an identified collection of immature insects.

Ent 809—RECENT ADVANCES IN ENTOMOLOGY I—1 cr. (1 and 0)

A review of the current literature in the fields of Entomology. Needs and changes in future research in Entomology will be discussed.

Ent 810—RECENT ADVANCES IN ENTOMOLOGY II—1 cr. (1 and 0)

A continuation of Ent 809.
Ent 840—INSECT ECOLOGY—3 cr. (2 and 3)
Principles of insect ecology including population dynamics and natural regulating mechanisms of insect populations. Effect of environment on distribution and abundance of insects.

Ent 856—MEDICAL ENTOMOLOGY—3 cr. (2 and 3)
Disease vectors of animals with emphasis on insects and related Arthropod disease carriers. **Prerequisite:** Ent 301 or permission of instructor.

Ent 860—INSECT PEST MANAGEMENT—3 cr. (3 and 0)
Application of ecological principle to the management or control of insect populations. Emphasis on major factors influencing insect population fluctuations and integrated systems including biological, cultural, physical, chemical and other techniques into a unified multifaceted approach based on applied ecology.

Ent 861—INSECT TOXICOLOGY—3 cr. (2 and 3)
History, development, application, chemical nature and mode of action of insecticides. **Prerequisite:** Organic Chemistry.

Ent 863—SPECIAL PROBLEMS IN ENTOMOLOGY—3-6 cr.
Original investigation of special problems in entomology not related to a thesis but designed to provide experience and training in research. Emphasis will be placed on insect toxicology, insect physiology, medical entomology and biological control of insects.

Ent 870—ADVANCED INSECT PHYSIOLOGY—3 cr. (2 and 3)
An in-depth study of metabolism, excretion, regulatory mechanisms, the endocrine system, pheromones, and the nervous system. Specialized topics such as insect immunity, defensive secretions, and chemicals controlling insect behavior will be discussed.

Ent 891—RESEARCH—Credit to be arranged.

Ent 991—DOCTORAL RESEARCH—Credit to be arranged.

**ENVIRONMENTAL SCIENCE**

**R. F. Borgman, Program Coordinator**

Degrees are not awarded in Environmental Science courses listed below are used as part of the major or minor work to support health oriented programs for students pursuing degrees in curricula such as Agronomy and Soils, Agricultural Engineering, Chemical Engineering, Environmental Systems Engineering, Entomology, Zoology, Nutrition, Physiology, and Water Resources Engineering.

En Sc 671—MAN AND HIS ENVIRONMENT—2 cr. (2 and 0)
En Sc 672—ENVIRONMENTAL PLANNING AND CONTROL—2 cr. (2 and 0)

En Sc 893—ENVIRONMENTAL HEALTH SEMINAR I—1 cr. (1 and 0)
A discussion of current advances and research developments in the area of environmental science. Both the students and the staff will participate. **Prerequisite:** Graduate standing

**EXPERIMENTAL STATISTICS**

**W. P. Byrd, Chairman**

Courses in Experimental Statistics are offered as support for students majoring in other areas. A minor is offered at the master's and doctoral levels. Courses to be used to satisfy the minor should be approved at the beginning of the student's program.

Students who elect a minor at the doctoral level will be expected to demonstrate competence in the theoretical basis as well as the application of statistics.

Ex St 662—STATISTICS APPLIED TO ECONOMICS—3 cr. (3 and 0) S

Ex St 801—STATISTICAL METHODS—4 cr. (3 and 3) F, S, S
Role and application of statistics in research including estimation, test of significance, analysis of variance, multiple comparison techniques, basic designs, mean square expectations, variance components analysis, simple and multiple linear regression and correlation, and non-parametric procedures. **Prerequisite:** Permission of instructor.

Ex St 803—REGRESSION AND LEAST SQUARES ANALYSIS—3 cr. (3 and 0) F
Regression analysis; simple and multiple linear, curvilinear and multiple curvilinear; curve fitting; least squares and computer techniques for fitting of constants and analysis of planned experiments. **Prerequisite:** Ex St 801.

Ex St 804—SAMPLING—3 cr. (3 and 0) F
The principles of scientific sampling; finite population sampling; simple random, stratified, multistage, and systematic sampling; optimum allocation: and methods of obtaining, processing and reporting survey information. Sampling as related to the environment, natural resources, and social and economic problems will be considered. **Prerequisite:** Ex St 801.

Ex St 805—DESIGN AND ANALYSIS OF EXPERIMENTS—3 cr (3 and 0) S
Review of the basic designs and analysis; data transformations; single degree of freedom, orthogonality, and responses in ANOVA; covariance; response surfaces; incomplete blocks; and introduction to least squares analysis of experiments. Uses of standard computer programs for selected analyses will be considered. **Prerequisite:** Ex St 801.
FOOD SCIENCE

W. P. Williams, Department Head

Advanced degrees are not awarded in Food Science. Courses may be taken as a minor or to supplement a major in other fields.

Fd Sc 601—FOOD CHEMISTRY I—4 cr. (3 and 3)
Fd Sc 602—FOOD CHEMISTRY II—4 cr. (3 and 3)
Fd Sc 615—HUMAN NUTRITION—2 cr. (2 and 0)
Fd Sc 622—QUALITY ASSURANCE AND SENSORY EVALUATION—2 cr. (2 and 0)
Fd Sc 624—QUALITY ASSURANCE AND SENSORY EVALUATION LABORATORY—1 cr. (0 and 3)

GENETICS

G. R. Craddock, Head, Department of Agronomy and Soils

Advanced degrees are not awarded in Genetics. Courses are offered as a minor for students majoring in other areas.

Gen 602—GENETICS—4 cr. (3 and 3) F, S
Gen 651—GENETICS—3 cr. (3 and 0) S
Gen 801—CYTOGENETICS—3 cr. (2 and 3) S, even numbered years.

A study of the classical and contemporary problems of chromosome structure, behavior and transmission. Topics will include recombination, interspecific hybridization, euchromatin and heterochromatin, polyploidy, mutable genetic systems, and structural and numerical aberrations of chromosomes and the effects upon breeding systems of plants and animals. Prerequisite: Gen 302 or equivalent.

Gen 806—SPECIAL PROBLEMS IN GENETICS—1-3 cr. (0 and 3-9)

Investigation of special problems in genetics not related to a thesis but designed to provide experience and training in research.

HORTICULTURE

T. L. Senn, Department Head

Courses are offered leading to the Master of Agriculture and Master of Science degrees. The Doctor of Philosophy degree is offered in the area of Plant Physiology on an interdepartmental basis.
Graduate study in horticulture is designed to acquaint the student with the important biological principles underlying the production and postharvest physiology and handling of horticultural crops. This includes not only the study of the economic product prior to harvest, but also through its harvesting, storage, marketing and processing. Scientific knowledge obtained in horticultural research as well as that available in the related fields of botany, plant physiology, biochemistry and genetics serve to give the student a broad base for future work in his chosen field.

Graduate study is carried on in pomology, vegetable crops, floriculture and ornamental horticulture, and postharvest physiology and handling, as well as plant physiology at the doctoral level. Prior to admission for graduate work, acceptable courses on the undergraduate level are recommended. While students need not major in horticulture as undergraduates, deficiencies in this respect must be made up by taking courses as directed by the departmental advisors and the graduate committee of the Department of Horticulture.

Hort 605—NUT TREE CULTURE—2 cr. (2 and 0) F, even numbered years.
Hort 606—NURSERY TECHNOLOGY—3 cr. (2 and 3) S
Hort 607—LANDSCAPE DESIGN—3 cr. (2 and 3) F
Hort 608—FLORAL DESIGN AND RETAIL MARKETING—2 cr. (1 and 3)
Hort 610—FLORICULTURE—3 cr. (2 and 3) S
Hort 612—TURF MANAGEMENT—3 cr. (2 and 3) F
Hort 651—SMALL FRUIT CULTURE—3 cr. (2 and 3) S
Hort 652—COMMERCIAL POMOLOGY—3 cr. (2 and 3) F
Hort 656—VEGETABLE CROPS—3 cr. (3 and 0) S, odd numbered years.
Hort 660—PROBLEMS IN LANDSCAPE DESIGN—5 cr. (3 and 6) F
Hort 664—POSTHARVEST HORTICULTURE—3 cr. (2 and 2) F
Hort 668—INTRODUCTION TO RESEARCH—2 cr. (1 and 3) S
Hort 670—HORTICULTURAL THERAPY—3 cr. (3 and 0)
Hort 801—PROBLEMS IN SMALL FRUIT PRODUCTION—3 cr. (3 and 0)
odd numbered years.
A study of selected problems encountered in the production of blueberries, strawberries, brambles and grapes.

Hort 802—RESEARCH SYSTEMS IN HORTICULTURE—3 cr. (2 and 3) F
A study of current trends, developments, and techniques in horticultural research. Prerequisites: Ch 223, 227 or Ch 201 and Phys 207, or Bioch 210.
Hort 803—EXPERIMENTAL OLERICULTURE—3 cr. (3 and 0) F, even numbered years.
A systematic study of sources of information on research developments in vegetable crops.

Hort 804—SCIENTIFIC ADVANCES IN ORNAMENTAL HORTICULTURE—3 cr. (3 and 0) S, odd numbered years.
Discussions on topics from scientific periodicals and on other research and current developments in ornamental horticulture.

Hort 805—PHYSIOCHEMICAL PROCEDURES FOR DETERMINING QUALITY IN HORTICULTURAL CROPS—3 cr. (2 and 3) F, even numbered years.
Subject matter will include the study of special titrations, organoleptic evaluations, refractory, colorimetry, and quality evaluations with succulometers and texturometers. The effect of acids, sugars, salts, and other chemical constituents on quality of horticultural crops will be evaluated.

Hort 806—POSTHARVEST PHYSIOLOGY AND HANDLING OF HORTICULTURAL CROPS—3 cr. (3 and 0) S, even numbered years.
Principles, developments, and application of research findings dealing with the physiology of maturation and storage of horticultural crops are emphasized. A concept of quality is formed through a study of the factors affecting physical and biological changes occurring in horticultural crops. Prerequisite: Bot 352.

Hort 807—POMOLOGY—3 cr. (3 and 0) S, odd numbered years.
A study of the growth and development of deciduous fruits with emphasis on the peach and apple. Prerequisite: Hort 352.

Hort 808—SPECIAL INVESTIGATIONS IN HORTICULTURE—2 cr. (2 and 0) S, SS
Special research investigations in horticulture not related to a thesis, but designed to provide opportunities for research experience and training. Prerequisite: Hort 802 or 805.

Hort 809—SEMINAR I—1 cr. (1 and 0) F
A review of current topics in horticulture with special emphasis on the preparation, organization, and presentation of material by the students.

Hort 810—SEMINAR II—1 cr. (1 and 0) S
A continuation of Hort 809.

Hort 811—QUANTITATIVE EXPOSITION OF PLANT DEVELOPMENT—2 cr. (1 and 3) S, even numbered years.
Principles and application of quantitative morphometry and crop production analysis. Techniques for visually detecting minute daily changes in plant development are studies and formulated. Graphic and statistical
evaluation is made of the influence of specific environmental factors and their interactions on plant development. Practical and theoretical applications of the derived systems of observation and analysis are considered.

Hort 891—RESEARCH—Credit to be arranged. F, S, SS

Hort 991—DOCTORAL RESEARCH—Credit to be arranged. F, S, SS

NUTRITION

W. A. King, Chairman
D. M. Henricks, Program Coordinator

Courses are offered leading to the Master of Nutritional Science, Master of Science, and Doctor of Philosophy degrees.

Nutrition is an interdisciplinary program encompassing four departments: Animal Science, Dairy Science, Food Science and Poultry Science. Nutritionists from those departments form the faculty that teach the nutrition courses listed below. Students enrolling in the program will be expected to have had sound undergraduate training in the biological and physical sciences. Students with deficiencies may be admitted, however, if they correct their deficiencies by completing the appropriate courses. A student's program of study will include a core of basic courses in nutrition, biochemistry, and physiology. Additional course work can be taken in areas of special interest. For the M.S. and Ph.D. degrees, a student will complete an original research project and submit a thesis. The thesis subject may deal with human, laboratory or domestic animal nutrition.

Students enrolling for a degree in nutrition will choose from those listed below and from others deemed appropriate by the Advisory Committee.

An Ph 802—DIGESTIVE AND EXCRETORY PHYSIOLOGY—3 cr. (2 and 3)
An Ph 803—CARDIOVASCULAR AND RESPIRATORY PHYSIOLOGY—4 cr. (3 and 3)
An Ph 804—MUSCLE AND NERVE PHYSIOLOGY—4 cr. (3 and 3)
An Sc 805—NUTRITION OF MEAT ANIMALS—3 cr. (3 and 0)
Bioch 815—LIPIDS—2 cr. (2 and 0)
Bioch 817—CHEMISTRY AND METABOLISM OF HORMONES—2 cr.
2 cr. (2 and 0)
Bioch 822—ENZYMES—3 cr. (3 and 0)
Bioch 823—CARBOHYDRATES—2 cr. (2 and 0)