clemson university 1973·74 announcements

This catalog includes information
for the following nine colleges:

College of Agriculture

College of Architecture

College of Education

College of Engineering

College of Forest and Recreation Resources

College of Industrial Management and Textile Science

College of Liberal Arts

College of Nursing

College of Physical, Mathematical and Biological Sciences

Equal Educational Opportunity

Clemson University offers equal educational opportunity to all persons without regard to race, sex, 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 nonteaching 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.

Clemson University Announcements 1973-74

1972

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CONTENTS

UNIVERSITY CALENDAR

1972 FIRST SUMMER SESSION

May 15	Registration
May 16	Classes begin
June 21-22	Examinations

1972 SECOND SUMMER SESSION

June 26	Orientation, new students
June 27	Registration
June 28	Classes begin
July 29	Classes meet
August 2-3	Examinations
August 5	Graduation

1972 FALL SEMESTER

August 21-22	Orientation, new students
August 23	Registration, all students
August 24	Late registration
August 25	Late registration fee applies
August 25	Classes begin regular schedule
August 29	Classes suspended
August 31	Last day for registration
August 31	Last day to add a subject
September 7	Last day to order diploma for mid-year graduation
September 21	Last day to drop a subject without record of drop
October 16	Preliminary reports due
November 7	Classes suspended
November 15	Last day to withdraw without having grades recorded
November 15	Last day to drop a subject
November 22	Thanksgiving holidays begin after last class
November 27	Classes resume
December 11	Examinations begin
December 21	Mid-year graduation

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1973 SPRING SEMESTER

January	8	Orientation, new students
January	9	Registration, all students
January	10	Late registration
January	11	Late registration fee applies
January	11	Classes begin regular schedule
January	17	Last day for registration
January	17	Last day to add a subject
January	24	Last day to order diploma for May graduation
February	7	Last day to drop a subject without record of drop
March	5	Preliminary reports due
March	16	Spring holidays begin after last class
March	26	Classes resume
April	6	Honors and Awards Day; classes suspended at recorded
April	6	Last day to drop a subject
April	11	Honors and Awards Day; classes suspended at 12 noon
April	30	Examinations begin
May	11	Commencement

1973 FIRST SUMMER SESSION

May	21	Registration
May	22	Classes begin
June	27-28	Examinations

1973 SECOND SUMMER SESSION

July	2	Orientation, new students
July	3	Registration
July	4	Classes begin
August	4	Classes meet
August	8-9	Examinations
August	11	Graduation

1973 FALL SEMESTER

August	20-21	Orientation, new students
August	22	Registration, all students
August	23	Late registration
August	24	Late registration fee applies
August	24	Classes begin regular schedule
August	30	Last day for registration
August	30	Last day to add a subject
September	6	Last day to order diploma for mid-year graduation
September	20	Last day to drop a subject without record of drop

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October 15	Preliminary reports due
November 12-16	Preregistration
November 14	Last day to withdraw without having grades recorded
November 14	Last day to drop a subject
November 21	Thanksgiving holidays begin after last class
November 26	Classes resume
December 10	Examinations begin
December 20	Mid-year graduation

1974 SPRING SEMESTER

January 7	Orientation, new students
January 8	Registration, all students
January 9	Late registration
January 10	Late registration fee applies
January 10	Classes begin regular schedule
January 16	Last day for registration
January 16	Last day to add a subject
January 23	Last day to order diploma for May graduation
February 6	Last day to drop a subject without record of drop
March 4	Preliminary reports due
March 15	Spring holidays begin after last class
March 25	Classes resume
April 5	Last day to withdraw without having grades recorded
April 5	Last day to drop a subject
April 10	Honors and Awards Day; classes suspended at 12 noon
April 15-19	Preregistration
April 29	Examinations begin
May 10	Commencement

1974 FIRST SUMMER SESSION

May 20	Registration
May 21	Classes begin
June 26-27	Examinations

1974 SECOND SUMMER SESSION

July 1	Orientation, new students
July 2	Registration
July 3	Classes begin
August 3	Classes meet
August 7-8	Examinations
August 10	Graduation

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BOARD OF TRUSTEES

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ELMER NEWTON TYNDALL, M.B.A., *Administrative Assistant to the President*

DOROTHY LEONORA ABBOTT, A.B., *Secretary to the President*

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VICTOR HURST, Ph.D., *Vice President for Academic Affairs and Dean of the University*

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FARRELL BLENN BROWN, Ph.D., *Assistant to the Dean, Graduate Studies and University Research*

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JOHN WALLACE GORDON GOURLAY, A.M.L.S., *Director of the Library*

University Extension

SAMUEL MARSH WILLIS, Ph.D., *Dean, University Extension*

ROBERT ALLEN BANISTER, M.S., *Director, Cooperative Education*

Colleges

COLLEGE OF AGRICULTURAL SCIENCES

LUTHER PERDEE ANDERSON, Ph.D., *Dean, College of Agricultural Sciences*

OLEN BRANFORD GARRISON, Ph.D., *Director, Agricultural Experiment Station; Director, Research in Agriculture*

WILLIE CECIL GODLEY, Ph.D., *Associate Director, Agricultural Experiment Station*

WAYNE TALMADGE O'DELL, Ph.D., *Director, Cooperative Extension Service*

JIMMY BRYANT COPELAND, Ph.D., *Associate Director, Cooperative Extension Service*

JESS WILLARD JONES, Ph.D., *Director, Resident Instruction; Assistant to the Dean*

WILLIAM JOSEPH LANHAM, Ph.D., *Head, Department of Agricultural Economics and Rural Sociology*

EARL THOMAS CARPENTER, Ed.D., *Head, Department of Agricultural Education†*

ABSALOM WEST SNELL, Ph.D., *Head, Department of Agricultural Engineering‡*

GARNET ROY CRADDOCK, Ph.D., *Head, Department of Agronomy and Soils*

RICHARD FERMAN WHEELER, Ph.D., *Head, Department of Animal Science*

WILLIAM MONROE EPPS, Ph.D., *Head, Department of Plant Pathology and Physiology*

WILLIS ALONZO KING, Ph.D., *Head, Department of Dairy Science*

† Agricultural Education curriculum is jointly administered by the College of Agricultural Sciences and the College of Education.
‡ Agricultural Engineering curriculum is jointly administered by the College of Agricultural Sciences and the College of Engineering.

SIDNEY BROOKS HAYS, Ph.D., *Head, Department of Entomology and Economic Zoology*

WOODIE PRENTISS WILLIAMS, Ph.D., *Head, Department of Food Science*

TAZE LEONARD SENN, Ph.D., *Head, Department of Horticulture*

BOBBY DALE BARNETT, Ph.D., *Head, Department of Poultry Science*

COLLEGE OF ARCHITECTURE

HARLAN EWART McCLURE, M.Arch., F.A.I.A., *Dean, College of Architecture*

JAMES EDWARD DALTON, M.Arch., *Assistant to the Dean, College of Architecture*

GAYLAND BROOKS WITHERSPOON, M.Arch., *Head, Department of Architectural Studies*

RALPH EDWARD KNOWLAND, M.B.A., *Head, Department of Building Science*

THOMAS EPHREM McPEAK, M.F.A., *Head, Department of History and Visual Studies*

EDWARD LOCKWOOD FALK, M.R.P., *Acting Head, Department of Planning Studies*

COLLEGE OF EDUCATION

HAROLD FOCHONE LANDRITH, Ed.D., *Dean, College of Education*

DUNCAN WILKIE RABEY, JR., B.S., Col., USAF, *Head, Department of Aerospace Studies*

EARL THOMAS CARPENTER, Ed.D., *Head, Department of Agricultural Education†*

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ALFRED FRANKLIN NEWTON, Ed.D., *Head, Department of Industrial Education*

THOMAS BROCK MAERTENS, M.S., Col., USA, *Head, Department of Military Science*

MYRTON ALFRED PACKER, Ed.D., *Coordinator, Office of Educational Services*

ARTHUR KENNETH JENSEN,° Ph.D., *Director, Vocational Education Media Center*

ROBERT TIDD BENSON, Ed.D., *Acting Director, Vocational Education Media Center*

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LYLE CHESTER WILCOX, Ph.D., *Associate Dean, Professional Studies*

SAMUEL F. HULBERT, Ph.D., *Associate Dean, Engineering Research and Interdisciplinary Studies*

ABSALOM WEST SNELL, Ph.D., *Head, Department of Agricultural Engineering‡*

° On leave.

† Agricultural Education curriculum is jointly administered by the College of Agricultural Sciences and the College of Education.

‡ Agricultural Engineering curriculum is jointly administered by the College of Agricultural Sciences and the College of Engineering.

GILBERT CHASE ROBINSON, Sc.D., *Head, Department of Ceramic Engineering*

CHARLES EDWARD LITTLEJOHN, Ph.D., *Head, Department of Chemical Engineering*

HERBERT WILLIAM BUSCHING, Ph.D., *Head, Department of Civil Engineering*

ALBERT L. DUKE, Ph.D., *Head, Department of Electrical and Computer Engineering*

ROBERT WARDLAW MOORMAN, Ph.D., *Head, Department of Engineering Mechanics*

EVERETT LAITALA, M.E., *Head, Department of Engineering Services*

JOHN F. ANDREWS, Ph.D., *Head, Department of Environmental Systems Engineering*

JARRETT CHARLES HESTER, Ph.D., *Head, Department of Mechanical Engineering*

FRANCIS WALTER COOKE, Ph.D., *Head, Division of Interdisciplinary Studies*

JAMES KARL JOHNSON, JR., M.S., P.E., *Director, Engineering Extension*

COLLEGE OF FOREST AND RECREATION RESOURCES

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HERBERT BRANTLEY, Ph.D., *Associate Dean, College of Forest and Recreation Resources; Head, Department of Recreation and Park Administration*

ROBERT MAX ALLEN, Ph.D., *Head, Department of Forestry*

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

WALLACE DABNEY TREVILLIAN, Ph.D., *Dean, College of Industrial Management and Textile Science*

THOMAS DANIEL EFLAND, M.S., *Associate Dean, Director of Research*

THOMAS BRUCE YANDLE, JR., Ph.D., *Head, Department of Economics*

CLINTON HOWARD WHITEHURST, JR., Ph.D., *Head, Department of Industrial Management*

EDWIN IRA STEARNS, Ph.D., *Head, Department of Textiles*

RALPH DELANO ELLIOTT, Ph.D., *Director, Professional Development*

HAROLD BETTS WILSON, B.S., *Field Representative*

COLLEGE OF LIBERAL ARTS

HEADLEY MORRIS COX, Ph.D., *Dean, College of Liberal Arts*

MARVIN ALPHEUS OWINGS, Ph.D., *Head, Department of English*

ROBERT STANSBURY LAMBERT, Ph.D., *Head, Department of History*

HARRY EUGENE STEWART, Ph.D., *Head, Department of Languages*

JOHN HARRISON BUTLER, Ed.D., *Head, Department of Music*

CHARLES WYTHE DUNN, Ph.D., *Head, Department of Political Science and Sociology*

BERNARD CLETUS CAFFREY, Ph.D., *Head, Department of Psychology*

COLLEGE OF NURSING

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LEON ROSWAL, M.A., *Director, Associate Degree Program*

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HENRY ELLIOTT VOGEL, Ph.D., *Dean, College of Physical, Mathematical and Biological Sciences*

RUFUS KENT GUTHRIE, Ph.D., *Associate Dean, College of Physical, Mathematical and Biological Sciences*

JESSUP MacLEAN SHIVELY, Ph.D., *Head, Department of Biochemistry*

CLYDE JEFFERSON UMPHLETT, Ph.D., *Head, Department of Botany*

HAROLD GARTH SPENCER, Ph.D., *Head, Department of Chemistry and Geology*

JOHN WILLIS KENELLY, Ph.D., *Head, Department of Mathematical Sciences*

MALCOLM JAMES BENJAMIN PAYNTER, Ph.D., *Head, Department of Microbiology*

EPHRIAM POSEY STILLWELL, JR., Ph.D., *Head, Department of Physics and Astronomy*

HONG SHIK MIN, Ph.D., *Head, Department of Zoology*

Faculty

ROBERT COOK EDWARDS, *President*
   B.S., Clemson University; LL.D., The Citadel; LL.D., Wofford College
VICTOR HURST, *Vice President for Academic Affairs; Dean of the University; Professor of Dairy Science*
   B.S., 1938, M.S., 1940, Rutgers University; Ph.D., University of Missouri, 1948

Main Campus

ABDALLA, DENNIS ARTHUR, *Assistant Professor of Horticulture, Sandhill Experiment Station*
   B.S., University of Maryland, 1958; M.S., Clemson University, 1962; Ph.D., Rutgers University, 1972
ABERNATHY, ATWELL RAY, *Associate Professor of Environmental Systems Engineering*
   A.B., Lenoir-Rhyne College, 1953; M.S.P.H., 1959, Ph.D., 1963, University of North Carolina
ACKER, KENNETH D., *Visiting Lecturer in Industrial Management*
   B.A., Presbyterian College, 1963; J.D., University of South Carolina, 1966
ACKERMAN, CARL WILLIS, *Associate Professor of Animal Science*
   B.S., 1953, M.S., 1960, Clemson University
ACORN, JOHN THOMSON, *Associate Professor of History and Visual Studies*
   B.A., Montclair State College, 1959; M.F.A., Cranbrook Academy of Art, 1961
ACTON, JAMES CROCKETT, *Assistant Professor of Food Science*
   B.S., 1965, Ph.D., 1970, University of Georgia
ADAIR, JOSEPH HENRY, *Instructor in Education*
   A.B., 1948, B.D., 1951, Johnson C. Smith University; M.Ed., Furman University, 1967
ADAMS, HEWITT DAYNE, *Assistant Professor of History*
   B.S., United States Naval Academy, 1937; M.A., Claremont Graduate School, 1964
ADDISON, CLARENCE L. B., *Instructor in Building Science*
   B.Arch., Howard University, 1959
ADKINS, THEODORE ROOSEVELT, JR., *Professor of Entomology and Economic Zoology*
   B.S., 1952, M.S., 1954, Ph.D., 1958, Auburn University
AHLERS, CARL WILKERSON, *Assistant Professor of Mathematical Sciences*
   B.S., 1964, M.A., 1966, University of Texas; Ph.D., Texas Tech University, 1971
ALAM, KURSHEED, *Associate Professor of Mathematical Sciences*
   B.S., 1941, M.S., 1943, Patna Science College; Ph.D., University of Minnesota, 1963

ALBERT, HAROLD EDWARD, *Assistant Professor of Political Science*
B.S., Madison College, 1957; B.D., United Theological Seminary, 1960; M.A.T., Miami University (Ohio), 1960; Ph.D., Florida State University, 1972

ALBRECHT, JOHN ERNEST, *Assistant Professor of Animal Science*
B.S., Delaware Valley College, 1965; M.S., 1968, Ph.D., 1971, North Carolina State University

ALLEN, JOE FRANK, *Associate Professor of Chemistry*
A.B., Berry College, 1955; M.S., University of Mississippi, 1959; Ph.D., Georgia Institute of Technology, 1963

ALLEN, LEONARD RAY, *Associate Professor of Agronomy and Soils*
B.S., Clemson University, 1952; M.S., 1962, Ph.D., 1965, Auburn University

ALLEN, ROBERT MAX, *Head of Forestry Department; Professor of Forestry*
B.S., 1947, M.S., 1951, Iowa State University; Ph.D., Duke University, 1958

ALLEY, FORREST CHRISTOPHER, *Professor of Chemical Engineering*
B.S., 1951, M.S., 1956, Auburn University; Ph.D., University of North Carolina, 1962; P.E.

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SUSAN G. DELONY, M.S., *Associate Dean of Students*
CATHY A. CAMPBELL, B.A., *Assistant Dean of Students*
FRANK A. BURTNER, Ph.D., *Director, Fraternity Affairs*
JOHN C. NEWTON, B.S., *Administrative Assistant*

OFFICE OF ADMISSIONS, REGISTRATION, AND FINANCIAL AID
KENNETH N. VICKERY, B.S., *Dean of Admissions and Registration*
GERTRUDE R. BAILEY, *Recorder*
REGINALD J. BERRY, B.S., *Registrar*
ARNOLD M. BLOSS, B.S., *Director, Financial Aid*
LINDA B. LAW, B.A., *Admissions Counselor*
ALBERT B. MARX, M.S., *Associate Director, Admissions and Registration*
WILLIAM R. MATTOX, M.S., *Assistant Director, Admissions*
WALTER A. MAYFIELD, M.Ed., *Admissions Counselor*
STANLEY B. SMITH, JR., M.A., *Administrative Assistant*

RESIDENCE HALLS OFFICE
MANNING N. LOMAX, B.S., *Director, Residence Halls*
JOEL L. FELSBURG, M.S., *Manager, Residence Halls*
ROBERT W. ROBINSON, JR., B.S., *Manager, Residence Halls*
FRANK MAULDIN, B.S., *Student Counselor*

PLACEMENT OFFICE
DAVIS G. HUGHES, M.Ed., *Director, Placement*

COUNSELING CENTER
JOHN F. MULKEEN, Ed.D., *Director, Counseling Center*
JOHN R. ANDERSON, M.S., *Counselor*
GALEN H. STEELE, Ph.D., *Counselor*

STUDENT HEALTH SERVICE

JUDSON E. HAIR, M.D., *Director, Student Health Service*
DONALD K. FREEMAN, M.D., *Psychiatrist*
PATRICIA L. GALLOWAY, M.D., *Psychiatrist*
BYRON B. HARDER, M.D., *Physician*
JOHN R. VAUGHN, M.D., *Physician*
RUTH D. DURHAM, R.N., *Director, Nurses*

MUSIC ACTIVITIES

JOHN H. BUTLER, Ed.D., *Director, Concert Band and Manager of Concert Series*
BRUCE F. COOK,* M.A., *Director, Tiger Band*
JAMES K. COPENHAVER, M.M.E., *Acting Director, Tiger Band*
JOSEPH E. JACKSON, M.A., *Director, Choral Music*

UNIVERSITY UNION AND YMCA

BUFORD E. TRENT, M.E., *Director, University Union*
NASH N. GRAY, B.S., *Associate Director, University Union*
OTIS D. NELSON, M.R.E., *Director, Foreign Student Affairs and Community Volunteer Services*
ARTHUR B. HARTZOG, M.S., *Program Director, University Union*
WILLIAM C. WOOTEN, B.C.E., *Director, Community YMCA*

ATHLETIC STAFF

HENSLEE C. McLELLAN, M.S., *Director, Athletics*
GEORGE U. BENNETT, B.S., *Assistant Director, Athletics*
JAMES B. McFADDEN, B.S., *Director, Intramural Athletics*
ROBERT C. BRADLEY, B.S., *Director, Sports Information*
EUGENE P. WILLIMON, B.S., *Executive Secretary, IPTAY*
BILLY H. WILHELM, A.B., *Head Coach, Baseball*
TAYLOR O. LOCKE, B.A., *Head Coach, Basketball*
HAROLD N. COOLEDGE, JR., Ph.D., *Head Coach, Fencing*
JIMMY D. PARKER, B.A., *Head Coach, Football*
ROBERT M. JONES, B.S., *Head Coach, Golf*
IBRAHIM M. IBRAHIM, Ph.D., *Head Coach, Soccer*
CARL M. McHUGH, B.S., *Head Coach, Swimming*
DUANE F. BRULEY, Ph.D., *Head Coach, Tennis*
H. C. GREENFIELD, M.S., *Head Coach, Track and Cross Country*

LITTLEJOHN COLISEUM

ROBERT W. SMITH, B.S., *Supervisor, Littlejohn Coliseum*

UNIVERSITY BOOKSTORE

JOHN C. CURETON, *Manager, University Bookstore*

UNIVERSITY CANTEENS

FRED D. MILLER, *Manager, University Canteens*

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* On leave.

General Information

Clemson is a land-grant, state-supported university. Clemson is fully accredited by the Southern Association of Colleges and Schools. Curricula are accredited by the American Chemical Society, Engineers' Council for Professional Development, National Architectural Accrediting Board, National League for Nursing, and Society of American Foresters.

The fifty-two undergraduate and fifty-one graduate curricula under the colleges of Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Nursing, Physical, Mathematical and Biological Sciences, and the Graduate School form a background of training for the hundreds of occupations and professions in which Clemson graduates engage. The University is organized on a basis whereby it retains a clear entity through the interrelationships of colleges and departments providing a well-balanced fundamental and general educational program.

The enrollment of Clemson has grown from 446 students at the opening of the University in 1893 to 9,757 for the first semester, 1972-73, including 559 at the Greenville and Sumter campuses. Since the opening of the University, through the first semester 1972-73, 67,452 students have attended Clemson, and of this number, 23,881 have been awarded the bachelor's degree. During this same period, 111 associate degrees, 2,254 master's degrees, and 279 Doctor of Philosophy degrees have been awarded.

ADMINISTRATIVE ORGANIZATION

The government of the University is vested in a Board of thirteen members, including six elected by the Legislature and seven life and self-perpetuating members, in accord with the Clemson will. The President of the University is the chief executive and administrative officer appointed by the Board of Trustees; and under the President there are five areas of administration, each headed by a chief administrative officer responsible to the President. The organizational units under each of these officers are outlined below.

I. Vice President for Academic Affairs and Dean of the University
   A. Undergraduate Studies
      1. Summer Sessions
      2. University Library
   B. Graduate Studies and University Research
      1. Computer Center
      2. Graduate School
      3. Office of University Research
   C. University Extension
      1. Clemson University at Greenville
      2. Clemson University at Sumter
      3. Cooperative Education
   D. Colleges
      1. Agricultural Sciences
      2. Architecture
      3. Education
      4. Engineering
      5. Forest and Recreation Resources
      6. Industrial Management and Textile Science
      7. Liberal Arts
      8. Nursing
      9. Physical, Mathematical and Biological Sciences
   E. Institutes
      1. Belle W. Baruch Research Institute in Forestry, Wildlife
         Science, and Marine Biology of Clemson University
      2. Water Resources Research Institute

II. Vice President for Business and Finance and Comptroller
   A. Accounting Division
   B. Auxiliary Enterprises
   C. The Clemson House Hotel
   D. Personnel Division
   E. Physical Plant Division
   F. Purchasing Division

III. Vice President for Development
   A. Alumni Relations
   B. Campus Master Plan
   C. Communications Center
   D. Deferred Gifts and Estate Planning
   E. Planning and Corporate Relations
   F. Public Relations

IV. Vice President for Executive Affairs and University Counsel

V. Vice President for Student Affairs and Dean of Students
   A. Athletic Department
   B. Counseling Center
   C. Littlejohn Coliseum
   D. Music Activities
   E. Office of Admissions, Registration and Financial Aid
   F. Offices of the Associate Deans of Students
   G. Placement Office
   H. Residence Halls Office
   I. Student Health Service
   J. University Bookstore
   K. University Canteens
   L. University Union and YMCA

REQUIREMENTS FOR ADMISSION

Beginning Freshmen. To receive consideration for admission to Clemson the applicant must present a transcript of his high school record and have an official copy of his SAT scores sent directly from the College Entrance Examination Board Office in Princeton, New Jersey or Berkeley, California. The examination scores along with the student's academic preparation, rank in class, and the recommendation of the high school principal will be weighed carefully in the decision-making process.

In addition, students may qualify for entrance by:

1. Achieving satisfactory scores on the College Board examinations and presenting a South Carolina high school certificate (awarded by certificate examination). This provision applies only to adult candidates 21-or-more-years of age or to those who have served at least two years of active duty in the Armed Forces.

2. Demonstrating unusual academic ability as a non-high-school graduate. In special cases candidates may be considered who possess superior high school records and whose College Board scores are above average for the freshman class. The typical student admitted under this provision ranks in the upper tenth of his class and has SAT scores which total 1,100 or more.

Transfer Candidates. Entrance examinations are required of many students in this category, but a number may omit this step. Details regarding these requirements are outlined in the sub-section dealing with entrance examinations.

Regardless of one's status relative to entrance examination requirements, all transfer applicants must have an original transcript of their records sent to Clemson directly from each college or university attended. Also, unless so stated on the transcript, the candidate will need to present statements of honorable dismissal and of eligibility to return to the institution last attended.

Applicants meeting the requirements outlined above will be considered carefully with regard to the quality of their credentials. If accepted, work completed in other institutions with a grade at least one letter-grade higher than the lowest passing mark may be evaluated for transfer in terms of equivalent courses in the Clemson curriculum of one's choice.

All Applicants. Various nonintellective factors will be considered in a few cases where it is impossible to make a positive decision on the strength of aptitude and previous academic performance alone.

Application Forms and Dates. Forms to be used in applying for admission to the University may be obtained by writing to the Office of Admissions, Clemson University, Clemson, South Carolina 29631.

Applications for entrance in August may be submitted, beginning in September of the previous year, and processing will begin in November or December. Applicants for architecture must apply by February 1 to be assured of consideration; others should apply by March 1. The time of application does not specifically control the time one receives a decision; however, the majority of admissions decisions are reached during January, February, and March.

Application Fee. Applicants for admission must submit a non-refundable fee of $15.00 with their application. This fee is not applicable toward tuition and/or other University fees. Details concerning the fee are contained in the letter of instructions sent with the application form.

Entrance Examinations. All freshman candidates and transfer students who, at the time of application, have completed fewer than thirty semester hours (or its equivalent) must submit scores for the College Entrance Examination Board Scholastic Aptitude Test. A student transferring from an accredited college usually need not submit SAT scores if he has earned thirty semester hours with at least a "C" average (based on a system using four passing grades). Those enrolled in technical institutes or in noncollege-parallel programs at institutions offering both transfer and terminal curriculums must submit SAT scores. For August enrollment, one

is encouraged to complete the SAT no later than the preceding December.

In addition, and with the exception of those transferring acceptable college credit in mathematics, candidates should take one of the College Board Achievement tests in mathematics. In most curricula, placement in this subject will be determined by the score one achieves. It is suggested that students sit for the Level I examination; however, either Level I or Level II is acceptable.

Applicants who will have completed two or more years of high school French, German, Russian, or Spanish and who will enroll in a curriculum which includes a modern foreign language should take the appropriate language achievement test. These candidates may qualify for advanced placement with credit in language on the basis of a satisfactory score on this test.

In addition to taking the achievement test in mathematics, students attending private schools are strongly advised to complete the achievement tests in English and one other subject of their choice.

August applicants are encouraged to complete all achievement tests by January, and must do so no later than May of the senior year.

Candidates who have completed the required tests previously may have their scores reported to Clemson by directing a request to the College Entrance Examination Board together with a fee of $2.00. Others may secure a *Bulletin of Information* and an application for the tests from their local high school or at one of the Board's offices, the addresses of which are: P. O. Box 592, Princeton, New Jersey 08540, and for residents of the West, P. O. Box 1025, Berkeley, California 94701. *Only those scores reported directly to the Clemson University Admissions Office from Princeton or Berkeley will be acceptable.*

All candidates are reminded to forward applications for the entrance examinations as indicated in the *Bulletin of Information* and not to Clemson University.

Applicants for enrollment in Architecture should also take the Architectural School Aptitude Test which is given at most schools of architecture in December and February. Applications for this test may be obtained from a school of architecture or from Educational Testing Service, Princeton, New Jersey 08540. Applicants for Architecture are urged to sit for the December test, and also to arrange for a personal interview with a representative of the College of Architecture.

Freshmen interested in obtaining credit by examination see

Campus Visits and the Orientation Program. Interviews are not required in considering candidates, nor will the results of interviews affect admissions decisions. Most prospective students, nevertheless, desire and actually need to visit the campus prior to enrollment. Accordingly, the University has scheduled during the summer months a series of two-day orientation programs for entering freshmen, transfer students and their parents. Moreover, all new students are expected to attend one of these sessions.

During orientation one will have the opportunity to discuss his educational objective with an adviser, to preregister for the fall semester, and to learn about student life. Transfer students have their transcripts evaluated and select appropriate courses for their first semester at Clemson.

Regularly scheduled orientation sessions are in June and July. Those transferring may find it difficult to schedule the appropriate courses if they fail to attend one of these regular sessions; however, a modified session will be conducted in connection with the opening of the fall session for those students living great distances from the University.

Matriculation. Upon arrival for the opening of the session, new students report to the Office of Admissions and Registration to complete enrollment. A student's matriculation is equivalent to his pledge to conform to the rules of the institution. Any admission gained or matriculation made irregularly is subject to cancellation.

Students from other Countries. A limited number of well-qualified students from other countries are accepted. The application for admission must be in English on the official application form furnished by the Office of Admissions and Registration. Official transcripts of all high school and college-level work which the applicant has undertaken should accompany the application. Also, the international candidate must complete the entrance examination referred to above.

GRADUATE STUDY

Programs leading to graduate degrees from Clemson University are available in eight colleges—Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, and Physical, Mathematical and Biological Sciences.

For information concerning advanced degrees see *The Graduate School Announcements* which may be obtained from the Office of the Dean of Graduate Studies and University Research.

SELECTIVE SERVICE

Registration. For the benefit of students who become 18 years of age during the school year, provision has been made for such students to register for Selective Service in the Office of Admissions and Registration on the campus. The registration is then sent through channels to the registrant's local board. Regulations provide that registration may be accomplished within thirty days either preceding or following the 18th birthday.

Deferment. Due to the changes occurring periodically, all registrants should keep themselves informed of current regulations governing deferments. Questions concerning student deferments may be referred to the Office of Admissions and Registration.

ROTC Deferment. Draft deferments, if required, may be obtained from the Army or Air Force ROTC detachments.

EXPENSES

Settlement of University Fees. The Schedule of Semester Charges for all undergraduate students—full- or part-time, and auditing—is shown on the pages which follow. 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 noninterest bearing promissory note for a portion of the semester residence-hall rent and semester-plan-board fee. Amounts up to $75.00 for room rent and $110.00 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 $75.00 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 $75.00 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.

SCHEDULE OF SEMESTER CHARGES 1972-73

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

	Full-Time S. C. Resident	Full-Time Nonresident
Tuition	$ 75.00	$200.00
Matriculation Fee (nonrefundable)	5.00	5.00
University Fee	205.00	430.00
Medical Fee	35.00	35.00
Semester Total Exclud. Room and Board	$320.00	$670.00

Room

East Campus (Air-conditioned with Telephones)
    Barnett, High Rise 3, Lever, Manning, Mauldin Halls $220.00
West Campus (Air-conditioned with Telephones)
    Johnstone Hall: New Sections A, F $205.00
    Johnstone Hall: Old Sections D, E, F $180.00
    Bowen, Bradley, Donaldson, Norris, Wannamaker H. $220.00
    Benet, Cope, Geer, Sanders, Young Halls $205.00
West Campus (Air-conditioned without Telephones)
    Johnstone Hall: Old Sections A, B, C $165.00

Board

Five-Day Plan (Monday through Friday) $220.00
Seven-Day Plan $275.00

Part-time Student. Undergraduate students taking less than 12 semester credit hours will be charged each semester according to the following schedule. These fees do not provide for admission to athletic events, concert series, etc.

	S. C. Resident	Nonresident
Matriculation Fee (nonrefundable)	$ 5.00	$ 5.00
Tuition (per semester hour)	$ 6.00	$16.00
University Fee (per semester hour)	$14.00	$28.00

Auditing. Charges for auditing are made each semester according to the following schedule:

Tuition (per semester hour)	$ 3.00	$ 8.00
University Fee (per semester hour)	$ 7.00	$14.00

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.

Refund of Academic Fees for Students Enrolled for Less than a Full Semester. No adjustments in charges will be made on a semester's tuition and fees after five weeks from the date classes begin for the semester. Charges for periods of attendance of five weeks or less during a semester shall be made on the following basis:

Two weeks or less	20%
More than 2 but not more than 3 weeks	40%
More than 3 but not more than 4 weeks	60%
More than 4 but not more than 5 weeks	80%
More than 5 weeks	100%

Special provision has been made for a student who is required to discontinue his enrollment to report for active duty in the Armed Forces of the United States. Such students shall be charged for tuition, University fee, and medical fee on a daily pro rata basis, holidays excepted, instead of the percentage basis stated above, provided that such discontinuance of enrollment is the result of circumstances, conditions, or actions over which the student has no control.

Refund of Dining Hall and Residence Hall Fees. Specific information relating to living-expense refunds is given in the sections on Residence Halls and Student Food Service.

Late Registration Service Charge. Registration for classes is scheduled for specific days, and certain definite procedures are outlined to prevent or reduce the problems incident to late registration. A student has not completed registration until all required steps have been taken, the final being the return of the matriculation card, the student directory card, and if not preregistered for classes, the properly signed class registration card to the Office of Admissions and Registration. Any student failing to register on the specified class registration days will incur a service charge of $10.00.

Late Payment Fee. Any student who registers for classes on or before a designated date each semester has three additional working days to make satisfactory settlement of all expenses without being charged a Late Payment Fee. Once begun, a Late Payment Fee of $5.00 per day will be charged until satisfactory settlement of all fees is made.

Books and Supplies. The cost of books is not included in the Schedule of Semester Charges. The cost of books and supplies at the beginning of the semester will be approximately $50.00, except for students enrolling in Architecture the cost will be approximately $75.00.

Optional Expenses. It is not possible to give an estimate of a student's expenditures for such amusements as dancing, motion pictures, etc. This depends largely upon the disposition of the student. The University endeavors to reduce to a minimum the temptation to spend money needlessly, but the authorities cannot be responsible for a student's private expenditures. This must be a matter between the student and his parents.

Transcripts. Requests for transcripts should be directed to the Office of Admissions and Registration. The initial transcript is issued gratis. Thereafter, a minimum fee of $3.00 is charged for a single copy. A charge of 50 cents will be made for each additional copy on the same order.

Student Depository. For the convenience of students, the University operates a depository in the Bursar's Office where money can be deposited and withdrawn as the occasion may demand. This service is purely local. Students are urged to deposit their money and not to keep it in their rooms.

COOPERATIVE EDUCATION PROGRAM

The Cooperative Education Program is a supervised program in which a student at the university level, combines alternate periods of academic study with periods of work experience in industry, business, education, nonprofit organization, or governmental agencies. For all four-year curricula under the Cooperation Education Program, the program requires five full years.

Coordination of academic study and work experience combines theory and practice to add a unique dimension to the education process, a dimension that can result in stronger academic performance and higher motivation.

Cooperative Education contributes to the development of individual responsibility, increased maturity, and a better appreciation of the importance of human relations. At the same time and from personal experience, the student is better able to determine if his choice of profession is the correct one. Since he is paid a salary by an employer during the work period, the student is able to earn at least part of his educational expenses.

Students who are graduated from the program will be awarded a Cooperative Education certificate, along with the baccalaureate degree.

Co-op students are required to spend the freshman and senior years in full-time academic endeavor. To be placed with an employer, a student must have an above-average-academic performance at Clemson University and must maintain that performance level to remain in the program.

All students desiring to enter the program are requested to schedule an interview with officials in the Office of Cooperative Education, 202 Tillman Hall, where application forms are available. Entering freshmen may schedule an interview immediately upon being accepted for admission by the University. Normally, there are five work periods scheduled during the sophomore and junior years. Three work periods, consisting of two semesters and one summer, are the minimum work requirements for all students entering the Cooperative Education Program.

The Cooperative Education Program is available for all curricula in the College of Education, Engineering, Industrial Management and Textile Science, and Liberal Arts. The College of Physical, Mathematical and Biological Sciences offers participation in Botany, Chemistry, and Mathematics.

Financial aid and scholarships available to Co-op students are the same as for other students with the exception that aid requests by Co-op students may not be based on financial need during the sophomore and junior years.

A nominal fee is assessed each Co-op student for continuous enrollment during each work assignment.

Additional information regarding the Cooperative Education Program may be obtained from the Director of Cooperative Education, 202 Tillman Hall, Clemson University, Clemson, South Carolina 29631.

DEFINITION OF STUDENT RESIDENCY— HIGHER EDUCATION

A. The word "student" as hereinafter used shall mean any person enrolled for studies in any state institution. The word "residence" or "reside" shall denote continuous and permanent physical presence within this State, provided that temporary absence for short periods of time shall not affect the establishment of a residence. The word "domicile" shall denote a person's true, fixed, and permanent home and place of habitation. It is the place where he intends to remain, and to which he expects to return when he leaves without intending to establish a new domicile elsewhere. It is presumed not to include residency in housing provided for students at state institutions, as residency in such housing is by nature temporary. The word "minor" shall mean a person who has not attained the age of 21 years; the words "emancipated minor" shall mean a minor whose parents have entirely surrendered the right to the care, custody and earnings of such minor, and who no longer are under any legal obligation to support or maintain such minor. The word "parent" shall mean an unemancipated minor's father; or if he has no father, his mother; or if one parent has

custody of the minor, the parent having custody; or if there is a guardian or legal custodian of his person, then such guardian or legal custodian, provided that there are no circumstances indicating that such guardianship or custodianship was created primarily for the purpose of conferring the status of an in-state student on such unemancipated minor.

B. South Carolina residency shall be established as follows in determinations of tuition and fees to be paid by students entering or attending state institutions:

1. Persons who have been domiciled in South Carolina for a period no less than twelve months with an intention of making a permanent home therein, including persons in their majority, emancipated minors and unemancipated minors whose parents have been domiciled in this State for no less than twelve months with an intention of making a permanent home herein may be considered South Carolina residents for tuition and fee purposes at state institutions; provided further, that where the parents of an unemancipated minor are living apart or are separated, divorced, or deceased, the residency of the child shall be determined by the place of domicile of the parent or legal guardian with whom the child normally resides. Students making application for residency status shall have the burden of proving that these requirements are met.

2. Where the domicile of a student or his parent or legal guardian changes after his enrollment at a state institution, tuition charges shall be adjusted as follows:

a) When domicile is taken in South Carolina, a student shall not become eligible for residency status for tuition and fee purposes until the beginning of the next semester after expiration of twelve months from date of domicile in this State.

b) When South Carolina domicile is lost, residency status for tuition and fee purposes ends on the last day of the semester in which the loss occurs; however, application of this subsection shall be at the discretion of the institution involved.

3. Marriage shall affect determinations of residency for tuition and fee purposes only insofar as it operates to emancipate minors or to evince an intention by the parties to make a permanent home in South Carolina.

C. Where it appears to the satisfaction of officials charged with administration of these provisions that a student has made willful misrepresentations of fact in an attempt to gain residency improperly, tuition and fees past due and unpaid must be repaid, plus interest at a rate of 8 percent per annum, plus a penalty amounting to 25 percent of the nonresident tuition and fees for one semester. No student shall be allowed to receive transcripts or graduate from any state institution until these provisions have been met.

D. Full-time faculty and administrative employees of state institutions, and the husbands, wives, or children of such employees, shall be excluded from the operation of this act.

E. Dependents of members of the armed services and federal employees stationed in South Carolina are permitted to attend the University, if accepted, by paying resident fees without regard to resident status, provided that if such military personnel or employees are ordered away from the State, their dependents may continue to have this privilege while they attend the University.

Any student or prospective student in doubt concerning his residence status must bear the responsibility for securing a ruling by stating his case in writing to the Dean of Admissions and Registration.

UNDERGRADUATE FINANCIAL AID

The Office of Student Financial Aid, operating in conjunction with the University Honors and Awards Committee, is responsible for coordinating all types of financial assistance administered by the University. Currently available financial aids consist of scholarships, student loans, grants, and part-time employment. Sufficient aid is programmed to meet the requirements of all students meeting the criteria of financial need as determined by College Scholarship Service and academic ability/potential as evidenced by achievement at Clemson or, for entering students, high school records and College Entrance Examination Board Scholastic Aptitude Test scores.

Cutoff dates for Receipt of Applications are February 1 for Grants and Scholarships and June 1 for Loans.

A brochure describing financial aid programs and procedures for making application may be obtained by writing to the Office of Student Financial Aid, Clemson University, Clemson, South Carolina   29631.

PLACEMENT SERVICES

The University is glad to assist all who ask for help in securing summer or permanent employment; it does not assure positions for those who complete any of the courses of study.

The Placement Office coordinates and plans campus interview visits requested by representatives seeking graduates for positions with business, industry, and public service. It maintains current files of reported job opportunities and of alumni who wish to learn of available openings.

A placement bulletin is prepared periodically for distribution on the campus and for mailing to alumni upon request. It announces

scheduled campus interviews and lists specific openings which may be of interest to students and alumni.

HONORS AND AWARDS

The University offers a number of awards for outstanding achievement in specific fields and endeavors. Recipients are chosen by selection committees and are announced at the annual Honors and Awards Day program or other appropriate ceremonies. Detailed information relating to such awards is available in the offices of the academic deans and department heads.

EDUCATIONAL BENEFITS FOR VETERANS AND WAR ORPHANS

The Veterans Administration provides educational assistance for veterans and children of deceased or totally disabled veterans who meet requirements of applicable laws and regulations. Any veteran or child of a deceased or totally disabled veteran should communicate with the nearest Veterans Administration Office to determine whether or not he is entitled to any educational benefits.

THE J. E. SIRRINE TEXTILE FOUNDATION

Funds in this foundation were contributed by the members of the textile industry in South Carolina. Income from this fund is administered by the trustees of the J. E. Sirrine Textile Foundation. They have used the income to benefit textile teaching and research at Clemson University. Under the present system it is used to (1) supplement University travel funds for faculty members, (2) sponsor the college library, (3) provide supplement to the salaries for two major professors, (4) provide eight undergraduate scholarships and five graduate fellowships annually, one of which may be held by a faculty member, (5) sponsor annual seminars for South Carolina high school counselors, (6) support special research projects, and (7) sponsor the *Clemson University Review of Industrial Management and Textile Science*—a professional journal.

CLEMSON UNIVERSITY FOUNDATION

The Clemson University Foundation, comprised of eighteen directors, is an incorporated tax-exempt foundation organized exclusively to help support the educational programs of Clemson University. Presently there are five committees composed of alumni and non-alumni, to procure contributions to advance the educational mission of Clemson University. The committees are as follows: Investment Committee, Alumni Liaison Committee, Deferred Gifts Committee, Business and Corporate Committee, and Committee

on Foundations. As of September, 1972, the total assets of the Clemson University Foundation, including Permanent Endowment, exceeded $1,600,000. Information concerning the operation of the Clemson University Foundation may be obtained by contacting the Office for Development.

ALUMNI RELATIONS

The office of Alumni Relations coordinates all functions and services of the Alumni Office. The director of alumni relations is secretary of the Clemson Alumni Association and the Clemson Foundation through election by the governing boards of these two organizations.

Accurate records of addresses and information concerning alumni are being compiled by this office which also publishes a magazine and newsletter for distribution to the alumni.

The purpose of the Alumni Association is to serve the University and its alumni in every possible way. The Association holds its regular annual meeting at the University each June. Active membership is made up of former Clemson students who participate in the Clemson Alumni Loyalty Fund for the purpose of providing supplementary financial aid to the educational programs of the University.

RESIDENCE HALLS

The University residence halls will accommodate 5,330 students, two residents being assigned to a room. All residence halls are fully air-conditioned, and each bedroom is furnished in a manner that provides maximum comfort.

All unmarried first-year students entering the University directly from high school or preparatory school, not residing with parents, guardians, or close relatives, are required to live in University-owned residence halls. All students in their second or more years in college are eligible to live off campus. Students who are assigned a room in University residence hall will be required to sign a Residence Hall contract relating to terms and conditions of occupancy for the full academic year. Those students living off campus will fill out an off-campus-locator card as part of the registration process and will report all changes of address as they occur. The Student Information Office maintains the off-campus-locator file and provides information pertaining to off-campus students.

West Campus. Eleven residence halls are located on West Campus. Five of these, Benet, Young, Cope, Geer and Sanders Halls, will accommodate 732 students. Each room is equipped with a lavatory, walk-in-type clothes lockers, individual study desks,

single beds, and chairs. The remaining six residence halls, John-stone, Donaldson, Bowen, Wannamaker, Bradley, and Norris Halls will accommodate 2,858 students. Rooms in new annexes A and F of Johnstone Hall are equipped similarly to those mentioned above. Rooms in Donaldson, Bowen, Wannamaker, Bradley, and Norris Halls are carpeted and furnished with clothes lockers, individual study desks, single beds, and chairs. Rooms in Johnstone Hall, other than new A and F annexes, are furnished with individual clothes lockers, convertible beds, individual study desks and chairs. A lavatory is installed in each room. All residence hall rooms, except those in Sections A, B, and C in Johnstone Hall have telephones. (See page 68, Schedule of Semester Charges for rates.)

East Campus. In this area there are 1,740 spaces available in six residence halls. Three of these, Mauldin, Barnett, and Smith Halls are modern four-story structures. Manning, Lever, and Byrnes Halls are eleven-story structures. All of these residence halls have rooms arranged in suites of six, accommodating twelve students. Each room contains single beds, two closets, two chest of drawers with wall-hung mirrors, individual student lamps, desks and chairs. Draperies must be furnished by the occupants. Studies and laundry rooms are available on each floor. Also, available in these residence halls are lounges, kitchenettes, televisions, and rec-reation rooms. All rooms located on East Campus are equipped with telephones.

Application for Residence Hall and Advance Payment. An ap-plication for residence hall accommodations will be forwarded to those students who are accepted by the University for the fall semester, provided they have paid the $50.00 admissions deposit. These applications are to be completed and returned with a $75.00 advance room payment to the Residence Halls Office at the earliest possible date. After June 1, the $75.00 advance payment will not be accepted. Students requesting accommodations after that date must pay the full semester's rent in order to receive a room assignment.

Students who have made an advance payment and later decide not to enroll or to live in the residence hall may obtain a refund of $60.00 provided notification of intent and request for refund is received at the Residence Halls Office prior to June 1. When such notification and refund request is not received by the deadline date, no refund of advance payment will be made.

Normally, residence hall accommodations are available to those students who enter the University at the beginning of the second semester; therefore, the advance payment is not now required of students entering at that time.

Notification of Assignments. As soon as room assignments are made, students are advised of the assignment and furnished information regarding occupancy.

Assignment Changes. Students who desire to move from the assigned room may request a room change at the Residence Halls Office. However, no approval of these requests will be made until after the last day for registration during any semester. Fee adjustments will be made when moving to a room which rents at a rate different from that of the originally assigned room.

Opening and Closing of Residence Halls. The University residence halls officially open for undergraduate students at 8 a.m. the day prior to matriculation date for new students and close at 8 p.m., the day scheduled for graduation exercises of the term or semester. Residence hall fees cover only the time between the day before matriculation and the scheduled date of graduation exercises or end of term when no graduation exercises are scheduled.

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.

Student Responsibility for Damages. The University holds residents responsible for any damages other than normal wear that occur to their rooms and furnishings. Damages will be assessed by the University and the student will be billed for repairs or replacements. Students should note on the property certificate immediately upon occupancy any conditions reflecting prior damages which have not been corrected.

Responsibility for Student Possessions. Although every precaution is taken to maintain adequate security, the University cannot assume the responsibility for the loss of or damage to student possessions resulting from any cause.

Refund of Residence Hall Fee. Except for the stated regulations governing the $75.00 advance payment to reserve a room for the first semester, refunds, when authorized, will be made on a daily pro rata basis.

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

MARRIED STUDENT HOUSING

Clemson provides comfortable and economical housing for its married students. There are three housing areas consisting of 100 single Prefab units, 100 East Campus apartments contained in 50 duplex buildings, and 50 Littlejohn apartments in eleven 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.

Brochures describing married students' housing, and rental-rate listings may be obtained by writing to the Housing Office, Clemson University, Clemson, South Carolina 29631.

STUDENT FOOD SERVICE

The University dining halls provide several food service plans for students as follows:

1. Five-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. Seven-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 Five- and Seven-Day Board Plans will begin immediately after the student obtains a meal ticket and will terminate on the day scheduled for graduation. (Five-Day Board Plan tickets will not be issued on Saturdays or Sundays.)

3. Meal Tickets. Students who are not on a board plan may purchase tickets for individual meals at prevailing prices. A la carte service will be offered in student dining halls only on special occasions.

All students who enter the University for the first time from high school or preparatory school and who live in University residence halls are required to subscribe to either the Five- or Seven-Day Board Plan. Either plan is recommended to upperclassmen who reside in University residence halls.

Upperclassmen and graduate students have the option at the time of their enrollment of electing either the Five- or Seven-Day Board Plan provided they agree to pay the board-plan fee for the period of their enrollment during the academic year.

A student having selected a board plan for the academic year may not withdraw as long as he remains enrolled, except in the

case of marriage or circumstances which are determined by the University to be beyond his control.

LAUNDRY AND DRY CLEANING

A plant with modern equipment is conveniently located on campus to service the laundry and dry-cleaning requirements of the student. Reasonable prices are charged for individual items on a cash-and-carry basis.

The University will not be liable for lost or damaged items unless reported within two days after the delivery date, and then for not more than the actual depreciated value of such articles as have been lost or damaged.

Coin-operated washing machines and dryers are available in the laundry building and several of the dormitories.

A student linen-rental service is also available. Information regarding this service will be forwarded to students who are accepted for enrollment in the University.

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.

The University requires that all new students have a current tetanus toxoid series or booster (within ten years), and an 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 as a service to the student at no additional charge.

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 outside 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.

GUIDANCE SERVICE

Guidance has an important role at all levels of education and particularly so during times of transition and articulation. To assist students in this period of emotional and academic adjustment, an orientation and counseling program has been established.

At the beginning of his university career, each student is assigned to a faculty adviser selected from his academic school. The faculty advisers provide information on courses of study, approve class schedules, interpret academic regulations, and suggest adjustments in making satisfactory progress toward graduation.

The residence hall program is organized to cope with personal problems and questions regarding procedures and policies of college life. Residence hall counselors and supervisors are primarily concerned with maintaining an environment compatible to serious study and with the educational potential of group living.

COUNSELING SERVICES

Counseling Services are located in Tillman Hall. These services are available free of charge to all registered students and spouses of registered students. These services are oriented to early identification of and assistance with academic, vocational, personal, and psychological problems. Testing facilities of a vocational and psychological nature are available. Students are encouraged to take advantage of the individual services of a counseling psychologist, a counselor, and of the Psychometric Services.

The service is dedicated to helping students in self-understanding, self-improvement, and in the attaining of academic and vocational goals. The aims of the service are preventive rather than curative.

RESERVE OFFICERS' TRAINING CORPS (ROTC)

The Department of the Army and the Department of the Air Force both maintain ROTC units at Clemson University. The mission of the Reserve Officers' Training Corps is to produce officers having qualities of leadership and attributes essential to their progress and continued development as commissioned officers in either the Army or the Air Force of the United States. A four-year program, consisting of the basic course for freshmen and sophomores and the advanced courses for juniors and seniors, is offered by both services.

To enroll in basic ROTC, students must be at least 14 years of age and citizens of the United States at the time of entrance. They must be of good moral character and must sign a loyalty certificate. They must not be physically disqualified to the extent that drill would further aggravate the physical defect. Air Force candidates will be administered a written Air Force Officer Qualification Test and a physical examination during their freshman or sophomore year to determine eligibility for the advanced AFROTC course. Army candidates will be administered a written Army Officer Qualification Test and a physical examination during their sophomore year to determine eligibility for advanced Army ROTC. Foreign students may enroll in the ROTC program provided they sign a statement of intention to become American citizens or receive the approval of their government.

Students enrolled in the advanced course are paid $100 per month, including one summer vacation. Pay while attending summer camp is computed differently and is considerably higher.

Students who have six months or more active military service and students who have successfully completed two or more years of ROTC training at the high school level may substitute such service and preparatory schooling for all or part of the Clemson basic ROTC course. Students in either of these categories should consult the Head of the Military Science or Aerospace Studies Department concerning accreditation.

Students who complete the prescribed ROTC courses and receive a bachelor's degree will be awarded commissions in the Army or Air Force. Students who complete the basic course will receive 4 semester credit hours of elective credit; those selected for Advanced ROTC may substitute aerospace studies or military science courses for an additional 6 semester hour credits.

Uniforms are provided for ROTC students. The University requires a deposit of $25.00 from each basic student. This is refundable when the uniform is turned in, provided there is no damage to the uniform other than normal wear. Each advanced ROTC student is credited with a uniform allowance, paid by the Government to the University, which is used by the University to purchase

officer-type uniforms for use during the junior and senior years. The uniform becomes the property of the student when he is commissioned.

AIR FORCE ROTC

The Air Force ROTC program provides for selected students an education vital to the career of a professional Air Force officer. Commissions in the United States Air Force are awarded to male and female students who qualify for enrollment and successfully complete the program.

AFROTC annually provides scholarships for two, three, or four years to qualified cadets. Each scholarship pays for tuition, fees, and books, in addition to $100 per month subsistence fee. For further information, contact the AFROTC Office at Clemson University.

The four-year program consists of the General Military Course (GMC) or basic course and the Professional Officer Course (POC). During the second year of the GMC, a cadet may apply for admission into the POC. Entry into the POC for nonflying candidates is on a competitive basis. Most male POC cadets are expected to become Air Force flying officers.

Cadets who enter the POC under the four-year program attend a four-week training period at an Air Force base during the summer following their sophomore year. This provides an exposure to an Air Force environment which is beneficial in preparing cadets for future management positions.

The two-year program consists of a six-week preparatory training period at an Air Force base during the summer between the student's sophomore and junior years, and the POC. The six-week preparatory training replaces the GMC and the four-week field training period. Applicants for the two-year program must meet all eligibility requirements for POC enrollment. Application should be made during the first six weeks of the spring semester prior to entry into the POC so that eligibility requirements for enrollment can be satisfied.

To be eligible for enrollment in the POC a cadet must: (1) make application; (2) pass the Air Force Officer's Qualification Test; (3) pass the Air Force physical examination; (4) meet citizenship, age, and loyalty requirements; (5) possess leadership ability and good moral character; (6) successfully complete two academic years of the GMC or have received credit for its equivalent; (7) enlist in the Air Force Reserve (Obligated Reserve Section); (8) have two academic years remaining (including graduate study) at Clemson University at the time of entrance; (9) be enrolled as a full-time student; (10) have attained the academic standards required by the

University and the Air Force; (11) be selected by a board of Air Force officers.

Male POC cadets who intend to become Air Force pilots participate in the Flight Instruction Program (FIP) during their senior year. They receive, at Government expense, pilot training conducted by a local civilian contract flying school. This training consists of 15 hours of ground school and 36.5 flight hours. Students who are not qualified, or do not desire pilot training may be considered for entry into the POC as candidates for navigator training or officer duty in nonflying categories.

The Air Force offers outstanding opportunities for an AFROTC graduate to pursue studies leading to an advanced degree. The educational delay program allows an AFROTC graduate to have his call to active duty delayed until he receives his advanced degree.

The Air Force Institute of Technology (AFIT) offers graduate programs in scientific, technical, and other professional fields. These programs are conducted at the AFIT resident school, Wright Patterson AFB, Ohio, at selected civilian institutions, and through training-with-industries programs. AFROTC graduates are eligible to apply for AFIT schooling after they are called to active duty. Air Force officers receive full pay and allowances while attending school under the AFIT program.

ARMY ROTC

The Army ROTC instruction stresses an academic college-level program in content, scope, and intensity. Emphasis is placed on the development of the student's leadership, bearing, discipline, judgment and sportsmanship which will be a distinct asset in any profession that he may choose, military or civilian.

The General Military Science Program is conducted at Clemson (see page 376 of this catalog for a description of courses). The program consists of a Basic course for freshmen and sophomores and the Advanced program for juniors and seniors. A student who has successfully completed the Basic course, who meets the physical requirements, who has earned sufficient academic credits to be designated as an academic junior, and is recommended by his instructors, may enter the Advanced course offered during the junior and senior years. Successful completion of the Advanced program qualifies the student for a regular or reserve commission.

Scholarship Program. Scholarships are available to selected ROTC students who are strongly motivated toward a career in the Army. Each scholarship pays for tuition, books and laboratory expenses, in addition to $100 per month during the school year for the duration of the award, except during the Advanced course

summer training camp at the end of the junior year when the pay is at the rate of one-half the base pay of a second lieutenant with less than two years of service per month. Only students who participate in the four-year program are eligible. For further information concerning the scholarship program, contact the Office of the Professor of Military Science.

The requirements for formal enrollment in the Advanced ROTC Program are as follows:

Junior Year. Must have successfully completed all previous military science courses, have acquired a passing grade on a general intelligence test which is administered during the sophomore year, be physically qualified, and must have acquired the credits, a grade-point ratio of 2.0 and be designated an academic junior. The number of credits required for participation in the Advanced course complements the academic requirements of the University and insures that the cadet receives his commission and his diploma simultaneously.

Senior Year. Must have successfully completed all previous military science courses and have attended summer camp, must be an academic senior, and have the cumulative grade-point ratio required for graduation.

Exceptions, where warranted, to the above general rules may be made by the Head of the Military Science Department.

During the four years of general military instruction, students will have the opportunity to indicate their preference for assignment to a particular branch. Final assignment authority remains with the Department of the Army and will be dependent upon such factors as the student's major academic course, class standing, qualities of leadership, the requirements and existing vacancies in the various branches of the Army, in addition to the student's choice.

Outstanding Army ROTC cadets who attain grades in the upper half of the class in academic subjects and the upper third in military science subjects upon completion of their junior year and summer camp, and who possess outstanding qualities of leadership, character, and aptitude for military service may, with the approval of the University President, be designated as Distinguished Military Students by the Head of the Military Science Department. Those who maintain this outstanding record during their senior year may be designated Distinguished Military Graduates. A Distinguished Military Student may apply for appointment as a Second Lieutenant in the Regular Army.

Flight Training Program. An Army ROTC student in his fourth year of Military Science, or having completed his fourth year of Military Science, but not completed his academic requirements for

graduation, may enroll in the Army ROTC Flight Training Program. If accepted, the student will receive 35 hours of ground school and 36½ hours of flight training at Government expense, after which the student may qualify for his FAA license and be recommended for further flight training upon entry on active duty. To be accepted in the Flight Training Program the candidate must agree that if commissioned at time of graduation, he will volunteer for Army Aviation Flight Training and assignment, and to serve on active duty as a commissioned officer for not less than three consecutive years from the date of completion of the Army Aviation Flight Training Course, in addition to meeting other physical and mental requirements.

ROTC students receiving commissions in the Regular Army or Army Reserve have the opportunity to apply for graduate school. If approved by the Army, the applicant may be allowed to delay entry upon active duty to complete graduate study.

The student who receives his commission through Army ROTC is appointed in the Army Reserve as a Second Lieutenant and called to active duty for two years or participate in active duty for training of three to six months. Graduates of the program who enter active duty for two years will acquire a six-year military obligation, only three of which would be in the Ready Reserve.

A recapitulation of Army service obligation is listed below:

Total Obligation	Active Duty Performed	Ready Reserve Obligation	Standby Reserve Obligation
8 Years	3–6 Months	Remainder of 8-Year Obligation	0
6 Years	2 Years	3 Years	1 Year
6 Years	3 Years	0	3 Years
6 Years	4 Years	0	2 Years

HISTORY

It was the fall of the year and likely one of those blustery days as the horsedrawn carriage slowly rolled to a stop on a Pendleton road in 1886.

The driver, a tall, distinguished-looking man in his late 70's peered from the carriage as if looking for someone he knew. Soon, another aged man approached the carriage, exchanged greetings with the first, and the two men—Thomas Green Clemson and Senator Benjamin Ryan Tillman—drove away together toward historic Fort Hill, a plantation some four miles away and the former homestead of John C. Calhoun, Clemson's late father-in-law.

Mr. Clemson had invited Senator Tillman to his home to discuss their mutual conviction that South Carolina needed a separate

college devoted to industrial and scientific education. At Fort Hill, they met with Colonels D. K. Norris and R. W. Simpson. There the four "spent nearly the whole day in talking over the new project which Mr. Clemson had in mind and which he unfolded to us," Tillman later wrote.

Perhaps the most significant result of this conference was Mr. Clemson's decision to change a will he had made three years earlier and to execute a new will so as to serve better the great purpose which he had had in mind for many years.

Although his will of 1883 sought to provide for establishment of a scientific institution upon the Fort Hill place, Mr. Clemson later decided that his intention and purpose as stated in that will may be misunderstood.

In his new will, executed November 6, 1886, Mr. Clemson wrote that he desired to make his purpose plain and to make some other changes in the disposition of his property. He clearly explained the nature and purpose of his proposed institution, the establishment of which "is now the one great desire of my life."

"It should afford thorough instruction in agriculture and the natural sciences connected therewith; it should combine, if practicable, physical and intellectual education, and should be a high seminary of learning in which the graduate of the common schools can commence, pursue and finish the course of studies terminating in thorough, theoretic and practical instruction . . ."

The first item of the new will concerned disposition of the 814 acres of the Fort Hill place and was largely taken from the 1883 will.

The will gave to the state all that part of the Fort Hill Estate inherited by Mrs. Clemson (the former Anna Maria Calhoun who died in 1875, thirteen years before her husband) from her mother and the bulk of Mr. Clemson's other real and personal property. The latter amounted to a sum which, considering the purchasing power at the time, probably has been only a few times exceeded in a public benefaction in South Carolina.

Mr. Clemson's will also provided for a seven-member Board of Trustees that would govern and manage the new institution. Named were: Colonels Simpson and Norris, M. L. Donaldson, R. E. Bowen, B. R. Tillman, J. E. Wannamaker, and J. E. Bradley, who with those chosen by the General Assembly, would constitute a governing board if the state accepted the bequest; but, who, in the event the state declined the bequest, would alone constitute a governing board for a private institution.

These seven trustees, along with other friends of the movement and the agricultural groups in the state, developed and organized a public opinion favorable to the plan.

In November, 1889, the South Carolina General Assembly accepted the terms of Mr. Clemson's will and following the decision of the U.S. Supreme Court to uphold the will, the State of South Carolina and the full Board of Trustees proceeded to convert the dream of Thomas G. Clemson into the reality of Clemson College.

The institution formally opened in July, 1893, with an enrollment of 446 students. The first graduating exercises were held in December, 1896, with a graduating class of 37—15 in the agricultural courses and 22 in engineering courses.

The college was also established under the Morrill Land-Grant Act passed by the National Congress in 1862. Clemson University, therefore, is a member of the national system of Land-Grant Colleges and Universities.

In 1964, in recognition of expanded offerings of the institution not only in the areas of agricultural and mechanical arts but also in the sciences and arts, the name of the institution was changed to Clemson University. This change by the legislature, effective July 1, 1964, followed a recommendation to that body by the Board of Trustees.

LOCATION

The University is located on the Fort Hill homestead of John C. Calhoun, in the foothills of the Blue Ridge Mountains. It has an elevation of 800 feet above sea level and commands an excellent view of the mountains to the north and west, some of which attain an altitude of over 5000 feet.

The University is located at Clemson, South Carolina, on the main line of the Southern Railway. U.S. Highways numbers 76 and 123 pass through Clemson, and daily bus service at regular intervals is available.

BUILDINGS AND GROUNDS

Change, challenge, and continuity are embodied in the architecture and landscape of Clemson University. The campus skyline is constantly changing, reflecting the new demands of the institution as it moves into the decade of the 70's and beyond.

While the challenges of the future—solving problems like environmental pollution—are symbolized by such buildings as the impressive new $2.4 million Rhodes Engineering Research Center (dedicated primarily to environmental and biomedical research), Clemson's long, rich tradition of education, scientific research, and public service is brought to mind by historic structures like the Tillman Hall tower, focal point of the campus, whose cornerstone was laid in 1891.

The campus proper consists of 600 acres and represents an investment of approximately $70 million in academic buildings, student housing, service facilities and equipment. Basically, this is the site of Thomas Green Clemson's plantation, willed to South Carolina in 1888 for the establishment of the University. Fort Hill, former home of both Mr. Clemson and his father-in-law, John C. Calhoun, has been preserved at the center of the campus as a national shrine.

Beyond the main campus, stretching into Oconee, Pickens, and Anderson counties, are another 24,000 acres of farm and agricultural and forestry research lands. Throughout the state are 6,800 more acres devoted to Agricultural Experiment Station research and 4-H Club activities.

One of the central features of campus development, the Robert Muldrow Cooper Library, was completed in 1966. This beautiful structure houses some 480,000 volumes and is the permanent home of papers and souvenirs of State Senator Edgar A. Brown, as well as valuable collections of papers and letters of John C. Calhoun, the late James F. Byrnes, and other famous South Carolina statesmen.

Other new facilities completed under the current building program are three high-rise residence halls which currently hold 1,296 students, a 34-bed hospital and outpatient clinic, an East Campus cafeteria, an arts and sciences classroom building and 10-story faculty office tower, and the multipurpose J. C. Littlejohn Coliseum, which seats 10,500 people for basketball games and 12,000 for speaking engagements, concerts and other functions.

Teaching and laboratory facilities of the College of Agricultural Sciences are housed in the R. F. Poole Agricultural Center complex. Another grouping serves the College of Engineering, including Olin Hall for Ceramic Engineering and Earle Hall for Chemical Engineering. These two buildings and their excellent equipment represent gifts from the Olin Foundation totaling nearly $2 million dollars.

Sirrine Hall is the home of the College of Industrial Management and Textile Science, where government and industrial cotton fiber testing laboratories are located. The College of Architecture is located in the modern, well-equipped Lee Hall. Other groupings of classrooms and laboratories serve the College of Education, the College of Liberal Arts, the College of Physical, Mathematical and Biological Sciences, and the College of Nursing.

The current building program includes plans for construction of a $6 million University union and related facilities, a new building to house agricultural administration and the recently established

College of Forest and Recreation Resources, a biological sciences building, and a $2.1 million addition to the College of Architecture.

The University's seventeen residence halls for men and women accommodate nearly 5,330 students. One hundred and fifty individual units and apartments provide living accommodations for another 289 married students.

Student Life and Activities

STUDENT BODY

The students of Clemson University believe that student government is necessary and beneficial and that every student should be represented in this government. All registered undergraduate and graduate students are, upon payment of the student activities fee, members of the student body of Clemson University which in turn is represented by the student government.

Student government is actively sponsored and highly effective at Clemson. The three branches of government are patterned after our federal system; however, there are no political parties within the framework of this student organization. February and March are election months for student body officers. Elections for student senators are held in September. Students interested in self-government are encouraged to participate in this active student organization.

STUDENT PUBLICATIONS

Chronicle is a student variety magazine published four times a year.

Taps is the yearbook published by the students of the University.

The Tiger is a weekly paper published by the students of the University.

STUDENT CENTER

The student center, located in Johnstone Hall, has a student lounge with space for reading and television. On the third floor there are meeting rooms and the student chapel. Also in this area are the offices of student publications, such as *The Tiger,* student newspaper; the *Taps,* annual publication; and Radio Station WSBF. The Information Center is on the second floor near the student lounge. The bookstore, post office, and canteen are located on the levels below the loggia.

CULTURAL, MUSICAL AND THEATRICAL ACTIVITIES

University Concert Series

Each year since 1940 Clemson University has sponsored a concert series. All Clemson students paying full-time student activities fees are admitted to these concerts without charge. Others, including faculty members, may purchase tickets at a moderate cost.

Program of Concerts for 1972-73

Itzhak Perlman, Violinist..................September 25, 1972
The Gregg Smith Singers....................November 14, 1972
"Heavy Organ," with Virgil Fox and
Pablo's Lights ....February 19, 1973
Les Ballets Africains ....March 8, 1973
Houston Symphony Orchestra, Lawrence Foster Conducting,
with Piano Soloist Horacio Gutierrez..........March 13, 1973

Architectural Foundation Lectures and Exhibits

The College of Architecture at Clemson is able to present annually an outstanding series of lectures, which are open to all Clemson students, through financial grants from the Clemson Architectural Foundation. The Foundation also presents an annual schedule of at least twelve art exhibits in the Architectural College gallery, which is open to the public weekdays between 9 a.m. and 4:30 p.m.

Music and Theater

Tiger Band. The Tiger Band and Color Guard, composed of approximately 140 members, participate in football games, pep rallies, functions, and parades throughout the South. This band has appeared in major stadiums in many states, including the Gator, Orange, Sugar, and Bluebonnet Bowls and has performed on national television. The Tiger Band makes several out-of-town trips during the fall season. A smaller "pep band" from its ranks performs at all home basketball games.

Concert Band. The Clemson Concert Band is composed of the better musicians on campus. It is formed at the end of the football season, and gives concerts both on and off the campus, including a tour in the spring. This organization plays music of the great composers in addition to lighter fare.

University Chorus. The University Chorus comprises some eighty students who perform a wide variety of choral music in concerts presented on campus and on an annual spring concert tour. An audition is required for new members, with prime consideration given to singing ability and balance of voices.

Clemson Players. This is the dramatic club of the University and is open to all students interested in dramatics. Four productions are presented annually.

UNIVERSITY UNION PROGRAMS

The purpose of the University Union on the campus is to serve the social, cultural, recreational, and spiritual needs of students. The University Union Governing Board, consisting of students, faculty, and alumni as well as the University Union staff, has the responsibility of planning and administering Union programs. Programs already underway are the coffee house, small concerts and jam sessions, Scuba Club, karate, and tutoring programs. Many others are in the planning phase.

The University Union is divided into five departments—the University Union building, the Holtzendorff YMCA Center, Foreign Student Affairs, Religious Affairs, and Community Services.

Union Building Activities

Activities planned in the Union building will include lounges, TV room, billiards, bowling, coffee house, meeting rooms, and club offices. A comprehensive social, recreational, and cultural program will be offered.

Holtzendorff YMCA

The "Y" is another area set aside for Union programs and includes a Health Club, game room, theatre, meeting rooms, coffee house, and other facilities. A major share of Union programming at the YMCA Center are activity groups such as karate, scuba diving, lifesaving, exercise groups, and interest groups.

Religious Affairs

Religious life on the campus is coordinated by the Union Director in cooperation with local University ministers and clergymen. The YMCA building provides a place for denominational groups not having a church at Clemson, as well as for many interdenominational groups. The Student Center in Johnstone Hall also contains a student chapel which is available for use on a regularly scheduled basis.

Student religious organizations at Clemson offer students an opportunity to grow spiritually and socially. These organizations are as follows:

> Agape
> Baptist Student Union
> Campus Crusade for Christ
> Christian Science Organization

Episcopal Student Association
Hillel-Brandeis (Jewish)
Lutheran Student Association
The Navigators
Newman Student Association (Catholic)
Wesley Foundation (Methodist)
Westminster Fellowship (Presbyterian)

Foreign Student Affairs

The University feels strongly that special emphasis should be placed on work with foreign students. An assistant director of the University Union is director of Foreign Student Affairs, and gives guidance to its program of education, social life, personal counseling, and legal affairs.

Community Services

Many students at Clemson are concerned not only about fellow students but also about persons in the Clemson community and surrounding area. This concern becomes involvement and action as students go out into the community to serve as volunteer coaches, tutors, friends, counselors, candy stripers, helpers in day care centers, children's homes, and in other different ways. The purpose of the Community Services program is to coordinate these efforts and services to better serve the campus and community.

The general purpose of the overall campus Union program is to serve student needs and interests, and the Union will continually seek to provide these opportunities for students on the Clemson University campus.

CAMPUS LEADERSHIP AND SERVICE

Block "C" Club. The Block "C" Club includes varsity lettermen in baseball, basketball, football, track, cheerleading, swimming, fencing, and soccer.

Tiger Brotherhood. A local honorary service fraternity composed of men students from the upper three classes who have demonstrated ability, character and loyalty to Clemson University.

Circle "K" International. International Service Club for college men sponsored by Kiwanis International.

Central Dance Association. The C.D.A. staff is responsible for planning and coordinating major dance weekends at which time name entertainment is brought to the campus.

WSBF. WSBF is an educational radio station managed, maintained, and operated by a student staff for the enjoyment of the Clemson student body and the surrounding academic community. The station broadcasts 24 hours a day on both open circuit FM

and closed circuit AM from a modern studio in the University Student Center.

Order of Athena. A local honorary society for senior women who have maintained a high standard of scholarship, demonstrated leadership, and shown a spirit of service to the University.

NATIONAL HONOR SOCIETIES

Clemson University has chapters of the following members of the Association of College Honor Societies:

Alpha Epsilon Delta (Pre-medical—Men and Women)
Alpha Lambda Delta (Scholarship—Freshman Women)
Delta Sigma Rho-Tau Kappa Alpha (Forensics)
Eta Kappa Nu (Electrical Engineering—Men and Women)
Kappa Delta Pi (Scholarship—Junior, Senior, Graduate Men and Women in Education)
Phi Eta Sigma (Scholarship—Freshman Men)
Phi Kappa Phi (Scholarship—Junior and Senior Men and Women)
Tau Beta Pi (Engineering—Men and Women)
Tau Sigma Delta (Architecture and Allied Arts—Men and Women)

Other Honor Societies

Sigma Xi (Scientific Research—Men and Women)
Xi Sigma Pi (Forestry—Men and Women)

NATIONAL RECOGNITION SOCIETIES

The following national recognition societies have chapters established at Clemson:

Alpha Phi Omega (Campus Service—Men)
Alphi Psi Omega (Drama)
Alpha Zeta (Agriculture)
Angel Flight (Air Force—Women)
Arnold Air Society (Air Force—Men)
Block and Bridle Club (Animal Science)
Blue Key (Scholarship, Leadership, Service—Men)
Fourth Regimental Headquarters (Coed Affiliates of Pershing Rifles)
Gamma Sigma Delta
Iota Lambda Sigma (Industrial Education)
Pershing Rifles—Company C-4 (Military)
Pershing Rifles—4th Regimental Headquarters
Scabbard and Blade—Company K-7 (Military)

DEPARTMENT AND PROFESSIONAL ORGANIZATIONS

Accounting Club
Agricultural Sciences Council
Agronomy Club (Kappa Alpha Sigma)
Alpha Tau Alpha (Agricultural Education)
American Agricultural Economics Association
American Association of Textile Chemists and Colorists
American Association for Textile Technology
American Ceramic Society
American Chemical Society (Student Affiliates)
American Civil Liberties Society
American Institute of Aeronautics and Astronautics
American Institute of Architects
American Institute of Chemical Engineers
American Institute of Planners
American Society of Agricultural Engineers (Student Branch)
American Society of Civil Engineers
American Society of Horticultural Science
American Society of Mechanical Engineers
American Society for Microbiology
Associated General Contractors of America, Inc.
Botany Club
Calhoun Forensic Union
Calhoun Literary Workshop
Capers (Coed Pershing Rifles)
Counter Guerrilla Platoon
Dairy Science Club
Delta Sigma Nu (Pre-med)
Food Science Club
Forestry Club
French Club
Gamma Alpha Mu (English)
German Club
Graphic Arts Society
Historical Society
Horticulture Club
Institute of Electronic and Electrical Engineers
Iota Mu Sigma (Industrial Management)
Keramos (Ceramics)
Mu Beta Psi (Music)
Newtonian Society (Mathematics)
Omicron Delta Epsilon (Agricultural Economics and Economics)
Outing Club
Periaktoi
Phi Psi (Textile Arts)
Photography Club

Poultry Science Club
Pre-veterinary Club
Psi Mu Psi (Music—Women)
Psychology Club
Recreation and Park Administration Club
Sigma Lambda Chi (Construction)
Sigma Pi Sigma (Physics)
Sigma Tau Epsilon (Arts and Sciences)
Society for the Advancement of Agricultural Education
Society for Advancement of Management
Society of American Foresters
Society for American Military Engineers
Society for Engineering Technology
Society of English Graduate Students
Society of Physics Students
Spanish Club
Student Education Association
Student Nurses Association
Theta Chi Epsilon (Civil Engineering)
Zoology Club

GENERAL ORGANIZATIONS

Aero Club
Amateur Radio Club
Bahai Club
Bowling Team
Chess Club
Dixie Skydivers Sport Parachute Club, Inc.
Fellowship of Christian Athletes
Fine Arts Film Club
Four-H Club
Gamma Omega Phi
Girls' Service Sorority
Kappa Alpha Sigma
Phi Alpha Xi
Phi Sigma Club
Rifle Club
Sailing Club
Ski Club
Skin and Scuba Diving Club
Soccer Booster Club
Sports Car Club
Stripes
Student Association for Mental Retardation
Student League for Black Identity
Student Organizing Committee

Students for Educational Aid
Students International Meditation Society
Tae Kwon Do Club (Karate)
University Democrat Club
University Republican Club
Veteran's Club
Water Polo Club
Weightlifting Club
Women's Fencing Club
Women's Swimming Team
Wrestling Club

SOCIAL FRATERNITIES AND SORORITIES

The Interfraternity Council serves as the coordinating and governing body of the social fraternities. The Panhellenic Council coordinates the activities of the social sororities.

Fraternities

Alpha Gamma Rho (Colony)
Alpha Tau Omega
Beta Theta Pi
Chi Psi
Kappa Alpha
Kappa Sigma
Phi Delta Theta
Phi Gamma Delta (Colony)
Pi Kappa Alpha
Sigma Alpha Epsilon
Sigma Nu
Sigma Phi Epsilon
Theta Chi

Sororities

Chi Omega
Delta Delta Delta
Kappa Alpha Theta
Kappa Kappa Gamma

REGIONAL CLUBS

The regional clubs of Clemson University are composed of international clubs, and clubs representing the various counties in the state. The regional clubs are comprised of students who wish to unite with other students from their own home areas. These clubs include:

International Student Association
Kappa Delta Kappa (Dillon County)
Colleton County Club

ATHLETIC PROGRAM

The University encourages students' interests in sports and recreational oriented activities through intercollegiate athletics, intramural programs, and planned University Union activities.

Clemson is a member of the Atlantic Coast Conference and the National Collegiate Athletic Association. Its athletic teams, the Tigers, regularly play teams of that conference and other major colleges and universities. Membership of the Atlantic Coast Conference includes—in addition to Clemson University—Duke University, North Carolina State University, University of Maryland, University of North Carolina, University of Virginia, and Wake Forest University. The intercollegiate athletic program includes football, basketball, baseball, track, tennis, golf, swimming, cross-country, soccer, and fencing. Intercollegiate schedules as a part of programmed union activity, or competition at club or team levels are conducted in bowling, rifle marksmanship, rugby, sailing, and wrestling.

Each year teams are formed in softball, football, volleyball, and basketball in the intramural program, with champions determined in each sport through a tournament. Other tournaments are conducted or arranged for in track, bowling, horseshoes, soccer, tennis, cross-country, and winter skiing.

Among the facilities for intramural and intercollegiate athletics at the University are tennis courts, baseball and track facilities, basketball courts, softball fields, tag football fields, handball courts, space for wrestling, a 1000″ indoor rifle range, and an indoor natatorium. Memorial Stadium will seat 43,451 people and the Littlejohn Coliseum has a seating capacity of approximately 10,000 for basketball and up to 12,000 for other events. The Fike Recreation Center accommodates intramural activities, and provides for indoor recreational needs of the University community.

AUTOMOBILE PRIVILEGES AND PARKING REGULATIONS

All motor vehicles owned and operated on the campus by students, faculty, and staff members must be registered with the designated authorities.

Scholastic Regulations

Academic Standards. Proper discharge of all duties is required at Clemson University, and a student's first duty is his scholastic work. All students should be thoroughly acquainted with and cognizant of these basic requirements.

The Credit System. The semester hour is the basis of all credits. Generally, one recitation hour or three laboratory or shop hours a week for a semester constitute a semester hour. Thus, in Engl 101, English Composition, 3 cr. (3,0), as you will find this subject listed in the Degrees and Curricula, the student takes three semester hours. When he completes this course satisfactorily, he is granted three semester credit hours on his record. The notation "3 cr. (3,0)" means that the course carries three credits, has three clock hours of theory or recitation per week, and no laboratory hours. Ch 101, General Chemistry, 4 cr. (3,3), carries four semester hours, has three hours of theory, and a three-hour laboratory period.

Semester Grades. The standing of a student in his work at the end of a semester is based upon daily classwork, tests or other work, and the final examinations. Faculty members may excuse from the final examinations all students having the grade of A on the work of the course prior to the final examination, but for all other students written examinations are required in all subjects at the end of each semester, except in certain laboratory or practical courses in which final examinations are not deemed necessary by the department faculty.

Scholastic reports are mailed to parents four times each year, including a preliminary statement of progress near the middle of each semester, and a final report at the end of each semester.

The Grading System. The grading system is as follows:

A—*Excellent.* Indicates that the student is doing work of a very high character. The highest grade given.

B—*Good.* Indicates work that is definitely above average, though not of the highest quality.

C—*Fair.* Indicates work of average or medium character.

D—*Pass.* Indicates work below average and unsatisfactory. The lowest passing grade.

F—*Failed.* Indicates that a student knows so little of the subject that it must be repeated in order that credit may be received.

I—*Incomplete Work.* Indicates that a relatively small part of the semester's work remains undone. Grade I is not given a student who has made a grade F on his daily work. Students are allowed thirty days after the beginning of the next semester in which the student is enrolled to remove the incomplete grades unless (1) an extension of time is approved by the instructor concerned, or (2) within one year of residence after receiving such a grade, a student repeats the conditional course satisfactorily at Clemson, in which case no credit hours taken shall be recorded for the grade of I. A student who elects to repeat an incomplete course is responsible for notifying the Office of Admissions and Registration of his election during the semester in which the course is taken. This regulation applies only to the first time that a course is repeated.

In order to make up incomplete work, the student must first obtain a permit card from the Office of Admissions and Registration. This card serves as the authority for the removal of the I and also as a form for reporting the final grade.

WP—*Withdrew Passing.* This grade indicates that the student withdrew from the course while doing satisfactory work. No credit hours taken are recorded for the grade of WP provided that the course is dropped prior to the last three weeks of classes in the semester. Only semester grades shall be given and recorded for courses dropped during the last three weeks.

WF—*Withdrew Failing.* Indicates that the student withdrew from the course while doing unsatisfactory work. The credit hours of a subject on which the grade of WF is received are counted as credits taken in computing the student's grade-point ratio.

Pass-Fail Option. Juniors or seniors enrolled in a four-year curriculum may take four courses (maximum of 14 credit hours), with not more than two courses in a given semester on a pass-fail basis. Transfer and five-year program students may take pass-fail courses on a pro rata basis.

Required courses, courses in the major field, or courses that are needed to fulfill departmental requirements may not be taken pass-fail.

Letter graded courses which have been failed may not be repeated pass-fail.

Honors Program may exercise an option as to acceptance of pass-fail grading for Honors courses.

Registration in pass-fail courses will be handled in the same manner as for regular enrollment. Departmental approval must be obtained via approval form and returned to the Office of Admissions and Registration in accordance with the University Calendar for adding courses.

Instructors will submit letter grades to the Office of Admissions and Registration. These grades will then be converted as follows: A, B, C to P (pass); D, F to F (fail). Only P (minimum letter grade of C), or F will be shown on a student's permanent record, and will not affect the grade-point ratio.

If a student changes to a major which requires a previously passed course, and this course has been taken pass-fail, he may request (a) to take the course on a letter-graded basis, (b) "pass" be changed to C, (c) substitution of another course.

In the event limited enrollment in a class is necessary, priority will be given as follows: (a) majors, (b) letter-graded students, (c) pass-fail students, and (d) auditors.

Dropping Classwork. A subject dropped after the first four weeks of classwork is recorded as "Withdrew Passing" or "Withdrew Failing" depending upon the student's grade in the course at the time the subject was dropped.

Upon the recommendation of the instructor and the dean concerned, a student's standing will be investigated and he may be required to drop a subject because of neglect, or lack of application or preparation. No student will be dropped under this rule without approval of the President.

Removal of Failures. A student who has failed (made a grade F) in a subject cannot receive credit for that subject until it has been satisfactorily repeated hour for hour in class, except that in the case of correlated laboratory work, the number of hours to be taken shall be determined by the instructor. Where separate grades for class and laboratory work are given, that part of the subject shall be repeated in which the failure occurs.

Rescheduling Courses Failed. A student who wishes to reschedule a course he has failed must do so within his next year of residence, or if the course is not offered during this year of residence, he must reschedule the course the first time it is offered thereafter during his attendance at Clemson.

Rescheduling Courses Passed. A student may repeat a course he has passed with a grade lower than B provided he does so within three semesters of residence after the completion of his original enrollment in the course.

Scheduling Remedial Mathematics. Any student who has passed a course in freshman mathematics is ineligible to enroll in Remedial Mathematics.

Advanced Placement and Credit by Examination. In addition to earning credit by the usual method involving classroom attendance, a student may receive credit toward his degree by completing a course successfully by examination only. Freshmen interested in exempting some of the elementary courses in this manner should participate in the College Board Advanced Placement Examination program, and have the results of these tests sent to Clemson.

Certain departments will also grant credit for successful completion of College-Level-Examination Programs (CLEP) subject examinations which are administered by the College Board.

Credit may be earned by enrolled students by means of a special examination without the necessity of class attendance subject to the following requirements:

1. The applicant must present evidence which would indicate that he has received training or taken work which is approximately equivalent to that given in the course at Clemson for which an examination is requested and that an examination is warranted.

2. The applicant must not have previously failed or audited the course at Clemson.

3. The applicant must apply in writing for the examination and the request must be approved by the instructor, head of the department in which the course is taught, dean of the college or school in which the course is taught, and the Dean of Admissions and Registration. Application forms are available in the Office of Admissions and Registration.

4. Credit (CR) will be awarded for acceptable work in lieu of letter grades in recognition of college-level achievement as determined by College Board Advanced Placement Examinations, College-Level Examination Program subject examinations, institutional special examinations, and similar instruments.

Work Taken at Another Institution. Clemson students may receive credit for work taken at another institution; however approval of the work should be obtained by the student prior to scheduling the work. Information and forms relative to this approval may be obtained in the Office of Admissions and Registration. By obtaining advance approval the student is assured of receiving proper credit at Clemson provided he passes the work with a grade of C or higher.

Classification. All new students are classified as freshmen unless they have attended another college prior to entrance. For those students who have completed college work elsewhere, classification

will be based on semester hours accepted at Clemson rather than the amount of work presented.

To be classified as a sophomore, a student must have completed at least 30 semester hours.

To be classified as a junior, a student must have completed at least 60 semester hours.

To be classified as a senior, a student must have completed at least 95 semester hours.

Regular Advancement in Classification. All students are urged to meet the requirements for sophomore classification by the beginning of the second year, for junior classification by the beginning of the third year, and for senior classification by the beginning of the fourth year. Failure to meet these requirements can jeopardize a student's academic standing with the University.

Credit Load. Except for an entering freshman, who is restricted to the curriculum requirements of his major course, the credit load for an undergraduate must be approved by his class adviser. The class adviser will approve a credit load deemed in the best interest of the student based on such factors as course requirements, grade-point ratio, participation in other activities, and expected date of graduation.

Since grades are an important factor in determining credit loads, the student should be guided by the following table in presenting his schedule to his class adviser for approval:

Grade-Point Ratio (Semester or Cumulative, Whichever Is Higher)	Recommended Maximum Number of Semester Hours to Be Scheduled
0.00 to 0.99	14 to 16
1.00 to 1.99	16 to 18
2.00 to 2.99	18 to 20
3.00 to 4.00	20 to 22

When any full-time student reduces his credit load below 12 hours, but is still carrying 9 or more, he may be suspended for at least the remainder of the semester upon recommendation of the Vice President for Student Affairs and approval of the President. When a student reduces his credit load below 9 hours he shall be suspended for at least the remainder of the semester.

ROTC Credit. Ten hours of aerospace studies or military science may be counted toward the baccalaureate degree in any curriculum.

Grade Points. Four grade points are assigned for each credit hour on which the student receives the grade of A, 3 grade points for each credit hour of grade B, 2 grade points for each credit hour of grade C, and 1 grade point for each credit hour of grade D. No grade points are assigned for grades F, I, WP, or WF.

Grade-Point Ratio. In calculating a student's grade-point ratio, the total number of grade points accumulated by the student is divided by the total number of credit hours taken by the student at Clemson during the semester, session, or other period for which the ratio is calculated.

The grade-point ratio of students entering college for the first time will be determined as follows: Students entering during the summer sessions or fall semester will have only those courses passed for credit during the summer sessions and/or the following fall semester counted toward their grade-point ratio; students entering the spring semester will have only those courses passed for credit during the spring semester and/or the following summer sessions counted toward their grade-point ratio. This policy does not apply to transfer students.

Minimum Requirements for Continuing Enrollment. At the end of the academic year in May, all student records are inspected for quality. At that time in order to be able to continue his enrollment, a student who has taken a total of:

(a) 12 to 59 credit hours at Clemson must have a cumulative grade-point ratio of 1.30 or above.
(b) 60 to 89 credit hours at Clemson must have a cumulative grade-point ratio of 1.50 or above.
(c) 90 or more credit hours at Clemson must have a cumulative grade-point ratio of 1.70 or above.

A student completing a regular session has the privilege of continuing his enrollment through the immediately following summer session at Clemson or in Clemson parallel programs in an effort to meet the above requirements.

A student who has taken fewer than 90 credit hours at Clemson and who fails to meet the required grade-point ratio, as indicated in the table above, may apply for readmission after a minimum of one semester has elapsed. A student who has taken 90 or more credit hours and fails to meet the required grade-point ratio is permanently ineligible for readmission. Any exceptions to these minimum requirements for continuing enrollment and readmission must be approved by the Committee on Admissions and Continuing Enrollment.

Withdrawal from the University. A student may withdraw from the University any time before the last three weeks of classes in the semester without having grades recorded. A student enrolled the last three weeks of classes shall have final semester grades recorded.

A student withdrawing from college after preliminary reports are due must be passing a minimum of 12 semester credit hours at

the time of withdrawal to qualify for re-enrollment the following semester.

After the first withdrawal from college the student is eligible to continue his enrollment the following semester, provided he meets other applicable regulations. For each succeeding withdrawal, however, the student shall be ineligible to continue his enrollment the following semester unless there are extenuating circumstances approved by the Committee on Admissions and Continuing Enrollment.

Course Prerequisites. Prerequisites for individual courses are enumerated under the course listings in the Description of Courses. In addition to these requirements, colleges and departments may also establish other standards as conditions for enrollment. In the College of Engineering a grade-point ratio of 1.8 or higher is required for registration in all engineering courses numbered 300 or higher. In the College of Nursing, a grade-point ratio of 1.8 or higher is required for registration in all nursing courses numbered 300 or higher. The College of Education requires a cumulative grade-point ratio of 1.6 or higher to enroll in 300-level education courses and a cumulative grade-point ratio of 1.8 for 400-level education courses. Directed teaching and teaching methods courses require a minimum cumulative grade-point ratio of 2.0.

Auditing Policies. Qualified students may audit courses upon the written approval of the professor, head of the department and the dean of the college concerned, and must register with the Dean of Admissions and Registration. Auditors are under no obligation of regular attendance, preparation, recitation, or examination and receive no credit. Participation in classroom discussion and laboratory exercises by auditors is at the discretion of the instructor. A student who has previously audited a course is ineligible for credit by examination.

A full-time undergraduate student with approval may audit courses at no additional charge as long as the student's credit load, including the course audited, is approved by his class adviser.

A graduate student regularly enrolled for a minimum of six semester hours may, with approval, audit one additional course without charge.

Members of the University teaching staff and the professional staff in research and agricultural extension may with approval audit courses without charge. Other full-time University employees may audit without charge with the additional approval of the employee's immediate supervisor and the Comptroller.

Honors and Awards Day. Each spring an Honors and Awards Day is held for students who qualify for the honor list and for

special awards. A cumulative grade-point ratio of 3.00 to 3.49 is required for listing with honor, 3.50 to 3.79 for high honor, and 3.80 or above for inclusion with highest honor.

Honors Program. The Honors Program at Clemson University provides for the fuller development of our most able students. They meet in small classes with outstanding professors and explore the subject matter of a course in greater depth than other students are able to do. The identification and selection of Honor students begins with their freshman year, and Honors courses are provided at all four levels of undergraduate instruction. To remain in the Honors Program a student must maintain a cumulative grade-point ratio of 3.0.

An Honors Council composed of faculty members from each college is responsible for planning and supervising the Honors Program. *The Honors Program Student Handbook* is available for those who are interested.

Honor Graduates. Students who graduate in the Honors Program will have this fact indicated on their diplomas. Other graduates who meet the required qualifications are designated as having graduated with honor. A grade-point ratio of 3.00 to 3.49 is required for graduation with honor, 3.50 to 3.79 for high honor, and 3.80 or above for graduation with highest honor.

Residence Requirement for Graduation. In order to qualify for an undergraduate degree, a student must spend at least the last year of residence at Clemson and complete at Clemson a minimum of 30 of the last 36 credits presented for the degree.

Examination on F Received in Last Semester. A candidate for a degree who, in the semester immediately prior to graduation, fails to graduate because of an F on one course taken in that semester may stand a special examination on the course provided:

1. That the candidate can furnish evidence of having done satisfactory study for the examination.

2. That the examination is not given until after the regular degree date.

3. That the candidate has fulfilled, prior to the due date for candidates' grades, all other requirements for his degree except those which can be fulfilled by passing the examination.

4. That the candidate by removing the F by examination will finish all requirements for his degree which will be awarded on the next regular date for award of degrees.

Makeup of I's Received in Last Semester. A candidate for a degree who in the semester immediately prior to graduation receives one or more grades of I shall have an opportunity of remov-

ing the unsatisfactory grades provided the final grades are received in the Office of Admissions and Registration by the time grades for candidates for graduation are due.

A candidate who qualifies for graduation under this regulation will be awarded his degree on the regular date for the award of degrees.

Special Graduation Requirements. A cumulative grade-point ratio of 2.0 is required for graduation. Candidates for degrees are required to apply for their diplomas within two weeks following the opening of the final semester or the opening of the summer session prior to the date the degrees are to be awarded. These applications should be filled out in the Office of Admissions and Registration on the regular blanks provided.

All work for a degree must be completed, all financial settlements made, and all government property and library books returned by 5 p.m. on the Tuesday preceding graduation.

A student in line for graduation at the end of this semester who fails to graduate because of an F on one course taken this semester may stand a special examination under certain conditions on the course *after the regular degree date.* A senior who qualifies for graduation under this provision will be awarded his degree *on the next regular date* for the award of degrees. For further information see paragraph Examination on F Received in Last Semester.

A student in line for graduation at the end of a semester or summer term who meets all requirements for graduation except for a deficiency in his grade-point ratio resulting from a deficiency of not more than six grade points shall have the privilege of making up his deficiency by standing special reexaminations under certain conditions.

The examinations shall be taken after the regular degree date and in courses totaling not more than six semester credit hours which were passed during the last year of residence, and only one such examination may be taken on an individual course. When such examinations are taken under the above provision, the credit hours of the course or courses will not be counted as additional credit hours taken. Only the grade points over and above the grade points previously earned in the course may count toward raising the grade-point ratio.

A student who qualifies for graduation under this provision will be awarded his degree on the next regular date for the award of degrees.

If all work toward a degree is not completed within five years after entrance, the student may be required to take additional courses.

Degrees and Curricula

UNDERGRADUATE CURRICULA AND DEGREES OFFERED

Undergraduate curricula are offered under the colleges of Agricultural Sciences, Architecture, Education, Engineering, Forest and Recreation Resources, Industrial Management and Textile Science, Liberal Arts, Nursing, and Physical, Mathematical and Biological Sciences.

The University grants the following degrees upon satisfactory completion of the requirements prescribed by the colleges listed:

Curriculum	Undergraduate Degree
College of Agricultural Sciences	
Agricultural Economics	B.S.
Agricultural Education†	B.S.
Agricultural Engineering*	B.S.
Agricultural Mechanization and Business	B.S. in Agriculture
Animal Industries	B.S.
Major concentrations:	
Animal Science	
Dairy Science	
Poultry Science	
Economic Biology	B.S.
Food Science	B.S.
Plant Sciences	B.S.
Major concentrations:	
Agronomy—Crops and Soil	
Horticulture—Fruit and Vegetable	
Horticulture—Ornamental	
Pre-veterinary	Nondegree
College of Architecture	
Building Construction	B.S.
Pre-architecture	B.A., B.S.
College of Education	
Agricultural Education†	B.S.
Early Childhood Education	B.A.
Elementary Education	B.A.
Industrial Education	B.S.

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Curriculum	Undergraduate Degree
Science Teaching	B.S.
Major concentrations:	
Biological Sciences	
Chemistry	
Earth Science	
Mathematics	
Physical Sciences	
Secondary Education	B.A.
Teaching majors:	
Economics	
English	
History	
Mathematics	
Modern Languages	
Natural Sciences	
Political Science	
Psychology	
Sociology	
College of Engineering	
Agricultural Engineering*	B.S.
Ceramic Engineering	B.S.
Chemical Engineering	B.S.
Civil Engineering	B.S.
Electrical Engineering	B.S.
Engineering Analysis	B.S.
Engineering Technology	B.S.
Mechanical Engineering	B.S.
College of Forest and Recreation Resources	
Forest Management	B.S.
Recreation and Park Administration	B.S.
College of Industrial Management and Textile Science	
Accounting	B.S.
Administrative Management	B.S.
Economics	B.A. in Arts and Sciences
Financial Management	B.S.
Industrial Management	B.S.
Textile Chemistry	B.S.
Textile Science	B.S.
Textile Technology	B.T.T.
College of Liberal Arts	
Major concentrations:	B.A.
English	
History	
Modern Languages	
Political Science	
Psychology	
Sociology	

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

Curriculum	Undergraduate Degree
College of Nursing	
Associate Degree Program	A.A. in Nursing
Baccalaureate Program	B.S. in Nursing
College of Physical, Mathematical and	
Biological Sciences	
Botany	B.S.
Chemistry	B.A. in Arts and Sciences, B.S.
Geology	B.A. in Arts and Sciences, B.S.
Mathematics	B.A. in Arts and Sciences, B.S.
Medical Technology	B.S.
Microbiology	B.S.
Physics	B.A. in Arts and Sciences, B.S
Pre-pharmacy	Nondegree
Zoology	B.S.

For detailed information concerning the programs of study and requirements in the colleges, the section describing each college should be consulted.

GRADUATE DEGREES

The degrees of Doctor of Philosophy, Master of Arts, Master of Science, Master of Agricultural Education, Master of Agriculture, Master of Architecture, Master of City and Regional Planning, Master of Education, Master of Engineering, Master of Fine Arts, Master of Forestry, Master of Industrial Education, Master of Nutritional Sciences, and Master of Recreation and Park Administration are awarded to those students who satisfactorily complete prescribed graduate programs. Also, the Master of Business Administration degree is available through a joint program with Furman University.

For further information concerning advanced degrees see *The Graduate School Announcements,* which may be obtained from the Office of the Dean of Graduate Studies and University Research.

Curricula Numbers

In the curricula which follow are given the official titles and number of the courses, the descriptive titles, the number of semester hours credit, and in parentheses, the number of hours per week in class and laboratory, respectively.

COLLEGE OF AGRICULTURAL SCIENCES

Modern agriculture is the science, business, and art of producing, processing, and distributing plant and animal products, including those aspects of economics and human relations connected with these activities. Agriculture is a unique area in education because it applies the basic sciences to biological material for economic implications.

Today's agriculture includes much more than farm production. About 6 million people provide supplies and services for farmers, and 10 million process and distribute farm products. These two segments together with farm production, which employs 5 million workers, provide jobs somewhere in agriculture for 21 million Americans—approximately one-third of all jobs.

Thousands of agricultural graduates are needed each year in this basic industry. Our land-grant colleges and universities are now

graduating considerably less than the total number needed to fill the jobs available each year—jobs important to every person, jobs with futures, jobs with challenge, jobs with personal and financial rewards.

The total program in Agriculture at this institution includes Resident Instruction, Research (Agricultural Experiment Station), and Extension (Agricultural Extension Service). Organized under Resident Instruction are curricula in Agricultural Economics, Agricultural Education,° Agricultural Engineering,† Agricultural Mechanization and Business, Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), Economic Biology (concentrations in Economic Zoology, Entomology, and Plant Pathology), Food Science, Plant Sciences (majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental), and Pre-veterinary Medicine.

The curricula in Agriculture are continuously revised to meet the changing needs of this dynamic industry. In this connection, students in many of the curricula now have the opportunity to specialize by choosing a minor in *Business, Environmental Science, International Agriculture, Production, Science,* or a *Second Department.*

Business Minor. This minor emphasizes principles and practices of business management as applied to businesses and industries associated with agriculture. It is designed for students who plan to work with one of the many businesses and industries that provide supplies and services for the farmer, and process and distribute farm products. Employment opportunities include work related to meat and poultry processing, sales and service of farm machinery, manufacturing and sales of fertilizers and pesticides, dairy and food processing, grain and seed processing, feed manufacturing, banking and credit, insurance, farm management, land appraising, and the marketing of agricultural commodities.

Environmental Science Minor. This minor emphasizes an understanding of the environment, including cause-and-effect relationships. It is designed for students who wish to supplement their undergraduate major with knowledge and skills uniquely applicable to the environment in relation to agriculture. Employment opportunities include agricultural processing plant management, fertilizer plant management, pesticide manufacture and sales, dairy plant management, food regulatory agencies, soils science, public health, and many other similar areas.

International Agriculture Minor. This minor emphasizes the international aspects of agriculture and applies basic scientific principles and agricultural practices to worldwide agriculture. It is

° Jointly administered by the College of Education and the College of Agricultural Sciences.
† Jointly administered by the College of Agricultural Sciences and the College of Engineering.

designed for students who contemplate work in international agricultural positions either in the United States or abroad. Employment opportunities include positions with the Foreign Agricultural Service of the United States Department of Agriculture, with foundations such as the Ford Foundation, with the Agency for International Development, with industries such as United Fruit Company, and with other domestic and foreign interests.

Production Minor.   This minor emphasizes the application of scientific principles to agricultural production. It is designed for students whose anticipated work requires broad general training in scientific and practical agriculture. Employment opportunities include general and specialized farming; agricultural extension services; teaching vocational agriculture; conservation of natural resources; agricultural communication; and agricultural services of the United States Department of Agriculture, State Departments of Agriculture and private enterprises.

Science Minor.   This minor emphasizes the basic sciences that prepare students to contribute to the advancement of knowledge in their respective fields. It is designed for students whose anticipated work requires considerable scientific training, usually including graduate studies. Employment opportunities include research with state Agricultural Experiment Stations, the United States Department of Agriculture, and industrial and commercial organizations; and teaching in colleges of agriculture, and other educational work with federal, state, and industrial organizations.

Second Department Minor.   This minor emphasizes special training in an area of study other than the major. A *Second Department* minor may be selected either within or outside of the College of Agricultural Sciences. It is designed for students who wish additional specialized training outside their major area of study. Additional information relative to employment opportunities open to students with a minor in a *Second Department* is given elsewhere in this catalog under the various curriculum listings.

To illustrate further the types of work in which graduates engage, a few of the many occupations of agricultural graduates are listed under each curriculum.

FRESHMAN YEAR CURRICULA

For students in Agricultural Economics, Agricultural Education, Agricultural Mechanization and Business, Animal Industries (majors in Animal Science, Dairy Science, and Poultry Science), and Plant Sciences (majors in Agronomy—Crops and Soils, Horticulture—Fruit and Vegetable, and Horticulture—Ornamental).

First Semester

BOT 101 Plant Biology	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)
or ZOOL 101 Animal Biology	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)
CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
HIST 102 American History	3	(3,0)
MATH 103 College Algebra†	2	(3,0)
Elective	1	
	17	

Second Semester

AGRIC 101 Intro. to Agriculture	1	(1,0)
CH 102 or 112 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 104 Trigonometry†	2	(3,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
or BOT 101 Plant Biology	3	(3,0)
and BOT 103 Plant Biology Lab.	1	(0,2)
Elective	1	
	15	

For students in Economic Biology and Food Science.

AGRIC 101 Intro. to Agriculture	1	(1,0)
BOT 101 Plant Biology	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)
or ZOOL 101 Animal Biology	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)
CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
MATH 103 College Algebra	2	(3,0)
MATH 104 Trigonometry	2	(3,0)
Elective	1	
	17	

CH 102 or 112 General Chemistry°	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
or BOT 101 Plant Biology	3	(3,0)
and BOT 103 Plant Biology Lab.	1	(0,2)
Elective	1	
	16	

° Economic Biology students take Ch 112.
† Eligible students in Agricultural Mechanization and Business curriculum may substitute Math 106 for Math 103, 104.

AGRICULTURAL ECONOMICS

The curriculum in Agricultural Economics places emphasis on a strong background in economic theory with applications to agricultural and agriculturally related businesses. Also included are courses in basic agricultural and biological sciences, liberal arts, and business. Students with a major in Agricultural Economics now have the opportunity to further specialize by selecting a minor in *Business, International Agriculture, Science,* or a *Second Department.*

Employment opportunities open to graduates with degrees in Agricultural Economics are many. They include research and teaching in institutions of higher learning; sales and promotional work for a variety of businesses; management positions in the farm loan departments of private banks or with cooperative farm credit agencies; public relations activities for various firms; market managers and directors; county agents; representatives of government agencies serving agriculture; and operators of numerous enterprises.

SOPHOMORE YEAR

First Semester		Second Semester	
AGRIC 201 Intro. to Animal Ind. 3	(2,3)	AG EC 202 Agric. Economics .. 3	(3,0)
AGRON 202 Soils 3	(2,2)	AG EC 305 Agric. Bus. Analysis. 3	(2,3)
ECON 201 Principles of Economics 3	(3,0)	or ACCT 201 Prin. of Account. 3	(3,0)
History–Literature Requirement° .. 3	(3,0)	AGRIC 202 Intro. to Plant Sci. .. 3	(2,3)
MATH 106 Calculus of One Var. 4	(4,0)	History–Literature Requirement° .. 3	(3,0)
Elective 1		PHYS 207 General Physics 4	(3,2)
17		Elective 1	
		17	

JUNIOR YEAR

AG EC 309 Economics of		AG EC 302 Agric. Firm Mgt. ... 3	(2,3)
Agricultural Marketing 3	(3,0)	AG EC 352 Public Finance 3	(3,0)
AG EC 357 Nat. Resource Econ. 3	(3,0)	ENGL 301 Public Speaking 3	(3,0)
ECON 314 Inter. Economic Theory 3	(3,0)	or ENGL 304 Adv. Composition 3	(3,0)
EX ST 301 Introductory Statistics 3	(2,2)	EX ST 462 Stat. Applied to Econ. 3	(3,0)
Minor† 6		Minor† 6	
18		18	

SENIOR YEAR

AG EC 405 Seminar 1	(1,0)	AG EC 402 Econ. of Agric. Prod. 3	(3,0)
AG EC 452 Agricultural Policy.. 3	(3,0)	AG EC 406 Seminar 1	(1,0)
GEN 302 Genetics 4	(3,3)	AG EC 456 Prices 3	(3,0)
or RS 401 Human Ecology ... 3	(3,0)	RS 301 Rural Sociology 3	(3,0)
Minor† 3		Elective 6	
Elective 5–6		16	
16			

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
    † See class adviser for available minors and course requirements.

AGRICULTURAL EDUCATION

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations, and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations, and agricultural extension; farming, soil conservation, and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in *Business, International Agriculture,* or in a *Second Department.* Students in other departments may minor in Agricultural Education and be certified to teach.

Note: Agricultural Education curriculum is jointly administered by the College of Agricultural Sciences and the College of Education.

SOPHOMORE YEAR

First Semester

AG ED 201 Intro. to Agric. Ed...	3	(2,2)
AGRIC 202 Intro. to Plant Sci. ..	3	(2,3)
ECON 201 Principles of Economics	3	(3,0)
History—Literature Requirement° ..	3	(3,0)
PHYS 207 General Physics	4	(3,2)
Elective	1	
	17	

Second Semester

AGM 205 Principles of Farm Shop	3	(2,3)
AGM 206 Agri. Mechanization ..	3	(2,3)
AGRIC 201 Intro. to Animal Ind.	3	(2,3)
AGRON 202 Soils	3	(2,2)
History—Literature Requirement° ..	3	(3,0)
Elective	1	
	16	

JUNIOR YEAR

AGM 301 Soil and Water Conserva.	3	(2,3)
AGRON 301 Fertilizers	3	(3,0)
ENGL 301 Public Speaking	3	(3,0)
Approved Horticulture Elective ..	3	
Minor†	3	
Elective	3	
	18	

AG EC 302 Agric. Firm Mgt. ...	3	(2,3)
AN SC 301 Feeds and Feeding ..	3	(3,0)
FOR 305 Elements of Forestry ..	2	(2,0)
FOR 307 Elem. of Forestry Lab.	1	(0,3)
Minor†	9	
	18	

SENIOR YEAR

AG EC 452 Agricultural Policy..	3	(3,0)
ENT 301 General Entomology....	3	(2,3)
HORT 407 Landscape Design....	3	(2,3)
PL PA 401 Plant Pathology	3	(2,3)
Minor†	3	
Elective	2	
	17	

AG ED 401 Methods in Agricultural Education	3	(2,2)
AG ED 406 Directed Teaching ..	6	(0,18)
AG ED 423 Curriculum	2	(2,0)
AG ED 425 Teach. Agric. Mech.	2	(1,3)
ED 302 Educational Psychology..	3	(3,0)
	16	

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
    † See class adviser for available minors and course requirements.

AGRICULTURAL ENGINEERING

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The agricultural engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electric power and processing, structures and environment, and food engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural

sciences of soils, plants and animals are included so as to provide a foundation for Agricultural Engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bachelor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to the Master of Science, the Master of Engineering, and the Doctor of Philosophy degrees are offered.

Since an Agricultural Engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in Agricultural Engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, and extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

FRESHMAN YEAR

First Semester		Second Semester	
AGRIC 101 Intro. to Agriculture 1	(1,0)	Basic Science† 4	(3,3)
CH 101 General Chemistry 4	(3,3)	ENGL 102 English Composition.. 3	(3,0)
ENGL 101 English Composition.. 3	(3,0)	Humanistic–Social Elective 3	(3,0)
ENGR 180 Engineering Concepts. 3	(2,2)	or ENGR 180 Engr. Concepts.. 3	(2,2)
or Humanistic–Social Elective.. 3	(3,0)	MATH 108 Cal. and Lin. Algebra 4	(4,0)
MATH 106 Calculus of One Var. 4	(4,0)	PHYS 122 Mech. and Wave Phen. 3	(3,0)
Elective 1		Elective 1	
16		18	

SOPHOMORE YEAR

AGE 221 Soil and Water		AGE 212 Fund. of Mechanization 3	(2,3)
Resources Engineering I 3	(2,3)	BOT 101 Plant Biology 3	(3,0)
EG 109 Engr. Graphical Com. 2	(0,6)	BOT 103 Plant Biology Lab. 1	(0,2)
EM 201 Engr. Mech. (Statics) 3	(3,0)	EM 202 Engr. Mech. (Dynamics) 3	(3,0)
Literature Requirement* 3	(3,0)	Literature Requirement* 3	(3,0)
MATH 206 Calculus of Sev. Var. 4	(4,0)	MATH 208 Engineering Math. I.. 4	(5,0)
PHYS 221 Thermal and Elec. Phen. 3	(3,0)	Elective 1	
Elective 1		18	
19			

JUNIOR YEAR

AGE 353 Computational Systems	2	(1,3)	AGE 362 Energy Conv. in Ag. Sys.	3	(2,3)
AGE 355 Engr. Anal. and Creat.	2	(1,3)	AGE 433 Design Criteria for Plant		
E&CE 307 Basic Elec. Engr.	3	(3,0)	and Animal Environment	3	(3,0)
EM 304 Mechanics of Materials	3	(3,0)	AGE 465 Engr. Prop. of Biol. Mat.	3	(2,3)
ME 311 Engineering Thermo. I	3	(3,0)	AGRON 202 Soils	3	(2,2)
ZOOL 101 Animal Biology	3	(3,0)	PHYS 222 Optics and Mod. Phys.	3	(3,0)
	16		Humanistic–Social Elective	3	(3,0)
				18	

SENIOR YEAR

AGE 431 Agric. Structures Design	3	(2,3)	AGE 416 Agric. Machinery Design	3	(2,3)
AGE 471 Undergraduate Research	1	(0,3)	AGE 422 Soil and Water		
ECON 201 Principles of Economics	3	(3,0)	Resources Engineering II	3	(2,3)
EM 320 Fluid Mechanics	3	(3,0)	AGE 442 Agric. Process Engr.	3	(2,3)
MATH 301 Statistical Theory and			ME 304 Heat Transfer I	3	(3,0)
Methods I	3	(3,0)	Engineering Elective	2–3	
Elective	3		Elective	3–2	
	16			17	

138 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† To be selected from Ch 102 or 112.

AGRICULTURAL MECHANIZATION AND BUSINESS

The curriculum in Agricultural Mechanization and Business is designed to provide an educational program for undergraduate students who desire training in areas which are relevant to a dynamic agricultural enterprise. It is organized with strength both in the business management area and in non-engineering-type support of technical agriculture and agribusiness concepts. In order to produce an individual who is well-rounded and capable of communicating, the curriculum includes courses in the humanities, social sciences, English composition, and public speaking.

The graduate in agriculture with a major in Agricultural Mechanization and Business should be able to find meaningful and remunerative employment in a variety of situations directly and indirectly related to agricultural production, processing, marketing, and the many services connected therewith.

SOPHOMORE YEAR

First Semester			Second Semester		
AGM 205 Principles of Farm Shop	3	(2,3)	AG EC 202 Agric. Economics	3	(3,0)
ECON 201 Principles of Economics	3	(3,0)	AGM 206 Agric. Mechanization	3	(2,3)
EG 115 Engr. Graphics for Ind. Ed.	2	(0,6)	AGRIC 202 Intro. to Plant Sciences	3	(2,3)
History–Literature Requirement°	3	(3,0)	History–Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)	PHYS 208 General Physics	4	(3,2)
Elective	2		Elective	1	
	17			17	

JUNIOR YEAR

ACCT 201 Principles of Accounting 3 (3,0)		
or AG EC 305 Agric. Bus.		
Anal. 3 (2,3)		
AGM 303 Cal. for Mech. Agric... 2 (2,0)		
AGM 308 Mech. and Hydraulic		
Systems 3 (2,3)		
AGRIC 201 Intro. to Animal Ind. 3 (2,3)		
AGRON 202 Soils 3 (2,2)		
Social Science Elective† 3 (3,0)		
Elective 3		
20		

AG EC 309 Economics of		
Agricultural Marketing 3 (3,0)		
or AG EC 402 Economics of		
Agricultural Production 3 (3,0)		
AG EC 351 Advertising and		
Merchandising 3 (3,0)		
AGM 301 Soil and Water Conserva. 3 (2,3)		
ENGL 301 Public Speaking 3 (3,0)		
Approved Agriculture Elective†... 3		
Elective 3		
18		

SENIOR YEAR

AG EC 456 Prices 3 (3,0)		
AGM 452 Farm Power 3 (2,3)		
AGM 460 Farm and Home Utilities 3 (2,3)		
Approved Economics Elective† .. 3		
Elective 3		
15		

AGM 404 Farm Structures 3 (2,3)		
AGM 408 Equip. Sales and Ser... 3 (3,0)		
Approved Agriculture Elective† .. 3		
Approved Economics Elective† ... 3		
Elective 3		
15		

134 Total Semester Hours

* One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† See class adviser for list of approved electives.
‡ To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.

ANIMAL INDUSTRIES

The Animal Industries curriculum includes three majors—Animal Science, Dairy Science, and Poultry Science.

ANIMAL SCIENCE MAJOR

The Animal Science Department emphasizes subject matter dealing with the application of scientific principles to livestock production and processing.

Students will minor in *Business, Environmental Science, International Agriculture, Production, Science,* or a *Second Department.*

Occupations for Animal Science graduates include livestock farming; cattle, swine and sheep breeding; extension livestock specialists; feed specialists; county agents; teaching and research in animal industry; positions with meat packing companies; feed dealers; freezer locker operators; livestock dealers; and livestock commission brokers.

SOPHOMORE YEAR

First Semester

CH 223 Organic Chemistry†	3	(3,0)
CH 227 Organic Chemistry Lab.†	1	(0,3)
or BIOCH 210 Elem. Biochem.	4	(3,3)
or CH 201 General Chemistry..	4	(3,3)
ECON 201 Principles of Economics	3	(3,0)
History–Literature Requirement°	3	(3,0)
ZOOL 307 Animal Anat. and Phys.	3	(2,3)
Minor‡	3	
Elective	1	
	17	

Second Semester

AGRIC 202 Intro. to Plant Sciences	3	(2,3)
AN SC 201 Intro. to Animal Sci.	2	(2,0)
AN SC 203 Intro. to An. Sci. Lab.	1	(0,3)
History–Literature Requirement° ..	3	(3,0)
PHYS 207 General Physics	4	(3,2)
Minor‡	3	
Elective	1	
	17	

JUNIOR YEAR

AN SC 301 Feeds and Feeding..	3	(3,0)
AN SC 353 Meats	2	(2,0)
AN SC 355 Meats Lab.	1	(0,3)
GEN 302 Genetics	4	(3,3)
MICRO 305 General Microbiology	4	(3,3)
Elective	3	
	17	

AN SC 303 Feeds and Feed. Lab.	1	(0,3)
AN SC 306 Livestock Selection		
and Evaluation	2	(1,3)
ENGL 301 Public Speaking	3	(3,0)
Social Science Elective§	3	(3,0)
Minor‡	6	
Elective	3	
	18	

SENIOR YEAR

AN SC 401 Beef Production	3	(3,0)
AN SC 403 Beef Production Lab.	1	(0,3)
DY SC 453 Animal Reproduction.	3	(3,0)
NUTR 401 Fund. of Nutrition ..	3	(3,0)
Minor‡	3	
Elective	4	
	17	

AN SC 406 Seminar	2	(2,0)
AN SC 408 Pork Production ...	3	(3,0)
AN SC 410 Pork Production Lab.	1	(0,3)
AN SC 452 Animal Breeding ...	3	(3,0)
Elective	7	
	16	

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† Required for Science Minor.
‡ See class adviser for available minors and course requirements.
§ To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.

DAIRY SCIENCE MAJOR

The major in Dairy Science is designed to provide the student with an understanding of scientific principles and the application of these principles in the scientific, technical, and business phases of the dairy industry. Completion of required studies in the sciences and humanities and selected courses by the student in areas of personal interest prepares the graduate for a successful chosen profession. A career in the dairy industry is a rewarding one, not only monetarily, but in rendering a service in providing a wholesome, nutritious food for mankind.

Opportunities for dairy science graduates are many. They include the management of production and processing facilities, quality control work for processing units and production organizations, industrial promotion and public relations work in both production and processing fields, dairy and food products engineering, special services, public health service, teaching and research. Special service opportunities are available in state and national breed associ-

ation work, breeding organizations, industrial supplies, production and processing equipment and supplies. Opportunities in educational activities include positions with industrial associations, state and federal services and federal programs with foreign assignments.

Students majoring in Dairy Science may choose a minor in *Business, Environmental Science, International Agriculture, Production, Science,* or a *Second Department.*

See page 117 for Freshman Year.

SOPHOMORE YEAR

First Semester			Second Semester		
AGRIC 202 Intro. to Plant Sci. . .	3	(2,3)	AGRON 202 Soils	3	(2,2)
CH 223 Organic Chemistry	3	(3,0)	History–Literature Requirement° . .	3	(3,0)
CH 227 Organic Chemistry Lab..	1	(0,3)	PHYS 207 General Physics	4	(3,2)
or BIOCH 210 Elem. Biochem.	4	(3,3)	Minor‡	3	
or CH 201 General Chemistry	4	(3,3)	Social Science Elective†	3	(3,0)
DY SC 201 Intro. to Dairy Science	3	(2,3)	Elective	1	
ECON 201 Principles of Economics	3	(3,0)		—	
History–Literature Requirement° . .	3	(3,0)		17	
Elective	1				
	—				
	17				

JUNIOR YEAR

DY SC 307 Market Milk	3	(2,3)	AN SC 301 Feeds and Feeding. .	3	(3,0)
DY SC 310 Dairy Cattle Sel. . . .	1	(0,3)	DY SC 306 Chemical and Physical		
or FD SC 424 Qual. Assur. and			Nature of Milk	3	(2,3)
Sens. Eval. Lab.	1	(0,3)	GEN 302 Genetics	4	(3,3)
FD SC 305 Dairy and Food Engr.	3	(2,3)	Minor‡	3	
MICRO 305 General Microbiology	4	(3,3)	Elective	4	
Minor‡	6			—	
	—			17	
	17				

SENIOR YEAR

DY SC 409 Dairy Sci. Seminar. .	2	(2,0)	AN SC 452 Animal Breeding . . .	3	(3,0)
DY SC 453 Animal Reproduction	3	(3,0)	or DY SC 404 Plant Mgt.	3	(2,3)
and DY SC 455 Animal			DY SC 410 Dairy Sci. Seminar. .	2	(2,0)
Reproduction Lab.	1	(0,3)	DY SC 452 Dairy Cattle Feeding		
or DY SC 402 Dairy Manuf. . . .	4	(3,3)	and Management	3	(2,3)
NUTR 401 Fund. of Nutrition . . .	3	(3,0)	MICRO 402 Dairy Microbiology. .	3	(2,3)
Minor‡	3		Elective	6	
Elective	5			—	
	—			17	
	17				

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
‡ See class adviser for available minors and course requirements.

POULTRY SCIENCE MAJOR

This major provides the student with a broad education in science and the humanities, and specialized knowledge of the biology of the avian species and the poultry industry. Avian science courses emphasize the nutrition, physiology, genetics, and pathology of domesticated and semidomesticated birds. The environmental requirements for propagating the various species and for handling eggs and meat are covered.

Minors in *Business, Environmental Science, International Agriculture, Production, Science,* or a *Second Department* provide for the specialized interests of the student.

Job opportunities include: supervisory positions with producers of eggs, broilers, turkeys, or game birds; technical representatives for feed manufacturers, vitamin and mineral suppliers, pharmaceutical and biological houses; extension specialists; teachers or researchers with a college, in government or industry; salesmen or marketing specialists; quality control and poultry products technologists; government graders, inspectors or sanitarians.

See page 117 for Freshman Year.

SOPHOMORE YEAR

First Semester

AGRIC 202 Intro. to Plant Sci... 3 (2,3)
CH 223 Organic Chemistry† 3 (3,0)
CH 227 Organic Chemistry Lab.† 1 (0,3)
  or BIOCH 210 Elem. Biochem. 4 (3,3)
  or CH 201 General Chemistry.. 4 (3,3)
GEN 302 Genetics 4 (3,3)
History–Literature Requirement° .. 3 (3,0)
PS 203 Avian Science 2 (2,0)
Elective 1

               17

Second Semester

ECON 201 Principles of Economics 3 (3,0)
History–Literature Requirement° .. 3 (3,0)
MICRO 305 General Microbiology 4 (3,3)
PHYS 207 General Physics 4 (3,2)
PS 352 Breeder Flock and
  Hatchery Management 3 (3,0)
PS 353 Breeder Flock and
  Hatchery Management Lab. .. 1 (0,3)
Elective 1

               19

JUNIOR YEAR

AN SC 301 Feeds and Feeding.. 3 (3,0)
ENGL 301 Public Speaking 3 (3,0)
PS 355 Poultry Products Grading
  and Technology 3 (2,3)
ZOOL 307 Animal Anat. and Phys. 3 (2,3)
Minor§ 3
Social Science Elective‡ 3 (3,0)

               18

PS 359 Management of Egg, Broiler
  and Turkey Enterprises 3 (2,3)
PS 451 Poultry Nutrition 2 (2,0)
Minor§ 6
Approved Elective¶ 3
Elective 2

               16

SENIOR YEAR

PS 401 Animal Environ. Tech. .. 2 (2,0)
PS 403 Ani. Environ. Tech. Lab. 1 (0,3)
PS 458 Avian Micro. and Parasit. 4 (3,3)
Minor§ 3
Approved Elective¶ 3
Elective 3

               16

PS 460 Seminar 2 (2,0)
Minor§ 3
Approved Elective¶ 3–2
Elective 8–9

               16

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
  † Science minors should schedule Ch 223, 227. Business minors may substitute Acct 201.
  ‡ To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
  § See class adviser for available minors and course requirements.
  ¶ See class adviser for list of approved electives.

ECONOMIC BIOLOGY

The Economic Biology curriculum includes areas of concentration in Economic Zoology, Entomology, and Plant Pathology.

See page 117 for Freshman Year.

SOPHOMORE YEAR

First Semester			Second Semester		
CH 223 Organic Chemistry	3	(3,0)	AG EC 202 Agric. Economics	3	(3,0)
CH 227 Organic Chemistry Lab.	1	(0,3)	AGRON 202 Soils	3	(2,2)
ECON 201 Prin. of Economics	3	(3,0)	CH 224 Organic Chemistry°°	3	(3,0)
GEN 302 Genetics	4	(3,3)	ENT 301 General Entomology	3	(2,3)
History–Literature Requirement°	3	(3,0)	History–Literature Requirement°	3	(3,0)
Elective	3		Elective	1	
	17			16	

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
°° Ch 228 is suggested as an elective.

ECONOMIC ZOOLOGY CONCENTRATION

This option is designed for the student interested in careers in applied animal biology. With increased interest and concern for conservation of natural resources and the environment, this area is becoming increasingly technical and will require large numbers of highly trained animal biologists. It is possible for the student in this option to elect courses to fit specific needs or interests.

Greatest demands for graduates are in the following areas: research, survey and regulatory positions with state and federal environmental protection, fish, wildlife, and public health agencies; in public relations and sales positions with commercial companies; industrial research and quality control laboratories; conservational, recreational and other public service agencies; and private enterprises.

See page 117 and above for Freshman and Sophomore Years.

JUNIOR YEAR

First Semester			Second Semester		
ACCT 201 Principles of Accounting	3	(3,0)	BOT 202 Survey of Plant Kingdom	4	(3,3)
or AG EC 305 Agric. Bus. Anal.	3	(2,3)	ENT 468 Introduction to Research	2	(1,3)
or EX ST 301 Intro. Statistics	3	(2,2)	PHYS 208 General Physics	4	(3,2)
ENGL 301 Public Speaking	3	(3,0)	ZOOL 302 Vertebrate Embryology	3	(2,3)
PHYS 207 General Physics	4	(3,2)	Elective	4	
WB 306 Wildlife Res. of SE. U.S.	2	(2,0)		17	
ZOOL 301 Comp. Vert. Anatomy	3	(2,3)			
Elective	2				
	17				

SENIOR YEAR

WB 412 Wildlife Management	..	3	(2,3)	MICRO 305 General Microbiology	4	(3,3)
WB 416 Fish Culture	....	3	(2,3)	ZOOL 460 General Physiology	.. 3	(2,3)
ZOOL 456 Parasitology	....	4	(3,3)	Social Science Elective†	 3	(3,0)
Social Science Elective†	....	3	(3,0)	Elective	 7	
Elective	....	4				
		17			17	

134 Total Semester Hours

† To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.

ENTOMOLOGY CONCENTRATION

Entomology is a unique scientific discipline which has its basic roots in biology. It is the study of insects, their biology and control. Insects form the largest and most widely distributed class of animals in the world. They affect the lives of everyone and are man's greatest competitors. However, not everything about insects is bad. Some, such as bees, are essential for pollination while others serve as parasites and predators in natural control of pest species.

There are exciting opportunities for professional entomologists in basic and applied areas of work such as (1) development of new and more selective methods of insect control involving both chemical and biological agents; (2) pest management practice and consulting; (3) perform services as quarantine and regulatory officials; (4) carry information to the public as extension entomologists; (5) apply knowledge in teaching programs; (7) insect control in the pest control industry; and (8) entomologists in the armed forces.

See pages 117 and 126 for Freshman and Sophomore Years.

JUNIOR YEAR

First Semester | Second Semester

ACCT 201 Principles of Accounting	3	(3,0)	ENT 410 Insect Taxonomy	.....	3	(1,6)
or AG EC 305 Agric. Bus. Anal.	3	(2,3)	ENT 468 Introduction to			
or EX ST 301 Intro. Statistics..	3	(2,2)	Research	....	2	(1,3)
ENGL 301 Public Speaking	 3	(3,0)	MICRO 305 General Microbiology		4	(3,3)
ENT 405 Insect Morphology	 4	(3,3)	PHYS 208 General Physics	......	4	(3,2)
PHYS 207 General Physics	 4	(3,2)	Elective	....	3	
ZOOL 201 Invertebrate Zoology..	4	(3,3)				
	18				16	

SENIOR YEAR

ENT 461 Seminar	....	1	(1,0)	ENT 462 Seminar	....	1	(1,0)
PL PA 401 Plant Pathology	....	3	(2,3)	ENT 470 Insect Physiology	.....	3	(2,3)
ZOOL 411 Animal Ecology	.....	3	(2,3)	ENT 480 Insect Pathology	.....	3	(2,3)
Entomology Elective‡	....	3	(2,3)	Entomology Elective‡	....	3	(2,3)
Social Science Elective†	....	3	(3,0)	Social Science Elective†	....	3	(3,0)
Elective	....	4		Elective	....	4	
		17				17	

134 Total Semester Hours

† To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
‡ At least 6 credits must be selected from the following: Ent 401, 402, 455, 458.

PLANT PATHOLOGY CONCENTRATION

Plant pathology is that branch of science that deals with the nature and control of the diseases of plants. Since man began to cultivate plants for food and fiber production, plant diseases have been a constant threat to the health and productivity of these plants. They have caused severe famines and mass migrations of people from one area to another since the dawn of recorded history. The current annual economic loss to plants from diseases in the United States has been estimated to be in excess of three billion dollars. In 1970 one disease alone on corn caused a loss of approximately one billion dollars in the eastern half of the United States.

Opportunities for graduates in Plant Pathology are dependent upon the level of training, experience, and interest of the graduate. These job opportunities include research with federal, state, industrial, or private agencies; inspection, quarantine, and other regulatory work with federal and state agencies; sales and technical service work with industry, especially those industries involved with agricultural pesticides; agricultural extension work, both in the United States and in foreign countries; and teaching at the college or university level.

See pages 117 and 126 for Freshman and Sophomore Years.

JUNIOR YEAR

First Semester

MICRO 305 General Microbiology 4 (3,3)
PHYS 207 General Physics 4 (3,2)
PL PA 401 Plant Pathology 3 (2,3)
   or PL PA 405 Forest Pathology 3 (2,3)
Group A Elective‡ 3
Social Science Elective† 3 (3,0)
                                ──
                                17

Second Semester

BOT 331 Intro. Plant Taxonomy . 3 (2,3)
BOT 352 Plant Physiology 4 (3,3)
PHYS 208 General Physics 4 (3,2)
Plant Pathology Elective° 3
Elective 3
                              ──
                              17

SENIOR YEAR

ENGL 301 Public Speaking 3 (3,0)
EX ST 301 Introductory Statistics 3 (2,2)
Group A Elective‡ 3
Group B Elective§ 3
Plant Pathology Elective° 3
Elective 3
                              ──
                              18

Group A Elective‡ 3
Group B Elective§ 3
Plant Pathology Elective° 3
Social Science Elective† 3 (3,0)
Elective 4
                              ──
                              16

134 Total Semester Hours

° At least 9 credits must be selected from the following: Bot 451, Micro 416, Pl Pa 451, 456, 458.
† To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
‡ Group A Electives (Plant Pathology). At least 9 credits must be selected from a or b:
   (a) Bot 404, 406, Bioch 423, 424, 425, 426, Ch 313, 317, Micro 401.
   (b) Agron 405, 407, Bot 451, Ent 307, 401, 402, Micro 416, Pl Pa 401, 405, 451, 458.
§ Group B Electives (Plant Pathology). At least 6 credits must be selected from the following: Acct 201, 202, Ag Ec 305, Engl 304, Geol 101, and any foreign language.

FOOD SCIENCE

The Food Science curriculum is designed to prepare students for the many career opportunities in technical and management areas of the food industry. The food industry, being the nation's largest industry, is becoming increasingly technical and requires large numbers of professional food scientists. World food supplies, particularly those rich in protein, are becoming increasingly critical in many parts of the globe. This situation is expected to accelerate the demand for food scientists.

Opportunities for graduates in Food Science include research positions in government organizations and state experiment stations, supervisory, administrative, research, and quality control positions in food processing industries, inspection and grading work with state and federal agencies, consulting, and teaching and extension activities with universities and colleges. Students graduating in Food Science are well prepared to pursue postgraduate training in areas such as microbiology, biochemistry, nutrition, as well as in food science.

The student majoring in Food Science will select a minor in *Business, Environmental Science, International Agriculture, Science*, or a *Second Department* which will emphasize training in an area other than Food Science and which is designed to supplement the major course of study.

SOPHOMORE YEAR

First Semester

CH 223 Organic Chemistry 3 (3,0)
CH 227 Organic Chemistry Lab. . 1 (0,3)
  or CH 201 General Chemistry. . 4 (3,3)
ECON 201 Principles of Economics 3 (3,0)
History–Literature Requirement° . . 3 (3,0)
PHYS 207 General Physics 4 (3,2)
Social Science Elective† 3 (3,0)
Elective 1
—
18

Second Semester

BIOCH 210 Elem. Biochemistry. . 4 (3,3)
FD SC 212 Man's Food
  Resources 2 (2,0)
History–Literature Requirement° . . 3 (3,0)
PHYS 208 General Physics 4 (3,2)
Social Science Elective† 3 (3,0)
Elective 1
—
17

JUNIOR YEAR

EX ST 301 Introductory Statistics 3 (2,2)
FD SC 305 Dairy and Food Engr. 3 (2,3)
FD SC 415 Human Nutrition . . . 2 (2,0)
MICRO 305 General Microbiology 4 (3,3)
Minor‡ 3
Elective 2
—
17

ENGL 301 Public Speaking 3 (3,0)
FD SC 422 Quality Assurance and
  Sensory Evaluation 2 (2,0)
FD SC 424 Quality Assurance and
  Sensory Evaluation Lab. 1 (0,3)
MICRO 404 Food Microbiology. . 3 (2,3)
Minor‡ 3
Elective 4
—
16

SENIOR YEAR

FD SC 321	Food Processing	2	(2,0)	FD SC 322	Food Processing	2	(2,0)
FD SC 323	Food Processing Lab.	2	(1,3)	FD SC 324	Food Processing Lab.	2	(1,3)
FD SC 401	Food Chemistry I ..	4	(3,3)	FD SC 402	Food Chemistry II ..	4	(3,3)
Minor‡	....	6		FD SC 418	Seminar	1	(1,0)
Elective	....	3		Minor‡	....	3	
		—		Elective	....	4	
		17				—	
						16	

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† To be selected from the following: Hist 102, Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
‡ See class adviser for available minors and course requirements.

PLANT SCIENCES

The Plant Sciences curriculum includes three majors—Agronomy—Crops and Soils, Horticulture (Fruit and Vegetable), and Horticulture (Ornamental).

AGRONOMY (CROPS AND SOILS) MAJOR

Agronomy is the science that deals with crops and soils. The crop science area includes plant breeding and genetics as related to crop improvement and variety introductions. Special emphasis is also placed on the science of weed control and management for field, forage and pasture crops.

Soil science covers soil formation, classification, management and fertility. The student acquires a basic understanding in chemistry, physics, and biology as related to soil properties and land use. Training in this area also includes those factors associated with land-pollution problems.

The science-oriented graduate can pursue research with both public and private agencies investigating problems associated with improving the world's crops and soils, determining pesticide residues in soil and water, or charting fertilizer ion movement through the soil-plant system. Research agronomists are currently studying the soils obtained from the moon.

Positions for Agronomy graduates are available with the Agricultural Extension Service, the Soil Conservation Service, Forest Service, Farmers Home Administration, Production Credit Associations and other public agencies. International opportunities are also available to the agronomist. Agronomists are employed with agri-chemical, seed and other industries as technical, supervisory and sales agronomists. Banks and other financial institutions employ agronomists as appraisers and farm managers. Other agronomists may return to the farm either as a manager or owner-manager.

The science of agronomy is basic to all agriculture and the graduate will find many opportunities to serve in modern agriculture.

Students majoring in Agronomy—Crops and Soils will declare a minor in *Business, Environmental Science, International Agriculture, Production, Science,* or a *Second Department.*

See page 117 for Freshman Year.

SOPHOMORE YEAR

First Semester

AGRIC 202 Intro. to Plant Sciences 3 (2,3)
CH 223 Organic Chemistry 3 (3,0)
CH 227 Organic Chemistry Lab. . 1 (0,3)
  or BIOCH 210 Elem. Biochem. 4 (3,3)
  or CH 201 General Chemistry . . 4 (3,3)
ECON 201 Principles of Economics 3 (3,0)
History–Literature Requirement° . . 3 (3,0)
PHYS 207 General Physics 4 (3,2)
Elective 1
                     —
                    18

Second Semester

AGRIC 201 Intro. to Animal Ind. 3 (2,3)
AGRON 202 Soils 3 (2,2)
History–Literature Requirement° . . 3 (3,0)
Minor† 6
Elective 1
                     —
                    16

JUNIOR YEAR

AGRON 301 Fertilizers† 3 (3,0)
AGRON 410 Cotton and Other
  Fiber Crops† 2 (2,0)
  or AGRON 411 Grain Crops . . 2 (2,0)
  or AGRON 412 Tobacco and
    Special Use Crops 2 (2,0)
BOT 352 Plant Physiology 4 (3,3)
GEN 302 Genetics 4 (3,3)
MICRO 305 General Microbiology 4 (3,3)
                     —
                    17

AGRON 308 Soil and Plant Anal. 3 (1,6)
AGRON 320 Forage and Pasture
  Crops† 3 (3,0)
AGRON 322 Forage Crops Lab.† 1 (0,2)
AGRON 410 Cotton and Other
  Fiber Crops† 2 (2,0)
  or AGRON 411 Grain Crops . . 2 (2,0)
  or AGRON 412 Tobacco and
    Special Use Crops 2 (2,0)
Minor† 6
Social Science Elective§ 3 (3,0)
                     —
                    18

SENIOR YEAR

AGRON 403 Soil Genesis and
  Classification† 2 (1,3)
AGRON 407 Prin. of Weed
  Control† 3 (2,2)
AGRON 455 Seminar 1 (1,0)
Minor† 5
Elective 6
                     —
                    17

AGRON 405 Plant Breeding† ... 3 (2,2)
  or MICRO 410 Soil Micro-
    biology 3 (2,3)
AGRON 452 Soil Fert. and Mgt.† 2 (2,0)
AGRON 456 Seminar 1 (1,0)
Minor† 4
Elective 6
                     —
                    16

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
  † See class adviser for available minors and course requirements.
  ‡ Required for all students except science minors. Science minors select 13 credits from these courses.
  § To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.

HORTICULTURE (FRUIT AND VEGETABLE) MAJOR

This major provides the student with a basic education in science and the humanities, and the application of both in the scientific, technical, and business phases of the fruit and vegetable industry.

Opportunities in this field of study include vegetable and fruit farm management; inspection of fresh fruit, vegetable and other food products as well as nursery stock. There are many other opportunities as in plant breeding, agricultural extension service work, horticultural research, horticultural teaching and writing, and fruit and vegetable processing. Other occupations include sales and

field work with seedsmen and nurserymen, and manufacturers of food, fertilizer, and pesticide products.

Students majoring in the fruit and vegetable phase of Horticulture may choose a minor in *Business, Environmental Science, International Agriculture, Production, Science,* or a *Second Department.*

See page 117 for Freshman Year.

SOPHOMORE YEAR

First Semester

AGRON 202 Soils 3 (2,2)
CH 223 Organic Chemistry 3 (3,0)
CH 227 Organic Chemistry Lab. . 1 (0,3)
  or BIOCH 210 Elem. Biochem. 4 (3,3)
  or CH 201 General Chemistry . . 4 (3,3)
ECON 201 Principles of Economics 3 (3,0)
History–Literature Requirement° . . 3 (3,0)
HORT 201 General Horticulture . . 3 (2,2)
Elective 1
  ——
  17

Second Semester

AGRIC 201 Intro. to Animal Ind. 3 (2,3)
ENT 301 General Entomology . . . 3 (2,3)
History–Literature Requirement° . . 3 (3,0)
PHYS 207 General Physics 4 (3,2)
Electives 4
  ——
  17

JUNIOR YEAR

GEN 302 Genetics 4 (3,3)
HORT 305 Plant Propagation . . . 3 (2,3)
HORT 352 Commercial Pomology 3 (2,3)
Minor‡ 3
Social Science Elective† 3 (3,0)
Elective 2
  ——
  18

BOT 352 Plant Physiology 4 (3,3)
HORT 302 Prin. of Veg. Prod. . . 3 (2,3)
HORT 451 Small Fruit Culture . . 3 (2,3)
MICRO 305 General Microbiology 4 (3,3)
Minor‡ 3
  ——
  17

SENIOR YEAR

HORT 405 Nut Tree Culture . . . 2 (2,0)
HORT 407 Landscape Design . . . 3 (2,3)
HORT 409 Seminar 1 (1,0)
HORT 464 Post Harvest Hort. . . 3 (2,2)
PL PA 401 Plant Pathology 3 (2,3)
Minor‡ 3
Elective 3
  ——
  18

HORT 410 Seminar 1 (1,0)
HORT 456 Vegetable Crops 3 (3,0)
Minor‡ 6
Elective 5
  ——
  15

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
  † To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
  ‡ See class adviser for available minors and course requirements.

HORTICULTURE (ORNAMENTAL) MAJOR

This major is designed to give students a scientific background and technical facilities in the field of ornamental horticulture. Subject matter covers plant materials culture, uses, and planning of ground spaces.

Graduates find careers in nursery work, floriculture, landscape designing, landscape contracting, turf management, and park supervision. Other occupations are research personnel, teachers, extension workers, and representatives of fertilizer, machinery, and chemical companies.

Students desiring to major in Ornamental Horticulture may choose a minor in *Business, International Agriculture, Production, Science,* or a *Second Department.*

See page 117 for Freshman Year.

SOPHOMORE YEAR

First Semester

AGM 301 Soil and Water Conserva.	3	(2,3)
CH 223 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab.	1	(0,3)
or BIOCH 210 Elem. Biochem.	4	(3,3)
or CH 201 General Chemistry	4	(3,3)
ECON 201 Principles of Economics	3	(3,0)
History–Literature Requirement°	3	(3,0)
HORT 201 General Horticulture	3	(2,2)
Elective	1	
	17	

Second Semester

AGRON 202 Soils	3	(2,2)
ENT 301 General Entomology	3	(2,3)
History–Literature Requirement°	3	(3,0)
PHY 207 General Physics	4	(3,2)
Elective	4	
	17	

JUNIOR YEAR

BOT 352 Plant Physiology	4	(3,3)
GEN 302 Genetics	4	(3,3)
HORT 303 Plant Materials I	3	(2,3)
HORT 305 Plant Propagation	3	(2,3)
Social Science Elective†	3	(3,0)
	17	

HORT 304 Plant Materials II	3	(2,3)
HORT 308 Landscape Design	3	(2,3)
HORT 310 Floriculture	3	(2,3)
Minor†	6	
Elective	3	
	18	

SENIOR YEAR

HORT 408 Floral Design and Retail Marketing	2	(1,3)
HORT 409 Seminar	1	(1,0)
HORT 412 Turf Management	3	(2,3)
HORT 460 Prob. in Landscp. Des.	5	(3,6)
Minor†	3	
Elective	3	
	17	

HORT 406 Nursery Technology	3	(2,3)
HORT 410 Seminar	1	(1,0)
PL PA 401 Plant Pathology	3	(2,3)
Minor†	6	
Elective	3	
	16	

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† To be selected from the following: Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
‡ See class adviser for available minors and course requirements.

PRE-VETERINARY MEDICINE

The curriculum in Pre-veterinary Medicine is designed to meet the general requirements for admission to certain schools of veterinary medicine. Since the requirements for entrance to these schools are not uniform, the student in planning his program should consider the specific requirements of the school he expects to attend. Under the Southern Regional Education Plan, ten qualified students from South Carolina may enter the College of Veterinary Medicine at the University of Georgia each year. Under the provisions of the compact, these students are exempt from out-of-state charges while studying Veterinary Medicine at the University of Georgia.

Students enrolled in the Pre-veterinary Medicine curriculum have a choice of one of three options: (1) apply for admission to the College of Veterinary Medicine after completion of the first two years of the curriculum. Only the exceptional student is accepted with a minimum of two years of college training; (2)

apply for admission to the College of Veterinary Medicine after completion of the three-year Pre-veterinary curriculum; (3) upon completion of the three-year Pre-veterinary curriculum, the student may transfer to a major at Clemson University in Animal Science, Dairy Science, Poultry Science, or Zoology and complete the requirements for a Bachelor of Science degree with one additional year's work. Curriculum requirements for Pre-veterinary Medicine transfer students to majors in Animal Science, Dairy Science, Poultry Science, and Zoology are listed below.

PRE-VETERINARY MEDICINE CURRICULUM

BASIC PROGRAM FOR ANIMAL SCIENCE, DAIRY SCIENCE, POULTRY SCIENCE, AND ZOOLOGY

FRESHMAN YEAR

First Semester			Second Semester		
BOT 101 Plant Biology	3	(3,0)	AGRIC 201 Intro. to Animal Ind.	3	(2,3)
BOT 103 Plant Biology Lab.	1	(0,2)	CH 112 General Chemistry	4	(3,3)
or ZOOL 101 Animal Biology	3	(3,0)	ENGL 102 English Composition	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)	ZOOL 101 Animal Biology	3	(3,0)
CH 101 General Chemistry	4	(3,3)	ZOOL 103 Animal Biology Lab.	1	(0,2)
ENGL 101 English Composition	3	(3,0)	or BOT 101 Plant Biology	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)	and BOT 103 Plant Biology Lab.	1	(0,2)
Social Science Elective†	3	(3,0)	Social Science Elective†	3	(3,0)
Elective	1		Elective	1	
	19			18	

PRE-VETERINARY MEDICINE CURRICULUM

ANIMAL SCIENCE MAJOR

See Freshman Year above.

SOPHOMORE YEAR

First Semester			Second Semester		
AGRIC 202 Intro. to Plant Sciences	3	(2,3)	CH 224 Organic Chemistry	3	(3,0)
CH 223 Organic Chemistry	3	(3,0)	CH 228 Organic Chemistry Lab.	1	(0,3)
CH 227 Organic Chemistry Lab.	1	(0,3)	GEN 302 Genetics	4	(3,3)
History–Literature Requirement°	3	(3,0)	History–Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)	NUTR 201 Intro. to Nutrition	3	(3,0)
Social Science Elective†	3	(3,0)	PHYS 208 General Physics	4	(3,2)
Elective	1		Elective	1	
	18			19	

JUNIOR YEAR

AN SC 301 Feeds and Feeding	3	(3,0)	AN SC 303 Feeds and Feed. Lab.	1	(0,3)
AN SC 353 Meats	2	(2,0)	AN SC 306 Livestock Selection		
AN SC 355 Meats Laboratory	1	(0,3)	and Evaluation	2	(1,3)
AN SC 401 Beef Production	3	(3,0)	AN SC 406 Seminar	2	(2,0)
AN SC 403 Beef Produc. Lab.	1	(0,3)	AN SC 408 Pork Production	3	(3,0)
DY SC 453 Animal Reproduction	3	(3,0)	AN SC 410 Pork Produc. Lab.	1	(0,3)
ZOOL 301 Comp. Vert. Anatomy	3	(2,3)	AN SC 452 Animal Breeding	3	(3,0)
	16		ENGL 301 Public Speaking	3	(3,0)
				15	

SENIOR YEAR

See class adviser for course requirements.

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† To be selected from Econ 201, Hist 101, 102, Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.

PRE-VETERINARY MEDICINE CURRICULUM

DAIRY SCIENCE MAJOR

See page 134 for Freshman Year.

SOPHOMORE YEAR

First Semester

AGRIC 202 Intro. to Plant Sciences	3	(2,3)
or DY SC 307 Market Milk ...	3	(2,3)
CH 223 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab..	1	(0,3)
History–Literature Requirement° ..	3	(3,0)
PHYS 207 General Physics	4	(3,2)
Social Science Elective†	3	(3,0)
Elective	1	
	18	

Second Semester

CH 224 Organic Chemistry	3	(3,0)
CH 228 Organic Chemistry Lab..	1	(0,3)
GEN 302 Genetics	4	(3,3)
History–Literature Requirement° ..	3	(3,0)
NUTR 201 Intro. to Nutrition ...	3	(3,0)
PHYS 208 General Physics	4	(3,2)
Elective	1	
	19	

JUNIOR YEAR

DY SC 307 Market Milk	3	(2,3)
or AGRIC 202 Intro. to		
Plant Sciences	3	(2,3)
DY SC 453 Animal Reproduction.	3	(3,0)
DY SC 455 Animal Reprod. Lab..	1	(0,3)
MICRO 305 General Microbiology	4	(3,3)
Elective§	6	
	17	

AGRON 202 Soils	3	(2,2)
AN SC 301 Feeds and Feeding..	3	(3,0)
DY SC 306 Chemical and Physical		
Nature of Milk	3	(2,3)
Elective‡	6	
	15	

SENIOR YEAR

See class adviser for course requirements.

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
  † To be selected from Econ 201, Hist 101, 102, Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.
  ‡ Select 6 credits from the following: Dy Sc 402, 404, 410, 452, Fd Sc 422, 424, Micro 402.
  § Select 3 credits from the following: Dy Sc 310, 409, Fd Sc 305.

PRE-VETERINARY MEDICINE CURRICULUM

POULTRY SCIENCE MAJOR

See page 134 for Freshman Year.

SOPHOMORE YEAR

First Semester

CH 223 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab..	1	(0,3)
GEN 302 Genetics	4	(3,3)
History–Literature Requirement° ..	3	(3,0)
PHYS 207 General Physics	4	(3,2)
Social Science Elective†	3	(3,0)
Elective	1	
	19	

Second Semester

CH 224 Organic Chemistry	3	(3,0)
CH 228 Organic Chemistry Lab..	1	(0,3)
History–Literature Requirement° ..	3	(3,0)
NUTR 201 Intro. to Nutrition ...	3	(3,0)
PHYS 208 General Physics	4	(3,2)
PS 359 Management of Egg,		
Broiler and Turkey Enterprises.	3	(2,3)
Elective	1	
	18	

JUNIOR YEAR

AN SC 301 Feeds and Feeding .. 3 (3,0)
MICRO 305 General Microbiology 4 (3,3)
PS 355 Poultry Products Grading
  and Technology 3 (2,3)
PS 401 Animal Envir. Technology 2 (2,0)
PS 403 Animal Envir. Tech. Lab. 1 (0,3)
PS 458 Avian Micro. and Parasit. 4 (3,3)
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17

AGRIC 202 Intro. to Plant Sci .. 3 (2,3)
ENGL 301 Public Speaking 3 (3,0)
PS 352 Breeder Flock and
  Hatchery Management 3 (3,0)
PS 353 Breeder Flock and
  Hatchery Management Lab. ... 1 (0,3)
PS 451 Poultry Nutrition 2 (2,0)
PS 460 Seminar 2 (2,0)
ZOOL 301 Comp. Vert. Anatomy. 3 (2,3)
—
17

SENIOR YEAR

See class adviser for course requirements.

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† To be selected from Econ 201, Hist 101, 102, Phil 201, Pol Sc 101, Psych 201, RS 301, 401, Soc 201.

PRE-VETERINARY MEDICINE CURRICULUM

ZOOLOGY MAJOR

See page 134 for Freshman Year.

SOPHOMORE YEAR

First Semester

CH 223 Organic Chemistry 3 (3,0)
CH 227 Organic Chemistry Lab.. 1 (0,3)
Literature Requirement° 3 (3,0)
PHYS 207 General Physics 4 (3,2)
ZOOL 201 Invertebrate Zoology .. 4 (3,3)
  or ZOOL 202 Vertebrate Zool.. 4 (3,3)
Social Science Elective† 3 (3,0)
Elective 1
—
19

Second Semester

CH 224 Organic Chemistry 3 (3,0)
CH 228 Organic Chemistry Lab.. 1 (0,3)
Literature Requirement° 3 (3,0)
PHYS 208 General Physics 4 (3,2)
ZOOL 202 Vertebrate Zoology‡... 4 (3,3)
  or ZOOL 201 Invertebrate Zool‡ 4 (3,3)
Elective 1
—
16

JUNIOR YEAR

BOT 352 Plant Pathology 4 (3,3)
ENGL 301 Public Speaking 3 (3,0)
GEN 302 Genetics 4 (3,3)
ZOOL 301 Comp. Vert. Anatomy 3 (2,3)
Social Science Elective† 3 (3,0)
—
17

NUTR 401 Fund. of Nutrition .. 3 (3,0)
ZOOL 302 Vertebrate Embryology 3 (2,3)
ZOOL 411 Animal Ecology 3 (2,3)
ZOOL 470 Animal Behavior 3 (2,3)
Social Science Elective† 3 (3,0)
—
15

SENIOR YEAR

See class adviser for course requirements.

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† See adviser for list of electives.
‡ May be exempted and replaced with an approved elective.
Note: The Pre-veterinary Medicine Curriculum with Zoology major is administered by the College of Physical, Mathematical and Biological Sciences.

COLLEGE OF ARCHITECTURE

The Clemson University College of Architecture provides coordinated preprofessional and professional degree programs at undergraduate and graduate levels in preparation for careers in Architecture, City and Regional Planning, Visual Studies, and Building Construction. These curriculums are not offered elsewhere in the State. The preprofessional offerings of the College also provide an excellent basis for graduate studies in Landscape Architecture and Art and Architectural History.

In addition to the courses and curriculums structured for the professional students of the College, cultural offerings in both lecture and studio courses are available to the general student population and required in certain other schools and colleges.

A rich annual series of exhibitions in the Rudolph Lee Gallery of the College and lectures by figures of international importance in

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the environmental arts and sciences are presented by the Clemson Architectural Foundation and open to the public. An unusual bond has existed between the architects of the State and region and the College since the first offering of architectural courses to a few students in 1914. The South Carolina Chapter of the American Institute of Architects in 1955 asked that a strong school be established and pledged its continuing unified support of school programs as the prime project of the organization. Sweeping administrative and curricular changes brought a five-year curriculum and full accreditation that year. Following three years of rapid development the College was made an autonomous professional school by action of the Board of Trustees in 1958.

During the decade just ending, the College has sought to select its students with increasing care and to broaden and strengthen its offerings and its faculty. As might be expected, the curriculums and objectives are under continuing study.

To better prepare professional students, a two-degree, six-year program is required for those majoring in architecture.

The College enjoys contracts for creative research in several areas, and receives an annual support budget from the Clemson Architectural Foundation to enrich its program. It is a member of the Association of Collegiate Schools of Architecture, the Associated Schools of Construction, American Institute of Planners, and is accredited by the National Architectural Accrediting Board, and the Association of Collegiate Schools of Planning.

The Architectural Foundation, a nonprofit corporation, was established in January 1956 under the Laws of the state of South Carolina and under the sponsorship of the South Carolina Chapter of the American Institute of Architects to facilitate the continuous improvement of architectural education and of the art and technology of building in South Carolina by providing financial and other assistance to the College of Architecture at Clemson University. By this means students in the College of Architecture at Clemson have been able to enjoy instruction, facilities, and conditions of superior quality.

The advantages to the students evolving from the Clemson Architectural Foundation are many. Among these are the programs of celebrated guest critics and lecturers, excellent exhibits of many types—paintings, sculpture, architecture, construction, furniture, ceramics, textiles and other allied arts and crafts—traveling expenses for student field trips and professional activities, and student loans and grants. Visual-aid facilities and gifts to the library are examples of permanent assets provided through Foundation support.

Intangible but important is the sense of unity and of high purpose resulting from the activities of the Clemson Architectural Foundation which now permeates the entire architectural scene in South Carolina, the architects, their friends in the building industry and the faculty of the College.

The College of Architecture is housed in a modern building constructed for its program in 1958. Space, nevertheless, is limited and enrollment restricted to students with capacity and motivation. A major addition to the building is projected for completion by 1973. At present the requisite functions are provided on two levels arranged around a central landscaped court. Design studios and the library occupy the entire second level. The first level accommodates the auditorium, classrooms, two art studios, the Exhibition Gallery, and administrative and faculty offices. A ground floor houses shops, photo laboratory, and sculpture studio, jury room and gallery preparations and storage. All areas are air-conditioned.

ENTRANCE REQUIREMENTS

In the interest of both students and the conservation of University resources and to maintain a program on the highest level, admission to the College of Architecture must necessarily be on a selective basis. Annual enrollment quotas are established consistent with space available. Selection considerations include secondary school record and performances in the College Board examination (SAT Test). A personal interview with the Dean or Department Head should be arranged by the applicant as early as possible in the year before admission.

Applicants for Architecture are required to take the Architectural Aptitude Examination as administered by the Educational Testing Service of Princeton, and although these are not used as criterion for admission, the results are helpful to both the applicant and the Admission Committee.

Applications for the Aptitude Examination may be obtained from the Educational Testing Service, Princeton, New Jersey 20933. This test is administered at Clemson and other regional testing centers in November and February.

Students wishing admission are advised to make application to the University early in the fall or winter of their senior year in high school and to make arrangements for a personal interview with the Dean of the College as soon as possible. The Admissions Council of the College will further interview entering students during freshman matriculation week of each academic year.

PROGRAMS OF STUDY

ARCHITECTURE

The architect as a practicing professional has the creative responsibility of designing the buildings which shape our physical environment. To understand the humanistic, economic and technological nature of environmental problems, he must have a sound general education. This professional education must prepare him for a life of continuing change, in which problems to be solved will be large and small, for every sort of function, in every type of climate and for every condition of budget.

The curriculum in Architecture is six years in length, embracing both a four-year Bachelor of Arts in the Pre-architecture program and a four-year Bachelor of Science in the Pre-architecture sequence, with a balance of general education. The Pre-architectural sequences include a minimum of 134 credit hours of study, and an additional 60 hours in the graduate program for a total of 194 credits leading to the first professional degree, Master of Architecture.

BUILDING CONSTRUCTION

The nation's leading industry in terms of annual dollar volume is building construction. Building contracting is a dynamic field and although organizations vary considerably in type, size and complexity, those in leadership positions must invariably have capability (education) in management, construction science, relevant technical disciplines, and the humanities. The curriculum in Building Construction has been structured to provide young people with the unique balance of studies needed to equip them for key roles in the industry. The course is four years in length and leads to the Bachelor of Science degree in Building Construction.

CITY AND REGIONAL PLANNING

The City Planner is a member of an essential and complex profession concerned with the programming and guiding of urban and regional development. Our expanding society presents unusual opportunities for Planning graduates in private firms and on public agency staffs. When asked what made a good planner, a leading British professional replied, "A sensitive, creative leader who has lived a bit." He must be able to integrate recommendations of a wide range of specialists. The sociologist, economist, traffic engineer, and ecologist play significant roles in urban growth and change, but the city planner and urban designer must bring the city to physical form with balance and imagination.

After the four-year Pre-architecture degree program or other acceptable undergraduate programs, the qualified student may opt

the two-year graduate professional curriculum in City and Regional Planning, encompassing 60 credit hours and leading to the Master of City and Regional Planning degree. Students admitted as candidates for the Master of City and Regional Planning degree must have the following qualifications:

(a) Meet the admissions requirements for the University Graduate School.

(b) Have a baccalaureate degree approved by the school in such fields as architecture, civil engineering, economics, landscape architecture, law, political science, or sociology.

Candidates entering the curriculum from a nondesign discipline will be required to take a special parallel course designed for their needs, and accordingly may be excused from courses in which they have achieved proficiency.

HISTORY AND VISUAL STUDIES.

The Department of History and Visual Studies provides required undergraduate courses in architectural and art history and visual arts. The Department also offers a two-year graduate program leading to the Master of Fine Arts degree in Ceramics, Painting, Sculpture, Printmaking, Graphic Design, Photography, and Multimedia. These programs each require a minimum of 60 credit hours. The graduate curricula have an emphasis in creative professional work of high standard. Maximum flexibility is provided in the management of these courses to foster innovation and imaginative solutions to fine arts problems.

PRE-ARCHITECTURE CURRICULUM

BACHELOR OF ARTS IN PRE-ARCHITECTURE

FIRST YEAR

First Semester			Second Semester		
ARCH 101 Architectural Analysis.	3	(1,6)	ARCH 102 Architectural Analysis.	3	(1,6)
ENGL 101 English Composition..	3	(3,0)	ENGL 102 English Composition..	3	(3,0)
MATH 103 College Algebra	2	(3.0)	MATH 106 Calculus of One Var.	4	(4,0)
MATH 104 Trigonometry	2	(3,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	Elective	3	
Elective	3				
	17			17	

SECOND YEAR

AAH 215 Arch. History I	3	(3,0)	AAH 216 Arch. History II	3	(3,0)
ARCH 253 Arch. Design I	5	(0,15)	ARCH 254 Arch. Design II	5	(0,15)
BLDSC 201 Building Science I ..	3	(3,0)	BLDSC 202 Building Science II..	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
VIS 203 Visual Arts Studio	3	(1,6)	Visual Studies°	3	(1,6)
	17			17	

THIRD YEAR

AAH 315 Arch. History III	3	(3,0)	AAH 316 Arch. History IV	3	(3,0)
ARCH 353 Arch. Design III	5	(0,15)	ARCH 354 Arch. Design IV	5	(0,15)
BLDSC 301 Building Science III .	3	(3,0)	BLDSC 302 Building Science IV.	3	(3,0)
Elective	6		Elective	6	
	17			17	

FOURTH YEAR

ARCH 421 Arch. Seminar	2	(2,0)	ARCH 422 Arch. Seminar	2	(2,0)
ARCH 453 Arch. Design V	5	(0,15)	ARCH 454 Arch. Design VI	5	(0,15)
BLDSC 401 Building Science V..	4	(3,3)	BLDSC 402 Building Science VI.	4	(3,3)
Elective	6		Elective	6	
	17			17	

136 Total Semester Hours

° Vis 205, 207, 209, 211, 213, 215, 217.

Elective Policy:

Major: To fulfill requirements for a major in Pre-architecture students must take, in addition to specified courses, a minimum of 9 credits above the sophomore level in areas of Art and Architectural History, Building Science, City and Regional Planning, Architectural Design, or Visual Studies.

English Literature: A minimum of 6 elective credits are required in the area of literature.

Minor Concentration: Students should select, no later than the end of their sophomore year, a minor field of concentration from the following areas: English, mathematics, modern language, philosophy, life sciences, physical sciences, or social sciences. The minor concentration requires a total of 15 credits with at least 3 credits above the sophomore level. A minor may include specified courses.

PRE-ARCHITECTURE CURRICULUM

BACHELOR OF SCIENCE IN PRE-ARCHITECTURE

FIRST YEAR

First Semester

ARCH 101 Architectural Analysis.	3	(1,6)
ENGL 101 English Composition..	3	(3,0)
MATH 106 Calculus of One Var..	4	(4,0)
PHYS 115 Classical Physics I ...	3	(3,0)
Elective	3	
	16	

Second Semester

ARCH 102 Architectural Analysis.	3	(1,6)
ENGL 102 English Composition..	3	(3,0)
MATH 108 Cal. and Lin. Algebra	4	(4,0)
PHYS 116 Classical Physics II...	3	(3,0)
Elective	3	
	16	

SECOND YEAR

AAH 215 Arch. History I	3	(3,0)
ARCH 253 Arch. Design I	5	(0,15)
BLDSC 201 Building Science I ..	3	(3,0)
ECON 201 Principles of Economics	3	(3,0)
VIS 203 Visual Arts Studio.....	3	(1,6)
	17	

AAH 216 Arch. History II	3	(3,0)
ARCH 254 Arch. Design II......	5	(0,15)
BLDSC 202 Building Science II .	3	(3,0)
ECON 202 Principles of Economics	3	(3,0)
Visual Studies°	3	(1,6)
	17	

THIRD YEAR

AAH 315 Arch. History III......	3	(3,0)
ARCH 353 Arch. Design III	5	(0,15)
BLDSC 301 Building Science III .	3	(3,0)
Elective	6	
	17	

AAH 316 Arch. History IV	3	(3,0)
ARCH 354 Arch. Design IV	5	(0,15)
BLDSC 302 Building Science IV.	3	(3,0)
Elective	6	
	17	

FOURTH YEAR

ARCH 421 Arch. Seminar	2	(2,0)
ARCH 453 Arch. Design V	5	(0,15)
BLDSC 401 Building Science V..	4	(3,3)
Elective	6	
	17	

ARCH 422 Arch. Seminar	2	(2,0)
ARCH 454 Arch. Design VI	5	(0,15)
BLDSC 402 Building Science VI.	4	(3,3)
Elective	6	
	17	

134 Total Semester Hours

° Vis 205, 207, 209, 211, 213, 215, 217.

Elective Policy:

Major: To fulfill requirements for a major in Pre-architecture students must take, in addition to specified courses, a minimum of 9 credits above the sophomore level in areas of Art and Architectural History, Building Science, City and Regional Planning, Architectural Design, or Visual Studies.

English Literature: A minimum of 6 elective credits are required in the area of literature.

Minor Concentration: Students should select, no later than the end of their sophomore year, a minor field of concentration from the following areas: English, mathematics, modern language, philosophy, life sciences, physical sciences, or social sciences. The minor concentration requires a total of 15 credits with at least 3 credits above the sophomore level. A minor may include specified courses.

BUILDING CONSTRUCTION CURRICULUM

BACHELOR OF SCIENCE IN BUILDING CONSTRUCTION

FIRST YEAR

First Semester			Second Semester		
ARCH 101 Architectural Analysis.	3	(1,6)	ARCH 102 Architectural Analysis.	3	(1,6)
ENGL 101 English Composition..	3	(3,0)	ENGL 102 English Composition..	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
PHYS 115 Classical Physics I ...	3	(3,0)	PHYS 116 Classical Physics II...	3	(3,0)
Elective	3		Elective	3	
	16			16	

SECOND YEAR

AAH 215 Arch. History I	3	(3,0)	AAH 216 Arch. History II	3	(3,0)
ACCT 201 Principles of Accounting	3	(3,0)	ACCT 202 Principles of Accounting	3	(3,0)
BLDSC 201 Building Science I ..	3	(3,0)	BLDSC 202 Building Science II .	3	(3,0)
BLDSC 241 Construction Organizations and Estimating	5	(2,9)	BLDSC 242 Construction Planning and Scheduling	5	(2,9)
ECON 201 Principles of Economics	3	(3,0)	ECON 202 Principles of Economics	3	(3,0)
	17			17	

THIRD YEAR

AAH 315 Arch. History III	3	(3,0)	AAH 316 Arch. History IV	3	(3,0)
BLDSC 301 Building Science III .	3	(3,0)	BLDSC 302 Building Science IV.	3	(3,0)
BLDSC 341 Construction Data Systems	5	(2,9)	BLDSC 342 Construction Labor Management	5	(2,9)
CE 201 Surveying	3	(2,3)	IM 312 Commercial Law	3	(3,0)
Elective	3		Elective	3	
	17			17	

FOURTH YEAR

ARCH 421 Arch. Seminar	2	(2,0)	ARCH 422 Arch. Seminar	2	(2,0)
BLDSC 401 Building Science V..	4	(3,3)	BLDSC 402 Building Science VI.	4	(3,3)
BLDSC 441 Construc. Economics.	5	(2,9)	BLDSC 442 Construction Mgt. ..	5	(2,9)
Elective	6		Elective	6	
	17			17	

134 Total Semester Hours

Elective Policy:

Major: To fulfill the requirements for a major in Building Construction students must take, in addition to specified courses, a minimum of 8 credits above the sophomore level in the areas of Accounting, Economics, Industrial Management, Building Science, or Planning Studies.

English: A minimum of 6 elective credits are required in the area of literature and oral expression.

COLLEGE OF EDUCATION

GENERAL INFORMATION

The purpose of the College of Education is to prepare teachers, special service personnel, and school leaders; to provide professional services to education in South Carolina; and to carry out basic and applied research in education. Curriculums are organized to give students the opportunities to (1) acquire a broad general education through liberal arts and science courses; (2) develop depth of knowledge in the teaching area; (3) gain an understanding of the historical, philosophical and psychological backgrounds of American education; and (4) acquire knowledge of and skill and experience in using effective teaching techniques.

Curriculums for those preparing to teach have been especially designed by committees from each department offering a teach-

ing major and the College of Education. The Clemson University Teacher Education Committee, composed of representatives from the teaching-major departments and public schools, serves in a curriculum advisory capacity to the Dean of the College of Education.

The College of Education offers courses in Aerospace Studies, Agricultural Education, Early Childhood Education, Elementary Education, Industrial Education, Military Science, and Secondary Education.

ADMISSION

Beginning in the fall semester, 1973, admission to programs in the College of Education will be accomplished in three phases: preprofessional, professional education, and directed teaching.

Preprofessional. Individuals who show an interest in teaching and related areas and who have met the general admission requirements of Clemson University must complete and submit form CED01 to be considered for admission to a preprofessional program. To insure that entering students pursue the appropriate preprofessional curriculum, an interview is required for completion of CED01. The interview is usually held during the university orientation program.

Professional. During the term in which a student is to complete 60 semester hours of work he is to apply on form CED02 for admission to a professional program in the College of Education. This application is to be submitted to his department head by November 10, March 1, or at the beginning of the summer school term in which he will have completed 60 semester hours. A student must fulfill the following requirements:

1. He must have the recommendation of his adviser.
2. During the semester in which he is to complete 60 semester hours he must have a minimum cumulative grade-point average of 1.6 to be admitted.

Directed Teaching. A student who is in a professional program and who has completed at least 95 semester hours is eligible to register for the appropriate directed teaching program. To be admitted the following must be fulfilled:

1. A student should apply to the head of his department on the form provided by the department prior to May 1 of the academic year preceding the school year in which directed teaching is to be scheduled.

2. A student must meet the cumulative grade-point-ratio requirement for graduation before being permitted to register for directed teaching and the related methods course.

3. A student must have the recommendation of his adviser.

Directed Teaching is on a "block schedule." The other classes are scheduled to meet during the first half of the semester, and Directed Teaching is scheduled for the last half.

CONTINUING ENROLLMENT

After having been admitted to the professional program a student must maintain the grade-point average for admission to the program and that required by Clemson University for continuing enrollment. Grade-point averages may be checked at the end of a semester or summer term. A student must have a cumulative grade-point average of 1.6 to enroll in 300 level and 1.8 to enroll in 400 level education courses, except directed teaching and the related methods course which require a minimum of 2.0.

Any student who desires to enroll in education courses must meet the cumulative grade-point requirements established for education majors.

A student who is denied admission may appeal to the College of Education Admissions Committee.

PROGRAMS OF STUDY

Programs leading to the Bachelor of Science degree are available in Agricultural Education, Industrial Education, and Science Teaching (Biological Sciences, Chemistry, Earth Sciences, Physical Sciences, or Mathematics). Programs leading to the Bachelor of Arts degree are available in Early Childhood Education, Elementary Education and Secondary Education with teaching majors in Economics, English, History, Mathematics, French, German, Spanish, Natural Sciences, Political Science, Psychology, and Sociology.

Qualified students who complete a minimum of six semester hours in junior-senior Honors courses in Education and a minimum of six semester hours of Honors courses in the teaching field may graduate with Departmental Honors.

A student completing at least six semester hours in junior-senior Honors courses in Education and a minimum of six semester hours of junior and senior Honors courses outside the teaching area may graduate with Senior Division Honors.

BACHELOR OF ARTS CURRICULA

EARLY CHILDHOOD EDUCATION

The curriculum in Early Childhood Education leads to a Bachelor of Arts degree in Early Childhood Education. It prepares students for teaching positions in kindergarten or grades 1-3. A minimum of 129 semester hours is required for graduation.

Application to Directed Teaching (Ed 484) should be made in writing no later than May 1 prior to the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

FRESHMAN YEAR

First Semester

ED 100 Orientation	1	(1,0)
ENGL 101 English Composition	3	(3,0)
MATH 115 Contemporary Math. for Elementary Teachers I	3	(3,0)
Modern Language	4	(3,1)
Science†	4	
Elective	1	
	16	

Second Semester

ENGL 102 English Composition	3	(3,0)
HIST 101 American History	3	(3,0)
MATH 116 Contemporary Math. for Elementary Teachers II	3	(3,0)
Modern Language	4	(3,1)
Science†	4	
Elective	1	
	18	

SOPHOMORE YEAR

HIST 102 American History	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 215 Algebra for Elementary Teachers	3	(3,0)
Modern Language	3	(3,0)
Science†	4	
Elective	1	
	17	

HIST 171 or 172 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 216 Geometry for Elementary Teachers	3	(3,0)
Modern Language	3	(3,0)
Science†	4	
Elective	1	
	17	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)
ENGL 351 Children's Literature	3	(3,0)
HIST 172 or 173 West. Civilization	3	(3,0)
IN ED 372 Arts and Crafts	3	(2,3)
MUS 400 Music in Elementary School Classroom	3	(3,0)
	15	

ED 302 Educational Psychology	3	(3,0)
ED 336 Behavior Preschool Child	3	(2,2)
ED 459 Fund. of Basic Reading	3	(3,0)
Social Science Elective§	6	
Elective	1	
	16	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)
ED 458 Health Education	3	(3,0)
ED 466 Curriculum for Early Childhood Education	3	(3,0)
MUS 210 Music Appreciation	3	(3,0)
Elective	3	
	15	

ED 334 Child Growth and Dev.	3	(3,0)
ED 461 Teaching Reading in the Elementary School	3	(1,4)
ED 483 Methods and Materials for Early Childhood Education	3	(3,0)
ED 484 Directed Teaching‡	6	(1,15)
	15	

129 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Must include Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
‡ Block schedule must be taken as shown in either semester of the senior year.
§ Economics, geography, philosophy, political science, religion, sociology.

ELEMENTARY EDUCATION

The curriculum in Elementary Education leads to a Bachelor of Arts degree in Elementary Education. It prepares students for teaching positions on the elementary level. Provisions are made for more detailed study in an instructional interest area. A minimum of 129 semester hours is required for graduation.

Application to Directed Teaching (Ed 481) should be made in writing no later than May 1 prior to the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for this course.

FRESHMAN YEAR

First Semester

ED 100 Orientation	1	(1,0)
ENGL 101 English Composition	3	(3,0)
MATH 115 Contemporary Math. for Elementary Teachers I	3	(3.0)
Modern Language	4	(3,1)
Science†	4	
Elective	1	
	16	

Second Semester

ENGL 102 English Composition	3	(3,0)
HIST 101 American History	3	(3,0)
MATH 116 Contemporary Math. for Elementary Teachers II	3	(3,0)
Modern Language	4	(3,1)
Science†	4	
Elective	1	
	18	

SOPHOMORE YEAR

HIST 102 American History	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 215 Algebra for Elementary Teachers	3	(3,0)
Modern Language	3	(3,0)
Science†	4	
Elective	1	
	17	

HIST 171 or 172 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 216 Geometry for Elementary Teachers	3	(3,0)
Modern Language	3	(3,0)
Science†	4	
Elective	1	
	17	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)
ED 302 Educational Psychology	3	(3,0)
ENGL 351 Children's Literature	3	(3,0)
HIST 172 or 173 West. Civilization	3	(3,0)
IN ED 372 Arts and Crafts	3	(2,3)
	15	

MUS 400 Music in Elementary School Classroom	3	(3,0)
Social Science Elective§	6	
Interest Area¶	6	
Elective	1	
	16	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)
ED 458 Health Education	3	(3,0)
MUS 210 Music Appreciation	3	(3,0)
Interest Area¶	6	
	15	

ED 334 Child Growth and Dev.	3	(3,0)
ED 461 Teaching Reading in the Elementary School	3	(1,4)
ED 481 Directed Teaching‡	6	(1,15)
ED 485 Meth. and Cur. in Elem. Math. and Science	3	(3,0)
or ED 486 Meth. and Cur. in Elem. Social Studies and Lang. Arts	3	(3,0)
	15	

129 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Must include Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
‡This is a block schedule and must be taken as shown in either semester of senior year.
§ Economics, geography, philosophy, political science, religion, sociology.
¶ Twelve semester hours in one of these areas: English, fine arts, mathematics, modern languages, natural sciences, social sciences, special education.

SECONDARY EDUCATION CURRICULA

Programs leading to a Bachelor of Arts degree in Secondary Education are available to students preparing to teach economics, English, history, mathematics, French, German, Spanish, natural sciences, political science, psychology, or sociology on the secondary school level. The teaching field should be selected as early as possible in order that appropriate freshman and sophomore courses may be taken.

Each curriculum requires a major concentration in the teaching field. Specific courses and sequences have been designated by teacher education committees to meet requirments for those planning to teach. Students who have elective courses in the teaching area should consult the departmental adviser prior to scheduling these courses.

The professional education courses should be completed in sequence prior to registering for the block schedule. Application to Directed Teaching (Ed 412) should be made in writing no later than May 1 preceding the school year in which student teaching is to be scheduled. A student whose cumulative grade-point ratio is lower than the requirement for graduation will not be permitted to register for Directed Teaching.

Education 412 is conducted on a full-day basis, "block schedule," for one-half semester. Students taking Ed 412 will register for Ed 424, 458, and Mus 210, these three courses being taught on a five-day basis during the first half of the semester.

TEACHING AREA: ECONOMICS

FRESHMAN YEAR

First Semester			Second Semester		
ED 100 Orientation	1	(1,0)	ENGL 102 English Composition	3	(3,0)
ENGL 101 English Composition	3	(3,0)	HIST 172 or 173 West. Civilization	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)	MATH 102 Math. Analysis II	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	Science†	3–4	
Science†	3–4		Elective	1	
Elective	1			17–18	
	18–19				

SOPHOMORE YEAR

ECON 201 Principles of Economics	3	(3,0)	ACCT 201 Principles of Accounting	3	(3,0)
Literature Requirement°	3	(3,0)	ECON 202 Principles of Economics	3	(3,0)
MATH 203 Elem. Stat. Inference	3	(3,0)	Literature Requirement°	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science†	4–3		Science†	4–3	
Elective	1		Elective	1	
	17–16			17–16	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)
ED 302 Educational Psychology. .	3	(3,0)
Teaching Major	9	
	15	

Teaching Major	9
Electives	6
	15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts . . .	3	(3,0)
ED 458 Health Education	3	(3,0)
MUS 210 Music Appreciation . . .	3	(3,0)
Teaching Major	6	
	15	

ED 335 Adol. Growth and Dev. .	3	(3,0)
ED 412 Directed Teaching‡	6	(1,15)
ED 424 Methods and Materials in Secondary School Instruction . .	3	(3,0)
ED 498 Teaching Secondary School Reading	3	(1,4)
	15	

129 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
‡ This semester is a block schedule and must be taken as listed.
Note: The teaching major requires twenty-four semester hours of junior and senior courses consisting of Econ 314, 407; nine semester hours from Econ 302, 403, 404, 410, 412, and 420 distributed as follows:
Group A: Econ 314, 407.
Group B: Three courses from: Econ 302, 403, 404, 410, 412, 420.
Group C: The remaining hours selected from Ag Ec 456, Econ 301, 302, 305, 306, 308, 309, 403, 404, 410, 412, 416, 420, 422, Ex St 462, IM 404, 405, 406; Mgt Sc 311.

TEACHING AREA: ENGLISH

FRESHMAN YEAR

First Semester

ED 100 Orientation	1	(1,0)
ENGL 101 English Composition. .	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)
Modern Language	4	(3,1)
Science†	4	
Elective	1	
	16	

Second Semester

ENGL 102 English Composition. .	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)
MATH 102 Math. Analysis II . . .	3	(3,0)
Modern Language	4	(3,1)
Science†	4	
Elective	1	
	18	

SOPHOMORE YEAR

HIST 172 or 173 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)
Modern Language	3	(3,0)
Science†	4	
Social Science Elective§	3	(3,0)
Elective	1	
	17	

Literature Requirement°	3	(3,0)
Modern Language	3	(3,0)
Science†	4	
Social Science Elective§	3	(3,0)
Elective	4	
	17	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)
HIST 361 History of England. . .	3	(3,0)
Teaching Major	9	
Elective	3	
	18	

ED 302 Educational Psychology. .	3	(3,0)
HIST 363 History of England . . .	3	(3,0)
Teaching Major	9	
	15	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts ...	3	(3,0)	ED 335 Adol. Growth and Dev. .	3	(3,0)
ED 458 Health Education	3	(3,0)	ED 412 Directed Teaching‡	6(1,15)	
MUS 210 Music Appreciation ...	3	(3,0)	ED 424 Methods and Materials in		
Teaching Major	6		Secondary School Instruction...	3	(3,0)
	—		ED 498 Teaching Secondary		
	15		School Reading	3	(1,4)
				—	
				15	

131 Total Semester Hours

* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
‡ This semester is a block schedule and must be taken as listed.
§ Economics, geography, philosophy, political science, religion, sociology.
Note: The teaching major requires twenty-four semester hours of junior and senior English courses and must include Engl 304, 352, 402, 404, 405, 422 or 423, 440, 461 or 462.
Those receiving departmental certification for Engl 304 are required to complete one additional course on the 400 level.

TEACHING AREA: HISTORY

FRESHMAN YEAR

First Semester			Second Semester		
ED 100 Orientation	1	(1,0)	ENGL 102 English Composition..	3	(3,0)
ENGL 101 English Composition..	3	(3,0)	HIST 171 or 172 West. Civilization	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)	MATH 102 Math. Analysis II ...	3	(3,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
Science†	4		Science†	4	
Elective	1		Elective	1	
	—			—	
	16			18	

SOPHOMORE YEAR

HIST 172 or 173 West. Civilization	3	(3,0)	HIST 101 American History	3	(3,0)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Science†	4		Science†	4	
Social Science Elective§	3	(3,0)	Social Science Elective§	3	(3,0)
Elective	1		Elective	1	
	—			—	
	17			17	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)	ED 302 Educational Psychology..	3	(3,0)
HIST 102 American History	3	(3,0)	Teaching Major	9	
Teaching Major	9		Elective	4	
Elective	2			—	
	—			16	
	17				

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts ...	3	(3,0)	ED 335 Adol. Growth and Dev. .	3	(3,0)
ED 458 Health Education	3	(3,0)	ED 412 Directed Teaching‡	6(1,15)	
MUS 210 Music Appreciation ...	3	(3,0)	ED 424 Methods and Materials in		
Teaching Major	6		Secondary School Instruction...	3	(3,0)
	—		ED 498 Teaching Secondary		
	15		School Reading	3	(1,4)
				—	
				15	

131 Total Semester Hours

* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
‡ This semester is a block schedule and must be taken as listed.
§ Economics, geography, philosophy, political science, religion, sociology.
Note: The teaching major requires twenty-four hours of junior and senior history courses, Hist 313, and at least one course from Group A, and two courses each from Group B and C.
Group A: Hist 306, 307, 314, 315, 410, 411, 412, 413, 414.
Group B: Hist 361, 363, 371, 385, 386, 473, 475, 476, 477, 479, 480, 482, 483, 484.
Group C: Hist 331, 332, 340, 341, 342, 431, 441.

TEACHING AREA: MATHEMATICS

FRESHMAN YEAR

First Semester		
ED 100 Orientation	1	(1,0)
ENGL 101 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
Modern Language	4	(3,1)
Science†	3–4	
Elective	1	
	16–17	

Second Semester		
ENGL 102 English Composition	3	(3,0)
MATH 108 Cal. and Lin. Algebra	4	(4,0)
Modern Language	4	(3,1)
Science†	3–4	
Elective	1	
	15–16	

SOPHOMORE YEAR

HIST 171 or 172 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)
Modern Language	3	(3,0)
Science†	4–3	
Elective	1	
	18–17	

HIST 172 or 173 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 295 Foundation of Anal.	3	(3,0)
Modern Language	3	(3,0)
Science†	4–3	
Social Science Elective§	3	(3,0)
Elective	1	
	20–19	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)
MATH 301 Statistical Theory and Methods I	3	(3,0)
MATH 308 College Geometry	3	(3,0)
Social Science Elective§	3	(3,0)
Elective	3	
	15	

AAH 303 Evol. of Visual Arts	3	(3,0)
ED 302 Educational Psychology	3	(3,0)
MATH 408 Topics in Geometry	3	(3,0)
MATH 411 Linear Algebra	3	(3,0)
Elective	3	
	15	

SENIOR YEAR

(Block Schedule—Either Semester)

ED 458 Health Education	3	(3,0)
MATH 412 Intro. to Modern Algebra	3	(3,0)
MUS 210 Music Appreciation	3	(3,0)
Mathematics Elective	6	
	15	

ED 335 Adol. Growth and Dev.	3	(3,0)
ED 412 Directed Teaching‡	6	(1,15)
ED 424 Methods and Materials in Secondary School Instruction	3	(3,0)
ED 498 Teaching Secondary School Reading	3	(1,4)
	15	

129 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
‡ This semester is a block schedule and must be taken as listed.
§ Economics, geography, philosophy, political science, religion, sociology.
Note: Suggested Math electives: Comp Sc 205, 210, Math 405, 409, 452, 453, 454.
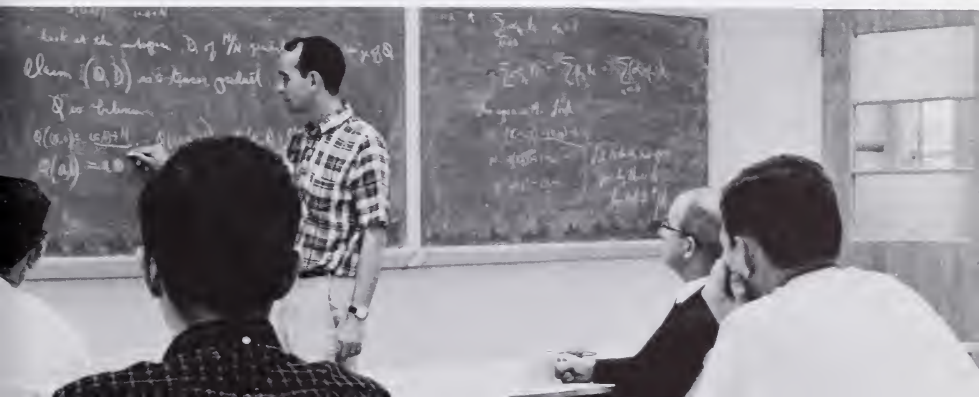
TEACHING AREA: MODERN LANGUAGES
(French, German and Spanish)

FRESHMAN YEAR

First Semester

ED 100 Orientation 1 (1,0)
ENGL 101 English Composition.. 3 (3,0)
MATH 101 Math. Analysis I 3 (3,0)
Modern Language 4 (3,1)
Science† 4
Elective 1
—
16

Second Semester

ENGL 102 English Composition.. 3 (3,0)
HIST 171 or 172 West. Civilization 3 (3,0)
MATH 102 Math. Analysis II ... 3 (3,0)
Modern Language 4 (3,1)
Science† 4
Elective 1
—
18

SOPHOMORE YEAR

HIST 172 or 173 West. Civilization 3 (3,0)
Literature Requirement* 3 (3,0)
Modern Language 3 (3,0)
Science† 4
Social Science Elective§ 3 (3,0)
Elective 1
—
17

Literature Requirement* 3 (3,0)
Modern Language 3 (3,0)
Science† 4
Social Science Elective§ 3 (3,0)
Elective 4
—
17

JUNIOR YEAR

ED 301 Principles of American Ed. 3 (3,0)
Teaching Major 9
Elective 3
—
15

ED 302 Educational Psychology.. 3 (3,0)
Teaching Major 9
Elective 3
—
15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts ... 3 (3,0)
ED 458 Health Education 3 (3,0)
MUS 210 Music Appreciation ... 3 (3,0)
Teaching Major 6
—
15

ED 335 Adol. Growth and Dev. . 3 (3,0)
ED 412 Directed Teaching‡ .... 6(1,15)
ED 424 Methods and Materials in
    Secondary School Instruction... 3 (3,0)
ED 498 Teaching Secondary
    School Reading 3 (1,4)
—
15

128 Total Semester Hours

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* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
‡ This semester is a block schedule and must be taken as listed.
§ Economics, geography, philosophy, political science, religion, sociology.
Note: The teaching major requires 24 semester hours in either French, German, or Spanish as listed.
French Major: Must include Fr 303, 304, 305. Select electives from Fr 306, 307, 308, 403, 404, 405, 406, 407, 408.
German Major: Must include Ger 303, 304, 305. Select electives from Ger 306, 307, 308, 403, 404, 405, 406.
Spanish Major: Must include Span 303, 304, 305. Select electives from Span 306, 307, 308, 401, 402, 405, 406.

TEACHING AREA: NATURAL SCIENCES

FRESHMAN YEAR

First Semester				Second Semester			
CH 101 General Chemistry	.....	4	(3,3)	CH 102 General Chemistry	.....	4	(3,3)
ED 100 Orientation	....	1	(1,0)	ENGL 102 English Composition	..	3	(3,0)
ENGL 101 English Composition	..	3	(3,0)	HIST 171 or 172 West. Civilization		3	(3,0)
MATH 101 Math. Analysis I	....	3	(3,0)	MATH 102 Math. Analysis II	...	3	(3,0)
Modern Language	....	4	(3,1)	Modern Language	....	4	(3,1)
Elective	....	1		Elective	....	1	
		16				18	

SOPHOMORE YEAR

BOT 101 Plant Biology	....	3	(3,0)	Literature Requirement°	....	3	(3,0)
BOT 103 Plant Biology Lab.	....	1	(0,2)	Modern Language	....	3	(3,0)
or ZOOL 101 Animal Biology	..	3	(3,0)	ZOOL 101 Animal Biology	.....	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)		ZOOL 103 Animal Biology Lab.	..	1	(0,2)
HIST 172 or 173 West. Civilization	3	(3,0)		or BOT 101 Plant Biology	....	3	(3,0)
Literature Requirement°	....	3	(3,0)	and BOT 103 Plant Biol. Lab.	1	(0,2)
MATH 203 Elem. Stat. Inference	3	(3,0)		Social Science Elective§	....	6	
Modern Language	....	3	(3,0)	Elective	....	1	
Elective	....	1					
		17				17	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)		ED 302 Educational Psychology	..	3	(3,0)
GEOL 101 Physical Geology	....	4	(3,3)	GEOL 102 Historical Geology	...	4	(3,3)
PHYS 207 General Physics	......	4	(3,2)	PHYS 208 General Physics	.....	4	(3,2)
Science Elective†	....	3		Science Elective†	....	3	
Elective	....	3		Elective	....	3	
		17				17	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	...	3	(3,0)	ED 412 Directed Teaching‡	....	6	(1,15)
ASTR 202 Stellar Astronomy	.....	3	(3,0)	ED 424 Methods and Materials in			
ED 335 Adol. Growth and Dev.	..	3	(3,0)	Secondary School Instruction	...	3	(3,0)
ED 498 Teaching Secondary				ED 458 Health Education	......	3	(3,0)
School Reading	....	3	(1,4)	MUS 210 Music Appreciation	...	3	(3,0)
Science Elective†	....	3				15	
		15					

132 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Science electives to be taken in biological sciences, chemistry, physics, geology.
‡ The last semester of the senior year is a block schedule and must be taken as listed.
§ Economics, geography, philosophy, political science, religion, sociology.

TEACHING AREA: POLITICAL SCIENCE

FRESHMAN YEAR

First Semester

ED 100 Orientation 1 (1,0)
ENGL 101 English Composition.. 3 (3,0)
HIST 171 or 172 West. Civilization 3 (3,0)
MATH 101 Math. Analysis I 3 (3,0)
Modern Language 4 (3,1)
Science† 3–4
Elective 1
_____
18–19

Second Semester

ENGL 102 English Composition.. 3 (3,0)
HIST 172 or 173 West. Civilization 3 (3,0)
MATH 102 Math. Analysis II ... 3 (3,0)
Modern Language 4 (3,1)
Science† 3–4
Elective 1
_____
17–18

SOPHOMORE YEAR

HIST 101 American History 3 (3,0)
Literature Requirement° 3 (3,0)
Modern Language 3 (3,0)
POL SC 101 Intro. to Pol. Sci. I 3 (3,0)
Science† 4–3
Elective 1
_____
17–16

HIST 102 American History 3 (3,0)
Literature Requirement° 3 (3,0)
Modern Language 3 (3,0)
POL SC 201 Intro. to Pol. Sci. II 3 (3,0)
Science† 4–3
Elective 1
_____
17–16

JUNIOR YEAR

ED 301 Principles of American Ed. 3 (3,0)
Teaching Major 9
Elective 3
_____
15

ED 302 Educational Psychology.. 3 (3,0)
Teaching Major 9
Elective 3
_____
15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts ... 3 (3,0)
ED 458 Health Education 3 (3,0)
MUS 210 Music Appreciation ... 3 (3,0)
Teaching Major 6
_____
15

ED 335 Adol. Growth and Dev. . 3 (3,0)
ED 412 Directed Teaching‡ .... 6(1,15)
ED 424 Methods and Materials in
   Secondary School Instruction... 3 (3,0)
ED 498 Teaching Secondary
   School Reading 3 (1,4)
_____
15

129 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physics, or Phy Sc 101, 102.
‡ This is a block schedule and must be taken as listed.
Note: The teaching major requires twenty-four semester hours of junior and senior political science courses including Pol Sc 101, 201, 302, and the remaining hours to be drawn from four of the following fields:
   American Government—Pol Sc 302, 403, 405, 409
   Comparative Governments—Pol Sc 371, 372, 473, 479
   International Relations—Pol Sc 361, 462, 463, 464, 465, 469
   Political Behavior—Pol Sc 341, 442, 443
   Political Thought—Pol Sc 351, 352
   Public Administration—Pol Sc 321, 422, 423, 426, 428
   Public Law—Pol Sc 331, 432, 433, 434, 435

TEACHING AREA: PSYCHOLOGY

FRESHMAN YEAR

First Semester

ED 100 Orientation	1	(1,0)
ENGL 101 English Composition	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)
Modern Language	4	(3,1)
Science†	3–4	
Elective	1	

18–19

Second Semester

ENGL 102 English Composition	3	(3,0)
HIST 172 or 173 West. Civilization	3	(3,0)
MATH 102 Math. Analysis II	3	(3,0)
Modern Language	4	(3,1)
Science†	3–4	
Elective	1	

17–18

SOPHOMORE YEAR

Literature Requirement°	3	(3,0)
MATH 203 Elem. Stat. Inference	3	(3,0)
Modern Language	3	(3,0)
PSYCH 201 General Psychology	3	(3,0)
Science†	4–3	
Elective	1	

17–16

Literature Requirement°	3	(3,0)
Modern Language	3	(3,0)
PSYCH 202 Intro. Exp. Psych.	3	(3,0)
Science†	4–3	
Social Science Elective§	3	(3,0)
Elective	1	

17–16

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)
Teaching Major	9	
Elective	3	

15

ED 302 Educational Psychology	3	(3,0)
Teaching Major	6	
Social Science Elective§	3	(3,0)
Elective	3	

15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)
ED 458 Health Education	3	(3,0)
MUS 210 Music Appreciation	3	(3,0)
Teaching Major	6	

15

ED 335 Adol. Growth and Dev.	3	(3,0)
ED 412 Directed Teaching‡	6	(1,15)
ED 424 Methods and Materials in Secondary School Instruction	3	(3,0)
ED 498 Teaching Secondary School Reading	3	(1,4)

15

129 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physics, or Phy Sc 101, 102.

‡ This is a block schedule and must be taken as listed.

§ Economics, geography, philosophy, political science, religion, sociology.

Note: The Teaching major requires 24 semester hours of junior and senior psychology courses.

TEACHING AREA: SOCIOLOGY

FRESHMAN YEAR

First Semester

ED 100 Orientation 1 (1,0)
ENGL 101 English Composition.. 3 (3,0)
HIST 171 or 172 West. Civilization 3 (3,0)
MATH 101 Math. Analysis I 3 (3,0)
Modern Language 4 (3,1)
Science§ 3–4
Elective 1
————
18–19

Second Semester

ENGL 102 English Composition.. 3 (3,0)
HIST 172 or 173 West. Civilization 3 (3,0)
MATH 102 Math. Analysis II ... 3 (3,0)
Modern Language 4 (3,1)
Science§ 3–4
Elective 1
————
17–18

SOPHOMORE YEAR

Literature Requirement* 3 (3,0)
MATH 203 Elem. Stat. Inference 3 (3,0)
Modern Language 3 (3,0)
SOC 201 Introductory Sociology.. 3 (3,0)
Science§ 4–3
Elective 1
————
17–16

Literature Requirement* 3 (3,0)
Modern Language 3 (3,0)
SOC 202 Social Problems 3 (3,0)
Science§ 4–3
Elective 4
————
17–16

JUNIOR YEAR

ED 301 Principles of American Ed. 3 (3,0)
Teaching Major 9
Elective† 6
——
18

ED 302 Educational Psychology.. 3 (3,0)
Teaching Major 9
Elective 3
——
15

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts.... 3 (3,0)
ED 458 Health Education 3 (3,0)
MUS 210 Music Appreciation ... 3 (3,0)
Teaching Major 6
Elective† 2
——
17

ED 335 Adol. Growth and Dev.. 3 (3,0)
ED 412 Directed Teaching‡ .... 6(1,15)
ED 424 Methods and Materials in
  Secondary School Instruction... 3 (3,0)
ED 498 Teaching Secondary
  School Reading 3 (1,4)
——
15

134 Total Semester Hours

* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Electives must include Econ 201, 202, Pol Sc 101.
‡ This semester is a block schedule and must be taken as listed.
§ Bot 101, 103 or Zool 101, 103, and a two-semester sequence in chemistry, geology, physical science, or physics.
Note: The teaching major consists of Soc 411, 421, and the remaining from Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 393, 431, 441, 451, 481, 499.

BACHELOR OF SCIENCE CURRICULA

AGRICULTURAL EDUCATION

The Agricultural Education curriculum is designed for students who wish to prepare for positions in vocational agriculture, agricultural occupations, and other teaching positions in the secondary schools; engage in other forms of educational work such as agricultural missionary, public relations and agricultural extension; farming, soil conservation and other governmental work; business and industry.

The curriculum provides for a broad education in general and professional education including student teaching. In addition to required courses giving a thorough background in the agricultural and biological sciences, a student may minor in business or international agriculture or in one subject-matter field. Students in other departments may minor in Agricultural Education and be certified to teach.

FRESHMAN YEAR

First Semester		
BOT 101 Plant Biology	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)
or ZOOL 101 Animal Biology	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)
CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
HIST 102 American History	3	(3,0)
MATH 103 College Algebra	2	(3,0)
Elective	1	
	17	

Second Semester		
AGRIC 101 Intro. to Agriculture	1	(1,0)
CH 102 or 112 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 104 Trigonometry	2	(3,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
or BOT 101 Plant Biology	3	(3,0)
and BOT 103 Plant Biol. Lab.	1	(0,2)
Elective	1	
	15	

SOPHOMORE YEAR

AG ED 201 Intro. to Agric. Ed.	3	(2,2)
AGRIC 202 Intro. to Plant Sciences	3	(2,3)
ECON 201 Principles of Economics	3	(3,0)
History–Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)
Elective	1	
	17	

AGM 205 Principles of Farm Shop	3	(2,3)
AGM 206 Agric. Mechanization	3	(2,3)
AGRIC 201 Intro. to Animal Ind.	3	(2,3)
AGRON 202 Soils	3	(2,2)
History–Literature Requirement°	3	(3,0)
Elective	1	
	16	

JUNIOR YEAR

AGM 301 Soil and Water Conserva.	3	(2,3)
AGRON 301 Fertilizers	3	(3,0)
ENGL 301 Public Speaking	3	(3,0)
Approved Horticulture Elective	3	
Minor†	3	
Elective	3	
	18	

AG EC 302 Agric. Firm Mgt.	3	(2,3)
AN SC 301 Feeds and Feeding	3	(3,0)
FOR 305 Elements of Forestry	2	(2,0)
FOR 307 Elem. of Forestry Lab.	1	(0,3)
Minor†	9	
	18	

SENIOR YEAR

AG EC 452 Agricultural Policy	3	(3,0)	AG ED 401 Methods in		
ENT 301 General Entomology	3	(2,3)	Agricultural Education	3	(2,2)
HORT 407 Landscape Design	3	(2,3)	AG ED 406 Directed Teaching	6	(0,18)
PL PA 401 Plant Pathology	3	(2,3)	AG ED 423 Curriculum	2	(2,0)
Minor†	3		AG ED 425 Teach. Agric. Mech.	2	(1,3)
Elective	2		ED 302 Educational Psychology	3	(3,0)
	17			16	

134 Total Semester Hours

° One course to be selected from each of the following groups. (At least one literature course is required.)
Group I: Engl 203, 205, 207, 231, Hist 171, 172.
Group II: Engl 204, 206, 208, 231, Hist 172, 173.
† See class adviser for available minors and course requirements.
Note: Agricultural Education curriculum is jointly administered by the College of Agricultural Sciences and the College of Education.

INDUSTRIAL EDUCATION

The curriculum in Industrial Education is designed to prepare students for careers in the teaching of industrial subjects and in training programs in industry. To accomplish these purposes the curriculum is divided into three areas of specialization leading to the degree of Bachelor of Science in Industrial Education. At the end of his freshman year, each student will select one of three options: Education for Industry, Industrial Arts Education, or Vocational-Technical Education. Each option requires 135 semester hours of course work.

EDUCATION FOR INDUSTRY OPTION

The Education for Industry option is designed to prepare students to enter industry as training specialists. Due to the expansion of technology and industrial development, there is a rapidly increasing demand for training specialists and training directors in industry.

FRESHMAN YEAR

First Semester

EG 115 Engineering Graphics for Industrial Education	2	(0,6)
ENGL 101 English Composition	3	(3,0)
IN ED 101 Intro. to Ind. Ed.	2	(1,2)
IN ED 102 Woodworking I	2	(1,3)
MATH 103 College Algebra	2	(3,0)
Science Elective§	4	(3,3)
Elective	1	
	16	

Second Semester

ENGL 102 English Composition	3	(3,0)
IN ED 105 Machining Practices	3	(1,6)
MATH 104 Trigonometry	2	(3,0)
Science Elective§	4	(3,3)
Social Science Elective†	3	(3,0)
Elective	1	
	16	

SOPHOMORE YEAR

IN ED 203 Basic Metal Processes	3	(1,6)
Literature Requirement°	3	(3,0)
SOC 201 Introductory Sociology	3	(3,0)
Science Elective§	4	(3,3)
Social Science Elective†	3	(3,0)
Elective	1	
	17	

ECON 201 Principles of Economics	3	(3,0)
IN ED 204 Graphic Arts	3	(1,6)
IN ED 208 Electricity	3	(2,3)
PSYCH 201 General Psychology	3	(3,0)
Elective	4	
	16	

JUNIOR YEAR

ECON 301 Economics of Labor ... 3 (3,0)
ED 302 Educational Psychology.. 3 (3,0)
IM 307 Personnel Management... 3 (3,0)
IN ED 302 Dwelling Materials
  and Construction Methods..... 2 (1,2)
PSYCH 301 Industrial Psychology 3 (3,0)
Elective 3
                              —
                              17

ENGL 301 Public Speaking 3 (3,0)
IE 303 Job Evaluation and
  Wage Incentives 3 (3,0)
IM 415 Managerial Dec. Making.. 3 (3,0)
IN ED 325 Ind. Org. and People 3 (3,0)
Approved Elective‡ 6
                              —
                              18

SENIOR YEAR

IM 408 Work Simp. and Stand... 3 (3,0)
IN ED 405 Course Org. and Eval. 3 (3,0)
IN ED 422 History and Philosophy
  of Industrial and Voc. Ed. 3 (3,0)
TEXT 460 Textile Processes 3 (3,0)
Approved Elective‡ 6
                              —
                              18

IN ED 408 Training Prog. in Ind. 3 (3,0)
IN ED 496 Public Relations 3 (3,0)
SOC 351 Industrial Sociology.... 3 (3,0)
Approved Elective‡ 8
                              —
                              17

135 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Select from the following: economics, history, philosophy, political science, religion, sociology.
‡ See class adviser for list of electives.
§ Select from the following: botany, chemistry, geology, physical science, physics, zoology. At least two fields must be represented.
Note: One summer (400 clock hours) of field experience is required of each student following the completion of his sophomore year.

INDUSTRIAL ARTS EDUCATION OPTION

The Industrial Arts Education option is for those students who desire to teach industrial arts in the secondary schools. Industrial arts is the subject area in the public school system which attempts to provide youth with an interpretation of American industry. It is a general education subject designed to give students exploratory experience in the classroom and laboratory. Majors in this option are qualified for full certification as secondary school teachers of industrial arts.

FRESHMAN YEAR

First Semester

EG 115 Engineering Graphics for
  Industrial Education 2 (0,6)
ENGL 101 English Composition.. 3 (3,0)
IN ED 101 Intro. to Ind. Ed. ... 2 (1,2)
IN ED 102 Woodworking I 2 (1,3)
MATH 103 College Algebra 2 (3,0)
Science Elective§ 4 (3,3)
Elective 1
                              —
                              16

Second Semester

EG 116 Graphical Technology for
  Industrial Education 2 (0,6)
ENGL 102 English Composition.. 3 (3,0)
IN ED 103 Woodworking II 2 (1,3)
IN ED 105 Machining Practices.. 3 (1,6)
MATH 104 Trigonometry 2 (3,0)
Social Science Elective† 3 (3,0)
Elective 1
                              —
                              16

SOPHOMORE YEAR

IN ED 203 Basic Metal Processes 3 (1,6)
IN ED 205 Power Technology ... 3 (2,2)
Literature Requirement° 3 (3,0)
Science Elective§ 4 (3,3)
Social Science Elective† 3 (3,0)
Elective 1
                              —
                              17

IN ED 204 Graphic Arts 3 (1,6)
IN ED 208 Electricity 3 (2,3)
IN ED 313 Arts and Crafts 3 (2,3)
Science Elective§ 4 (3,3)
Approved Elective‡ 3
Elective 1
                              —
                              17

JUNIOR YEAR

ED 302 Educational Psychology.. 3 (3,0)
IN ED 302 Dwelling Materials
  and Construction Methods..... 2 (1,2)
IN ED 414 Electronics for Teach. 3 (1,6)
TEXT 460 Textile Processes...... 3 (3,0)
Social Science Elective† 3 (3,0)
Approved Elective‡ 5
  —
  19

ED 335 Adol. Growth and Dev... 3 (3,0)
ENGL 301 Public Speaking 3 (3,0)
IN ED 416 Management and
  Operation of Ind. Ed. Labs. .. 3 (2,2)
Social Science Elective† 3 (3,0)
Elective 6
  —
  18

SENIOR YEAR

AAH 303 Evol. of Visual Arts... 3 (3,0)
IN ED 422 History and Philosophy
  of Industrial and Voc. Ed. 3 (3,0)
IN ED 441 Comp. Lab.
  Field Exper. 2 (1,3)
MUS 210 Music Appreciation.... 3 (3,0)
Approved Elective‡ 6
  —
  17

ED 458 Health Education 3 (3,0)
IN ED 402 Directed Teaching .. 6(0,18)
IN ED 405 Course Organization
  and Evaluation 3 (3,0)
IN ED 425 Teaching Ind. Subj.. 3 (3,0)
  —
  15

135 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Social Science electives to be selected from economics, history, philosophy, political science, religion, sociology. At least two fields must be represented with six, but not more than six hours, in one field.
‡ See class adviser for list of approved electives.
§ Science electives to be selected from botany, chemistry, geology, physical science, physics, or zoology. At least two fields must be represented, one of which must be in the biological sciences.

VOCATIONAL-TECHNICAL EDUCATION OPTION

The Vocational-Technical Education option is designed to prepare teachers of vocational and technical subjects in the senior high schools, area vocational schools, and technical education centers. All elective courses in this option will be in an area of specialization or related fields. Teachers graduating from this option will possess the skills and knowledge required to teach the occupation or family of occupations in their area of specialization.

FRESHMAN YEAR

First Semester

EG 115 Engineering Graphics for
  Industrial Education 2 (0,6)
ENGL 101 English Composition.. 3 (3,0)
IN ED 101 Intro. to Ind. Ed. ... 2 (1,2)
IN ED 102 Woodworking I 2 (1,3)
MATH 103 College Algebra 2 (3,0)
Science Elective§ 4 (3,3)
Elective 1
  —
  16

Second Semester

EG 116 Graphical Technology for
  Industrial Education 2 (0,6)
ENGL 102 English Composition.. 3 (3,0)
IN ED 105 Machining Practices.. 3 (1,6)
MATH 104 Trigonometry 2 (3,0)
Social Science Elective† 3 (3,0)
Elective 3
  —
  16

SOPHOMORE YEAR

IN ED 203 Basic Metal Processes 3 (1,6)
IN ED 205 Power Technology .. 3 (2,2)
Literature Requirement° 3 (3,0)
Science Elective§ 4 (3,3)
Social Science Elective† 3 (3,0)
Elective 1
  —
  17

ENGL 301 Public Speaking 3 (3,0)
IN ED 204 Graphic Arts 3 (1,6)
IN ED 208 Electricity 3 (2,3)
Science Elective§ 4 (3,3)
Elective 1
  —
  14

SUMMER
In Ed 350 Industrial Cooperative Experience........ 6

JUNIOR YEAR

ED 302 Educational Psychology. . 3 (3,0)
IN ED 302 Dwelling Materials
   and Construction Methods. 2 (1,2)
Social Science Elective† 3 (3,0)
Elective (Area of Spec.) 3 (3,0)
Elective 4
                    15

ED 335 Adol. Growth and Dev. . . 3 (3,0)
IN ED 416 Management and
   Operation of Ind. Ed. Labs. . . 3 (2,2)
Social Science Elective† 3 (3,0)
Approved Elective‡ 3
Elective (Area of Spec.) 3
                    15

SUMMER

In Ed 450 Industrial Cooperative Experience. 6

SENIOR YEAR

AAH 303 Evol. of Visual Arts. . . 3 (3,0)
IN ED 422 History and Philosophy
   of Industrial and Voc. Ed. 3 (3,0)
IN ED 441 Comp. Lab.
   Field Exper. 2 (1,3)
MUS 210 Music Appreciation. . . . 3 (3,0)
Elective (Area of Spec.) 4
                    15

ED 458 Health Education 3 (3,0)
IN ED 402 Directed Teaching . . 6(0,18)
IN ED 405 Course Organization
   and Evaluation 3 (3,0)
IN ED 425 Teaching Ind. Subj. . 3 (3,0)
                    15

135 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Social Science electives to be selected from economics, history, philosphy, political science, religion, sociology. At least two fields must be represented with six, but not more than six hours, in one field.
‡ See class adviser for list of approved electives.
§ Science electives to be selected from botany, chemistry, geology, physical science, physics, or zoology. At least two fields must be represented, one of which must be in the biological sciences.

SCIENCE TEACHING

The program leading to a Bachelor of Science degree in Science Teaching is designed for students planning to teach Mathematics, Biology, Chemistry, Earth Science, or Physical Sciences on the secondary school level.

It requires a major concentration in Mathematics, Biological Sciences, Chemistry, Earth Science, or Physical Sciences, The required science electives are included to give some degree of competency in a field other than the major area.

A student must have a minimum of 130 semester hours of credit for graduation.

TEACHING AREA: BIOLOGICAL SCIENCES

FRESHMAN YEAR

First Semester

BOT 101 Plant Biology 3 (3,0)
BOT 103 Plant Biology Lab. . . . 1 (0,2)
   or ZOOL 101 Animal Biology. . 3 (3,0)
   and ZOOL 103 Ani. Biol. Lab. 1 (0,2)
CH 101 General Chemistry 4 (3,3)
ED 100 Orientation 1 (1,0)
ENGL 101 English Composition. . 3 (3,0)
MATH 103 College Algebra 2 (3,0)
MATH 104 Trigonometry 2 (3,0)
Elective 1
                    17

Second Semester

CH 112 General Chemistry 4 (3,3,)
ENGL 102 English Composition. . 3 (3,0)
MATH 106 Calculus of One Var. 4 (4,0)
ZOOL 101 Animal Biology 3 (3,0)
ZOOL 103 Animal Biology Lab. . 1 (0,2)
   or BOT 101 Plant Biology 3 (3,0)
   and BOT 103 Plant Biol. Lab. 1 (0,2)
Elective 1
                    16

SOPHOMORE YEAR

HIST 171 or 172 West. Civilization	3	(3,0)	HIST 172 or 173 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)	PHYS 208 General Physics	4	(3,2)
Chemistry Elective	4		Chemistry Elective	4	
Elective	4		Social Science Elective§	3	(3,0)
	—		Elective	1	
	18			—	
				18	

JUNIOR YEAR

BOT 202 Survey of Plant Kingdom	4	(3,3)	BOT 352 Plant Physiology	4	(3,3)
ED 301 Principles of American Ed.	3	(3,0)	or ZOOL 458 Cell Physiology	3	(2,3)
ZOOL 301 Comp. Vert. Anatomy	3	(2,3)	ED 302 Educational Psychology	3	(3,0)
Science Elective	3		GEN 302 Genetics	4	(3,3)
Social Science Elective§	3	(3,0)	MICRO 305 General Microbiology	4	(3,3)
	—		Elective	3	
	16			—	
				18–17	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts	3	(3,0)	ED 335 Adol. Growth and Dev.	3	(3,0)
ED 458 Health Education	3	(3,0)	ED 412 Directed Teaching‡	6	(1,15)
MUS 210 Music Appreciation	3	(3,0)	ED 424 Methods and Materials in		
Major Elective†	6–7		Secondary School Instruction	3	(3,0)
	—		ED 498 Teaching Secondary		
	15–16		School Reading	3	(1,4)
				—	
				15	

133 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Botany, genetics, microbiology, zoology.
‡ Block schedule must be taken as shown.
§ Economics, geography, philosophy, political science, religion, sociology.

TEACHING AREA: CHEMISTRY

FRESHMAN YEAR

First Semester   Second Semester

BOT 101 Plant Biology	3	(3,0)	CH 112 General Chemistry	4	(3,3)
BOT 103 Plant Biology Lab.	1	(0,2)	ENGL 102 English Composition	3	(3,0)
or ZOOL 101 Animal Biology	3	(3,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)	ZOOL 101 Animal Biology	3	(3,0)
CH 101 General Chemistry	4	(3,3)	ZOOL 103 Animal Biology Lab.	1	(0,2)
ED 100 Orientation	1	(1,0)	or BOT 101 Plant Biology	3	(3,0)
ENGL 101 English Composition	3	(3,0)	and BOT 103 Plant Biol. Lab.	1	(0,2)
MATH 106 Calculus of One Var.	4	(4,0)	Elective	1	
Elective	1			—	
	—			16	
	17				

SOPHOMORE YEAR

HIST 171 or 172 West. Civilization	3	(3,0)	HIST 172 or 173 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	PHYS 208 General Physics	4	(3,2)
PHYS 207 General Physics	4	(3,2)	Social Science Elective†	3	(3,0)
Elective	1		Elective	4	
	—			—	
	15			17	

JUNIOR YEAR

CH 223 Organic Chemistry	3	(3,0)	CH 224 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab.	1	(0,3)	CH 331 Physical Chemistry	3	(3,0)
CH 313 Quantitative Analysis	3	(3,0)	CH 339 Physical Chem. Lab.	1	(0,3)
ED 301 Principles of American Ed.	3	(3,0)	ED 302 Educational Psychology	3	(3,0)
Social Science Elective†	3	(3,0)	Elective	6	
Elective	5			—	
	—			16	
	18				

SENIOR YEAR

(Block Schedule—Either Semester)

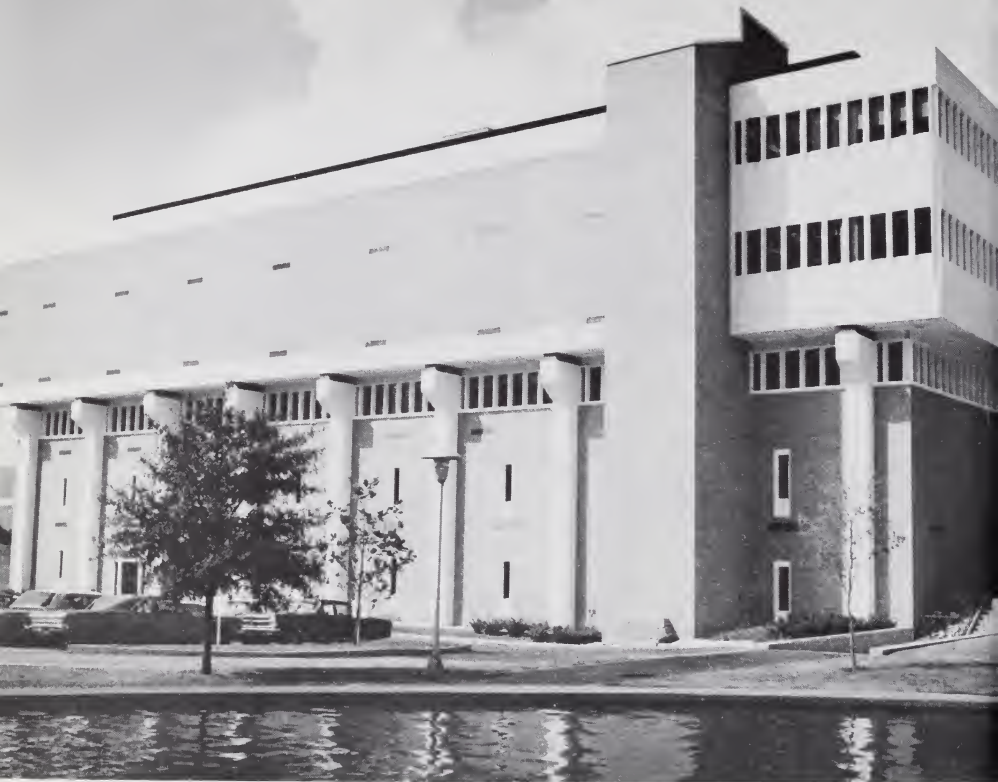|					
AAH 303 Evol. of Visual Arts. . .	3	(3,0)	ED 335 Adol. Growth and Dev. .	3	(3,0)
CH 332 Physical Chemistry	3	(3,0)	ED 412 Directed Teaching‡	6(1,15)	
CH 340 Physical Chem. Lab. . . .	1	(0,3)	ED 424 Methods and Materials in		
CH 402 Inorganic Chemistry	3	(3,0)	Secondary School Instruction. . .	3	(3,0)
ED 458 Health Education	3	(3,0)	ED 498 Teaching Secondary		
MUS 210 Music Appreciation	3	(3,0)	School Reading	3	(1,4)
	16			15	

130 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Economics, geography, philosophy, political science, religion, sociology.
‡ Block schedule must be taken as shown.

TEACHING AREA: EARTH SCIENCE

FRESHMAN YEAR

First Semester			Second Semester		
BOT 101 Plant Biology	3	(3,0)	CH 102 General Chemistry	4	(3,3)
BOT 103 Plant Biology Lab. . . .	1	(0,2)	ENGL 102 English Composition. .	3	(3,0)
or ZOOL 101 Animal Biology. .	3	(3,0)	MATH 102 Math. Analysis II . . .	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)	ZOOL 101 Animal Biology	3	(3,0)
CH 101 General Chemistry	4	(3,3)	ZOOL 103 Animal Biology Lab. .	1	(0,2)
ED 100 Orientation	1	(1,0)	or BOT 101 Plant Biology	3	(3,0)
ENGL 101 English Composition. .	3	(3,0)	and BOT 103 Plant Biol. Lab.	1	(0,2)
MATH 101 Math. Analysis I§ . . .	3	(3,0)	Elective	2	
Elective	1			16	
	16				

SOPHOMORE YEAR

GEOL 101 Physical Geology	4	(3,3)	GEOL 102 Historical Geology . . .	4	(3,3)
HIST 171 or 172 West. Civilization	3	(3,0)	HIST 172 or 173 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)	PHYS 208 General Physics	4	(3,2)
Social Science Elective†	3	(3,0)	Elective	4	
Elective	1			18	
	18				

JUNIOR YEAR

ASTR 301 General Astronomy. . . .	3	(3,0)	ED 302 Educational Psychology . .	3	(3,0)
ED 301 Principles of American Ed.	3	(3,0)	GEOL 405 Geomorphology	4	(3,3)
GEOL 306 Mineralogy	3	(2,3)	PHYS 240 Physics of Atmospheric		
MATH 203 Elem. Stat. Inference	3	(3,0)	Environment	3	(3,0)
Elective	4		Science Elective	3	
	16		Social Science Elective†	3	(3,0)
				16	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts. . .	3	(3,0)	ED 335 Adol. Growth and Dev. .	3	(3,0)
ED 458 Health Education	3	(3,0)	ED 412 Directed Teaching‡	6(1,15)	
MUS 210 Music Appreciation	3	(3,0)	ED 424 Methods and Materials in		
Science Elective	3		Secondary School Instruction. . .	3	(3,0)
Elective	3		ED 498 Teaching Secondary		
	15		School Reading	3	(1,4)
				15	

130 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Economics, geography, philosophy, political science, religion, sociology.
‡ Block schedule must be taken as shown.
§ *Prerequisite:* Satisfactory score on the Mathematics Test, Level I, or Math 104.

TEACHING AREA: MATHEMATICS

FRESHMAN YEAR

First Semester		
BOT 101 Plant Biology	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)
or ZOOL 101 Animal Biology	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)
CH 101 General Chemistry	4	(3,3)
ED 100 Orientation	1	(1,0)
ENGL 101 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
Elective	1	
	17	

Second Semester		
CH 102 or 112 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 108 Cal. and Lin. Algebra	4	(4,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
or BOT 101 Plant Biology	3	(3,0)
and BOT 103 Plant Biol. Lab.	1	(0,2)
Elective	1	
	16	

SOPHOMORE YEAR

HIST 171 or 172 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)
PHYS 207 General Physics	4	(3,2)
Elective	2	
	16	

HIST 172 or 173 West. Civilization	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 295 Foundation of Anal.	3	(3,0)
PHYS 208 General Physics	4	(3,2)
Elective	4	
	17	

JUNIOR YEAR

ED 301 Principles of American Ed.	3	(3,0)
MATH 301 Statistical Theory and Methods I	3	(3,0)
MATH 308 College Geometry	3	(3,0)
Science Elective	3	
Social Science Elective§	3	(3,0)
	15	

ED 302 Educational Psychology	3	(3,0)
MATH 408 Topics in Geometry	3	(3,0)
MATH 411 Linear Algebra	3	(3,0)
Science Elective	3	
Social Science Elective§	3	(3,0)
Elective	2	
	17	

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts.	3	(3,0)
ED 458 Health Education	3	(3,0)
MATH 412 Intro. to Modern Algebra	3	(3,0)
MUS 210 Music Appreciation	3	(3,0)
Mathematics Elective†	6	
	18	

ED 335 Adol. Growth and Dev.	3	(3,0)
ED 412 Directed Teaching‡	6	(1,15)
ED 424 Methods and Materials in Secondary School Instruction	3	(3,0)
ED 498 Teaching Secondary School Reading	3	(1,4)
	15	

131 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Suggested electives: Comp Sc 205, 210, Math 405, 409, 452, 453, 454.
‡ Block schedule must be taken as shown.
§ Economics, geography, philosophy, political science, religion, sociology.

TEACHING AREA: PHYSICAL SCIENCES

FRESHMAN YEAR

First Semester		
BOT 101 Plant Biology	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)
or ZOOL 101 Animal Biology	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)
CH 101 General Chemistry	4	(3,3)
ED 100 Orientation	1	(1,0)
ENGL 101 English Composition	3	(3,0)
MATH 103 College Algebra	2	(3,0)
MATH 104 Trigonometry	2	(3,0)
Elective	1	
	17	

Second Semester		
CH 102 or 112 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
or BOT 101 Plant Biology	3	(3,0)
and BOT 103 Plant Biol. Lab.	1	(0,2)
Elective	1	
	16	

SOPHOMORE YEAR

HIST 171 or 172 West. Civilization 3 (3,0)
Literature Requirement° 3 (3,0)
PHYS 207 General Physics 4 (3,2)
Science Elective 4
Elective 3
                              ——
                              17

CH 201 General Chemistry 4 (3,3)
HIST 172 or 173 West. Civilization 3 (3,0)
Literature Requirement° 3 (3,0)
PHYS 208 General Physics 4 (3,2)
Elective 4
                              ——
                              18

JUNIOR YEAR

ASTR 201 Solar System Astronomy 3 (3,0)
ED 301 Principles of American Ed. 3 (3,0)
GEOL 101 Physical Geology 4 (3,3)
Social Science Elective† 3 (3,0)
Elective 3
                              ——
                              16

ASTR 202 Stellar Astronomy 3 (3,0)
ED 302 Educational Psychology .. 3 (3,0)
GEOL 102 Historical Geology ... 4 (3,3)
PHYS 460 Contemporary Physics
   for High School Teachers 3 (3,0)
Social Science Elective† 3 (3,0)
                              ——
                              16

SENIOR YEAR

(Block Schedule—Either Semester)

AAH 303 Evol. of Visual Arts... 3 (3,0)
ED 458 Health Education 3 (3,0)
MUS 210 Music Appreciation 3 (3,0)
Elective 6
                              ——
                              15

ED 335 Adol. Growth and Dev. . 3 (3,0)
ED 412 Directed Teaching‡ .... 6(1,15)
ED 424 Methods and Materials in
   Secondary School Instruction... 3 (3,0)
ED 498 Teaching Secondary
   School Reading 3 (1,4)
                              ——
                              15

130 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Economics, geography, philosophy, political science, religion, sociology.
‡ Block schedule must be taken as shown in either semester of the senior year.

COLLEGE OF ENGINEERING

The College of Engineering offers professional curricular programs and programs in both Engineering Analysis and Engineering Technology. Each of the programs offered leads to a wide range of career opportunities and serves as preparation for further study at the graduate level.

Professional Curricula. Six, four-year, professional-oriented curricula are offered by the College of Engineering; namely, Agricultural Engineering, Ceramic Engineering, Chemical Engineering, Civil Engineering, Electrical and Computer Engineering and Mechanical Engineering. Each curriculum is accredited by the Engineers' Council for Professional Development, the recognized national accrediting agency for professional curricula in engineering. The curriculum in Agricultural Engineering is jointly admin-

istered by the College of Agricultural Sciences and the College of Engineering.

Although the College of Engineering does not offer specific options or majors in each of these professional curricula, the instruction includes many phases of each respective field. Thus, a Civil Engineering student is graduated in Civil Engineering rather than Structural Engineering, Highway Engineering, Sanitary Engineering, or other such options. However, a student who wishes to study within the areas encompassed by these options will find adequate courses within the Civil Engineering curriculum to prepare himself for work in any of these areas. In the same way the other engineering curricula include thorough education in various phases of the field of specialization without overemphasizing one phase to the neglect of others. The professional curricula lead to a Bachelor of Science degree in the specific professional area.

The courses required in all professional curricula for the freshman year are as follows:

FRESHMAN YEAR

First Semester			Second Semester		
CH 101 General Chemistry	4	(3,3)	Basic Science°	3–4	
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
ENGR 180 Engineering Concepts	3	(2,2)	Humanistic–Social Elective	3	(3,0)
or Humanistic–Social Elective	3	(3,0)	or ENGR 180 Engr. Concepts	3	(2,2)
MATH 106 Calculus of One Var.	4	(4,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
Elective	2		PHYS 122 Mech. and Wave Phen.	3	(3,0)
	16		Elective	1	
				17–18	

° Agricultural Engineering and Ceramic Engineering students may take either Ch 102 or 112. Chemical Engineering students are required to take Ch 112.
Note: Agricultural Engineering students take Agric 101 in lieu of 1 hour of elective in the first semester.

Engineering Analysis Curriculum:† This curriculum is a four-year engineering science-oriented course of study. Its objectives are two-fold. These are (1) to prepare a student for employment in areas of engineering activity requiring a high level of analytical competency, and (2) to provide a flexible undergraduate preparation for the study of engineering at the graduate level.

The curriculum leads to the Bachelor of Science degree in Engineering Analysis. Requirements for this degree are stated in terms of subject matter area rather than in terms of specific courses. This latitude of course selection permits maximum accommodation of the individual student's interests and career objectives. Degree requirements are as follows:

Hours Credit

Area of Concentration..................................... 12
Basic Science (including 8 hours of physics)................. 16
Engineering Science (distributed in at least
    six engineering science areas) 32
Humanistic–Social Studies 32
Mathematics (including 12 hours of post-calculus mathematics) 24
Electives 22

            138

The educational objectives of the program will be met by the selection of an area of concentration which will be chosen from several specialty areas offered within the other professional engineering curricula. The selection of specific courses, particularly in the junior and senior years, will then depend primarily on the choice of the area of concentration. By judicious selection of courses within this flexible structure, a student may prepare himself for entry into the professional schools of law and medicine.

Maximum flexibility within this program is achieved by permitting a student to defer his choice of specialization until the junior year or later. Such deferral will then allow students from junior and senior colleges not offering engineering to transfer into the program with little or no loss in academic credit.

Engineering Technology Curriculum:† This curriculum is a four-year, student-interest oriented course of study which leads to a Bachelor of Science degree in Engineering Technology. It provides a broad base of fundamentals and their application in the areas of electricity, heat, and mechanics. In addition, approved electives amounting to approximately two semesters of work permit developing a program to match the student's aptitudes and interests as related to industrial and other employment opportunities. These opportunities are found in such areas as production supervision and management, planning industrial production methods, technical sales, technical purchasing, building construction, quality control, technical personnel management and supervision of plant environmental and energy systems.

The difference between the Bachelor of Science degree in the engineering curricula and the Bachelor of Science degree in the Engineering Technology program rests, in general, on the former being concerned with original system design and the latter with operation and adaptation of that design to meet the needs of mankind. The Engineering Technology curriculum is designed to meet a broad base of general practitioner-type needs in industry and other types of enterprise in contrast to those requiring an in-depth specialist.

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† Additional information on both the Engineering Analysis and the Engineering Technology programs is available from the Office of the Dean of Engineering.

The curriculum leads to the Bachelor of Science degree in Engineering Technology. Requirements for the degree are as follows:

Hours Credit

Basic Science (including 8 hours of physics)................. 16
Engineering Technology 42
Humanistic–Social Studies 24
Mathematics 12
Electives 34

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The Engineering Technology courses are offered only during the junior and senior years of the program. Hence, a student from a junior college may transfer into the program at the junior level with little or no loss of academic credit.

AGRICULTURAL ENGINEERING

The graduate in Agricultural Engineering, with broad training in mathematics, physics, chemistry, and the biological sciences as well as comprehensive coverage of the engineering sciences, is well equipped to apply engineering to many functions affecting the well-being of mankind. The Agricultural Engineer is sought by industry and public service organizations primarily for his ability to apply engineering know-how to agricultural production and processing, and to the conservation of land and water resources. Specific areas of interest include power and machinery, soil and water resources engineering, electric power and processing, structures and environment, and food engineering.

The undergraduate Agricultural Engineering curriculum leads to the Bachelor of Science degree. Based upon fundamental training in the basic sciences, the curriculum includes such engineering sciences as mechanics, fluids, thermodynamics, electrical theory, computing devices and systems analyses. The basic agricultural sciences of soils, plants and animals are included so as to provide a foundation for agricultural engineering analysis and design. Recognition is also given to the necessity for being able to synthesize information from any of the applicable subject matter areas, including studies of energy conversion, engineering analysis and the engineering properties of biological materials, and with emphasis upon economy and integrity of design. Research is included in order to introduce the student to the scientific method. Courses in the humanities are required to provide the graduate engineer with a well-rounded educational experience.

The undergraduate curriculum is designed for both the student who wishes to terminate his formal academic training at the bache-

Note: The Agricultural Engineering curriculum is jointly administered by the College of Agricultural Sciences and the College of Engineering.

lor's level, and also to provide the necessary prerequisites for those who wish to continue in graduate study. Graduate programs in Agricultural Engineering which lead to the Master of Science, the Master of Engineering, and the Doctor of Philosophy degrees are offered.

Since an agricultural engineering graduate has a broad training in engineering, in the sciences, in humanities, and in life sciences, he has the pick of opportunities in many areas. Opportunities in agricultural engineering include employment with industry as design engineers, research engineers, production engineers, and in sales and service; with state and federal agencies as teachers, research engineers, and extension engineers; as field engineers with the Soil Conservation Service, Bureau of Reclamation, and similar organizations; and with agricultural enterprises as managers, contractors, equipment retailers and as consulting engineers.

The Agricultural Engineering curriculum is accredited by the Engineers' Council for Professional Development.

See page 169 for Freshman Year.

SOPHOMORE YEAR

First Semester

AGE 221 Soil and Water Resources Engineering I	3	(2,3)
EG 109 Engr. Graphical Com.	2	(0,6)
EM 201 Engr. Mech. (Statics)	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)
Elective	1	
	19	

Second Semester

AGE 212 Fund. of Mechanization	3	(2,3)
BOT 101 Plant Biology	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)
EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 208 Engineering Math. I	4	(5,0)
Elective	1	
	18	

JUNIOR YEAR

AGE 353 Computational Systems	2	(1,3)
AGE 355 Engr. Anal. and Creat.	2	(1,3)
E&CE 307 Basic Elec. Engr.	3	(3,0)
EM 304 Mechanics of Materials	3	(3,0)
ME 311 Engineering Thermo. I	3	(3,0)
ZOOL 101 Animal Biology	3	(3,0)
	16	

AGE 362 Energy Conv. in Ag. Sys.	3	(2,3)
AGE 433 Design Criteria for Plant and Animal Environment	3	(3,0)
AGE 465 Engr. Prop. of Biol. Mat.	3	(2,3)
AGRON 202 Soils	3	(2,2)
PHYS 222 Optics and Mod. Phys.	3	(3,0)
Humanistic–Social Elective	3	(3,0)
	18	

SENIOR YEAR

AGE 431 Agri. Structures Design	3	(2,3)
AGE 471 Undergraduate Research	1	(0,3)
ECON 201 Principles of Economics	3	(3,0)
EM 320 Fluid Mechanics	3	(3,0)
MATH 301 Statistical Theory and Methods I	3	(3,0)
Elective	3	
	16	

AGE 416 Agric. Machinery Design	3	(2,3)
AGE 422 Soil and Water Resources Engineering II	3	(2,3)
AGE 442 Agric. Process Engr.	3	(2,3)
ME 304 Heat Transfer I	3	(3,0)
Engineering Elective	2–3	
Elective	3–2	
	17	

138 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

CERAMIC ENGINEERING

Ceramic Engineering offers rewarding careers for persons interested in making useful products. The ceramic products range from items important to everyday life, such as brick, cement, and glass to more exotic products, such as ceramic fuel elements for nuclear reactors, ceramic parts for electronic equipment and ceramic nose cones, ceramic heart valves, and other prosthetic parts for medical research. A variety of occupations are available to the ceramic engineering graduate thus making it possible to select a type of work that is compatible with individual preferences. Some graduates work as researchers, developing new ceramic knowledge; others are design engineers, creating new processes or new products; still others are engaged in technical sales, supervision of plant operations or in management.

South Carolina possesses a wide variety of ceramic minerals which rank with forests as the richest natural resources in the State and make it possible for South Carolina to contribute raw materials to every major classification of the ceramic industry. South Carolina has a diversified ceramic industry with plants manufacturing portland cement, glass containers, glass fibers, sewer pipes, brick, refractories, special raw materials, and electronic ceramics.

The curriculum of Ceramic Engineering leads to the degree of Bachelor of Science in Ceramic Engineering, and graduate courses are offered leading to advanced degrees. The course is based on a study of the fundamental courses in chemistry, physics, mathematics, and geology, and advanced courses are designed to apply these fundamental sciences to ceramic engineering. Courses in the humanities and social sciences together with courses in engineering sciences form major parts of the curriculum. A large number of elective courses permits the individual student to plan a program that is compatible with his particular interests, talents, and educational goals.

The Ceramic Engineering building and equipment are recognized as outstanding throughout the nation. These facilities were provided by a grant from the Olin Foundation.

SOPHOMORE YEAR

First Semester		Second Semester	
CRE 201 Intro. to Ceramic Engr.	2 (2,0)	CRE 202 Ceramic Materials	3 (3,0)
CRE 204 Laboratory Procedures..	1 (0,3)	Literature Requirement°	3 (3,0)
Literature Requirement°	3 (3,0)	MATH 208 Engineering Math. I..	4 (5,0)
MATH 206 Calculus of Sev. Var.	4 (4,0)	PHYS 222 Optics and Mod. Phys.	3 (3,0)
PHYS 221 Thermal and Elec. Phen	3 (3,0)	Planned Elective	4
Planned Elective	3	Elective	1
Elective	1		—
	—		18
	17		

JUNIOR YEAR

CH 331 Physical Chemistry	3 (3,0)	CH 332 Physical Chemistry	3 (3,0)
CRE 304 Experiment Design ...	1 (0,3)	CRE 302 Thermo-Chemical Cer. .	3 (3,0)
CRE 307 Thermal Process. of Cer.	3 (3,0)	CRE 309 Research Methods	2 (0,6)
EM 201 Engr. Mech. (Statics) ..	3 (3,0)	E&CE 307 Basic Elec. Engr.	3 (3,0)
Planned Elective	7	Planned Elective	3
	—	Elective	3
	17		—
			17

SENIOR YEAR

CRE 402 Solid State Ceramics ...	3 (3,0)	CRE 403 Glasses	3 (3,0)
EM 304 Mechanics of Materials..	3 (3,0)	ME 304 Heat Transfer I........	3 (3,0)
Planned Elective	9	Planned Elective 12	
Elective	2		—
	—		18
	17		

138 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
Note: Nine credits of planned electives must be taken in humanistic–social science courses. Nineteen credits of planned electives should be technical courses selected with the help of class adviser.

CHEMICAL ENGINEERING

The graduate of the science-oriented, research-minded Chemical Engineering Department is finding intellectually stimulating and financially rewarding positions in all phases of modern endeavor. The traditional chemical process industries which produce the industrial chemicals upon which our modern society is based require large numbers of chemical engineers. In addition, because of the fundamental nature of the Chemical Engineering curriculum, the graduate is avidly sought by industries in many areas of specialized technology such as nuclear power, aviation and space, fibers and textiles, pharmaceuticals, pulp and paper, computers, foods, metals, ceramics, instrumentation and automatic control, and petroleum. The chemical engineer is in the forefront of the fight against environmental pollution, and is leading the way in applying engineering technology to the solution of medical and health-related problems.

The Chemical Engineering curriculum is unique in that it is built upon a firm base in three sciences (chemistry, physics, and mathematics), hence the chemical engineer is able to apply scientific knowledge to the solution of problems involving both chemical and physical principles. In chemical engineering courses emphasis

is placed upon why things happen as they do and not how; upon enduring principles and not present or past methods. The student is taught to realize that all material things are chemical in nature; hence the chemical engineer, in the practice of his profession, may be called upon to work with anything on the face of the earth. He will be concerned with the conception, design, construction, and management of complete systems of men, processes, computers, and procedures for the most efficient production of chemicals and related products. He produced all the materials required to land men on the moon, he produced uranium to power nuclear reactors, he produced instant foods, he created the synthetic fiber industry, etc. The scope of chemical engineering is broad and the profession is interdisciplinary in nature.

In spite of the strong scientific flavor of the Chemical Engineering curriculum the faculty is constantly striving to impress upon the student that he is studying engineering and not pure science. The ultimate purpose of engineering is to serve mankind by making practical use of scientific and engineering theories and laboratory schemes, thus the engineer must always design his processes to produce products at minimum cost. The chemical engineer in industry must, in brief, be concerned that his company be profitable since it could not exist otherwise.

In industry the chemical engineer may pursue one of two parallel lines of advancement. One path leads to management, and it should be noted that the top managers of most chemical companies are technically educated men. The second and equally rewarding path is in engineering research and development. In this latter category are found the men who have developed the processes and products which shape the modern world in which we live.

The chemical engineering graduate, because of his broad background in three sciences is uniquely prepared for a wide variety of careers in which he can apply his abilities and education. By the judicious use of electives and course substitutions, and with the advice and consent of his adviser, a chemical engineering student may enhance his basic education by the selection of an option designed to further a specific career objective. Such options might be used, for example, to (a) prepare him to enter other professional schools, such as medicine, dentistry, or law, (b) broaden his outlook on emerging specialty fields such as biomedical engineering or computer applications, (c) focus attention on the role of the chemical engineer in environmental protection, (d) expose him to the role of management in technical enterprises and increase his awareness of the interplay of engineering and the social sciences in solving many problems of our current society, (e) acquaint him with the field of occupational health and safety and its relation to

engineering design or (f) prepare him for graduate study in Chemical Engineering or related fields. Options will be integrated with courses in chemical process engineering and design so as to broaden the student, rather than make him a specialist.

Typical options are:

1. Pre-medicine or pre-dentistry
2. Biochemical engineering
3. Environmental protection engineering
4. Management
5. Pre-legal
6. Occupational health and safety engineering
7. Preparation for graduate study
8. Chemical process engineering practice

This list is not exclusive and, in fact, options can be tailored to suit any career objective of the student. Students are advised to see their counselor to discuss an option best suited to their talents and interests.

The Chemical Engineering Department at Clemson is housed in Earle Hall, one of the newest and best equipped buildings for chemical engineering education in the nation. All members of the Chemical Engineering faculty have been educated at the doctoral level and the department offers work leading to the Master of Science and Doctor of Philosophy degrees as well as the Bachelor of Science degree.

SOPHOMORE YEAR

First Semester

CH 223 Organic Chemistry 3 (3,0)
CHE 201 Intro. to Chem. Engr. . . 3 (2,3)
EM 201 Engr. Mech. (Statics) . . 3 (3,0)
Literature Requirement° 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)
PHYS 221 Thermal and Elec. Phen. 3 (3,0)
Elective 1
        ——
        20

Second Semester

CH 224 Organic Chemistry 3 (3,0)
CH 229 Organic Chemistry Lab.. 1 (0,3)
CHE 202 Stagewise Separation Op. 4 (3,3)
COMP SC 210 Digital Computation
  and Num. Meth. for Engr.† . . . 3 (3,0)
Literature Requirement° 3 (3,0)
MATH 208 Engineering Math. I . 4 (5,0)
Elective 1
        ——
        19

JUNIOR YEAR

CH 331 Physical Chemistry 3 (3,0)
CH 339 Physical Chemistry Lab.. 1 (0,3)
CHE 301 Unit Op. Theory I 3 (3,0)
E&CE 307 Basic Elec. Engr. 3 (3,0)
PHYS 222 Optics and Mod. Phys. 3 (3,0)
Humanistic–Social Elective 3 (3,0)
Elective 2
        ——
        18

CH 332 Physical Chemistry 3 (3,0)
CH 340 Physical Chemistry Lab.. 1 (0,3)
CHE 302 Unit Op. Theory II . . . 3 (3,0)
CHE 306 Unit Op. Lab. I 1 (0,3)
CHE 331 Chem. Engr. Thermo. I 3 (3,0)
CHE 352 Chem. Engr. Sys. Anal. 4 (3,3)
EM 304 Mechanics of Materials.. 3 (3,0)
        ——
        18

SENIOR YEAR

CHE 401 Transport Phenomena . . 3 (3,0)
CHE 407 Unit Op. Lab. II 2 (0,6)
CHE 421 Process Dev., Design and
   Optimiza. of Chem. Engr. Sys. I 3 (2,3)
CHE 430 Chem. Engr. Thermo. II 3 (3,0)
CHE 440 Senior Inspection Trip . 0
CHE 450 Chem. Engr. Kinetics . . 3 (3,0)
Humanistic–Social Elective 3 (3,0)

             17

CHE 422 Process Dev., Design and
   Optimiza. of Chem. Engr. Sys. II 3 (0,9)
CHE 453 Process Dynamics 3 (3,0)
CRE 419 Sci. of Engr. Materials . 3 (3,0)
Humanistic–Social Elective 6
Elective 3
             —
             18

144 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Or ChE 210 if offered.
Elective Policy. All electives must be chosen from a departmental elective list. A copy of this list may be obtained from the departmental secretary.

CIVIL ENGINEERING

Civil engineering is the broadest in scope of the engineering professions, being the parent stem from which most of the other branches of engineering have developed. All branches of civil engineering rest on a comparatively compact body of principles, in which the students are thoroughly trained in the classroom, the drafting room, the laboratory, and the field. Particular effort is made to develop those qualities essential to success in any field of endeavor and to fit the graduate to become a useful citizen—a good businessman as well as a successful engineer.

The practice of civil engineering involves the planning, design, construction, maintenance, and use of large structures and systems to control and improve the environment for modern civilization. The structures may serve many purposes, such as buildings for commerce and industry, bridges for transportation, vehicles for space exploration, or dams for the control and storage of water or for generation of power. The systems provide essential services: water supply; wastewater treatment; rail, air, and water transportation; and systems of highways. Projects such as these require that the civil engineer be trained in the social and economic issues as well as in the basic science, engineering science, and technology. Though he may specialize in a particular branch of civil engineering, such as structural or transportation, he will need some acquaintance with all subdivisions of civil engineering as well as of other branches of engineering.

The program in Civil Engineering at Clemson University leads to the degree of Bachelor of Science and is planned to equip the graduate with a working knowledge of the above subjects. The student receives training in the basic sciences of mathematics, chemistry, and physics, and is introduced gradually to the engineering sciences and the technical courses in civil engineering. By the end of the junior year the student will have had courses in structural design, construction materials, transportation engineering, and soil mechanics. These will enable him to choose

technical electives in his senior year in the subdivision of his choice. The nontechnical electives are sufficient in number to provide breadth in the arts and humanities, and assure that the graduate has a well-rounded education.

The civil engineering graduate is prepared to work immediately upon graduation in practically any of the areas of the profession. He may find himself in responsible charge at an early date, so every effort is made to train him at Clemson in the ethical standards demanded by the profession. All courses are directed toward the development of initiative, self-reliance, and integrity in the student.

The department is located in Lowry Hall, a modern air-conditioned structure erected in 1958. The laboratories are well-equipped, and the classrooms are light and conducive to study. The building has an internal television system and the 220-seat auditorium is one of the most attractive ones on the campus.

SOPHOMORE YEAR

First Semester

CE 206 Geometrics 2 (1,3)
EM 201 Engr. Mech. (Statics) .. 3 (3,0)
Literature Requirement° 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)
PHYS 221 Thermal and Elec. Phen. 3 (3,0)
Elective 1
    ——
    16

Second Semester

CE 205 Civil Engr. Methodology . 2 (1,3)
    or EG 109 Engr. Graph. Com. 2 (0,6)
EM 304 Mechanics of Materials.. 3 (3,0)
EM 305 Mech. of Materials Lab. 1 (0,3)
Literature Requirement° 3 (3,0)
MATH 208 Engineering Math. I.. 4 (5,0)
PHYS 222 Optics and Mod. Phys. 3 (3,0)
PHYS 224 Modern Physics Lab... 1 (0,3)
Elective 1
    ——
    18

JUNIOR YEAR

CE 301 Intro. to Struc. Sci. 3 (2,2)
CE 320 Conc. and Bit. Materials. 2 (1,3)
CRE 310 Intro. to Material Sci. .. 3 (3,0)
EM 202 Engr. Mech. (Dynamics) 3 (3,0)
ESE 401 Environmental Engr. ... 3 (3,0)
Mathematics Elective† 3
    ——
    17

CE 302 Structural Design I 3 (2,2)
CE 310 Transportation Engr. ... 4 (3,2)
ECON 201 Principles of Economics 3 (3,0)
E&CE Elective 3 (3,0)
Humanistic—Social Elective† 3 (3,0)
Elective 2
    ——
    18

SENIOR YEAR

CE 330 Soil Mechanics 3 (2,2)
CE 424 Construction Methods ... 2 (2,0)
EM 320 Fluid Mechanics 3 (3,0)
EM 322 Fluid Mechanics Lab... 1 (0,3)
Earth or Life Science Elective†..4–3
Humanistic—Social Elective† 3 (3,0)
Technical Elective† 3
    ——
    19–18

CE 402 Structural Design II 3 (2,2)
CE 425 Engineering Relations ... 3 (3,0)
EM 421 Hydrology and Hyd. ... 2 (2,0)
ME 311 Engineering Thermo. I.. 3 (3,0)
Technical Elective† 3
Elective 3
    ——
    17

138 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Each class adviser has a list of approved electives from which students may make selections. Any exceptions to this list must have the approval of the department head.

ELECTRICAL AND COMPUTER ENGINEERING

Electrical and computer engineering is the largest and most diversified of the engineering disciplines. Its technical society membership is more than double that of any other and the responsibilities of the profession range from highly analytical problem solving to detailed design of electronics, communications and computing systems. Electrical and computer engineers have traditionally occupied key positions in a wide variety of engineering programs and their educational program must be structured to allow for this diversity of career objectives. The Electrical and Computer Engineering Department allows this flexibility of course selection in its curriculum. A liberal number of humanistic-social electives provide the graduate with the ability to address himself to both the "how" and the "why" of engineering.

The flexibility of the curriculum allows either a sampling from the many aspects of electrical and computer engineering or a concentration in a specific area. The student's interests and career objectives are carefully considered by the Electrical and Computer Engineering advising staff in structuring a program of study.

Electrical and computer engineering can be subdivided into the rather broad areas of networks and systems analysis, communications, electronics, computer engineering and energy systems. A brief discussion of each of these follows.

Systems and electric network analysis provides the fundamental core materials in the curriculum. These core credits of required work constitute the fundamental studies in analysis and experimentation which receive subsequent further development in elective courses. Computer simulation, mathematical modeling, experimental design and scientific reasoning are representative of the topics covered.

Computers, both analog and digital, are studied extensively in the Electrical and Computer Engineering program. Few areas in engineering present the promise of continued growth that is offered by the computing industry. In preparing the student to meet this challenge, the department offers courses in real-time computing, computer language structures, the theory and design of digital computers, computation and simulation of physical systems, information processing and data handling. The department operates its own digital and analog computing laboratories and makes extensive use of equipment in the University Computer Center.

The study of electronics continues to be one of the most active professional areas in electrical and computer engineering. Changes in this field have occurred so rapidly that equipment designed five years ago is obsolete by present design criteria. The vacuum tube gave way to the transistor sixteen years ago and

more recently the integrated circuit has replaced the discrete solid-state device. The Electrical and Computer Engineering curriculum includes basic work in the theory of operation of solid-state devices, the design of solid-state circuits and the study of integrated circuit technology. Electronic laboratories within the department contain the most modern equipment available for the study of these devices, including special microscopic and micro-manipulation equipment needed in the study of minute integrated circuits.

The study of energy systems analysis and energy conversion is carried out in a recently renovated power laboratory. This new facility contains the machinery and instrumentation necessary to explore solid-state-static motor control, dynamic speed and torque measurement techniques and power system stability.

Communication theory may be the most comprehensive field of specialization found in Electrical and Computer Engineering. It includes course work in information theory, electromagnetic theory, switching circuits and electronics. Engineers working in communication find themselves studying switching equipment in tele-communications, working on the plasma blackout problem in missile reentry, studying the design implications of complex missile detection and defense systems or they may be designing antennas and transmitting equipment for space satellites. Some will be trying to comprehend the nature of bioelectricity by studying the human brain.

The Honors Program in the Department of Electrical and Computer Engineering has for the past five years accounted for a large percentage of the honors students in the University. All qualified Electrical and Computer Engineering students are strongly urged to take advantage of this program in order to participate in some uncommonly rewarding educational experiences during their final two years of study. Honors students receive individualized professional guidance and special laboratory privileges in many of their courses. Honors students in the past have designed electronic devices, have written complex computer programs and have studied technical material which ordinarily would be reserved for students at the graduate level. Students are asked to contact their Electrical and Computer Engineering adviser for more information.

While most courses in the Department of Electrical and Computer Engineering have been developed for students who wish to complete the curriculum, a number of courses are suitable for students pursuing other objectives. Students are asked to contact an Electrical and Computer Engineering adviser for more information on these courses.

SOPHOMORE YEAR

First Semester

Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)
Humanistic–Social Elective‡	.3	
Technical Elective†	2	
Elective	1	
	16	

Second Semester

Literature Requirement°	3	(3,0)
MATH 208 Engineering Math. I	4	(5,0)
PHYS 222 Optics and Mod. Phys.	3	(3,0)
PHYS 224 Modern Physics Lab.	1	(0,3)
Humanistic–Social Elective‡	3	
Technical†/Humanistic–Social Elective‡	3	(3,0)
Elective	1	
	18	

JUNIOR YEAR

E&CE 320 Electronics I	2	(2,0)
E&CE 325 Electronics and Electromagnetics Lab. I	1	(0,2)
E&CE 329 Logic and Computing Devices	3	(2,2)
E&CE 330 Systems I	3	(3,0)
E&CE 331 Electric Circuits Workshop I	3	(2,2)
E&CE 340 Electric and Magnetic Fields I	2	(2,0)
Technical Elective†	3	
	17	

E&CE 321 Electronics II	2	(2,0)
E&CE 326 Electronics and Electromagnetics Lab. II	1	(0,2)
E&CE 332 Systems II	2	(2,0)
E&CE 333 Electric Circuits Workshop II	3	(2,2)
E&CE 341 Electric and Magnetic Fields II	2	(2,0)
Humanistic–Social Elective‡	3	
Technical Elective†	3	
Elective	3	
	19	

SENIOR YEAR

E&CE 410 Systems III	3	(3,0)
E&CE 411 Elec. Sys. Workshop	2	(0,4)
E&CE 422 Electronics III	2	(2,0)
Technical Elective†	9	
Elective	2	
	18	

E&CE 450 Systems IV	3	(3,0)
E&CE 451 Systems Design Workshop	2	(0,4)
Humanistic–Social Elective‡	3	(3,0)
Technical Elective†	9–8	
	17–16	

138 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† A minimum of 6 credits with Electrical and Computer Engineering designations are required among the technical electives. A distribution among the engineering sciences of not less than 9 credits is also required.
‡ A list of approved humanistic–social electives is available from the student's adviser. Any exceptions to this list must be approved in writing by the department head.

MECHANICAL ENGINEERING

Mechanical engineers are involved in the solution to mankind's basic problems: the maintenance and development of food, shelter, clothing, health, transportation, and communications. These problems require that the mechanical engineer be prepared to work in a wide variety of areas including bioengineering, advanced power systems, environmental and life support systems, propulsion and transportation systems, food technology, textile processing and manufacturing, materials machining and processing, housing and construction techniques, ocean systems, and plant operation, production, and maintenance. His functions may range from technical management to basic research and development, but they all involve innovative problem-solving skills. The training received in such a program must be sufficiently general to serve these diverse areas, yet sufficiently thorough to assure technical competence for prolonged periods.

In preparing an individual to function in both nontechnical and technical areas for a professional career which will generally span 40-45 years, it is essential that the entire man be developed. In accomplishing this development a rather broad educational pattern is followed. It begins with a thorough preparation in the basic sciences: mathematics, chemistry, and physics. Parallel to this development the student gains proficiency in the necessary communications skills, reading and writing, and is taught to see himself as a nontechnical being in society through a study of history, political science, economics, etc. Next in the process comes a rigorous study of the engineering sciences: electrical, thermal, and mechanical sciences which are built upon mathematics, chemistry, and physics.

Upon completion of these fundamentals the program then begins to develop the applications and synthesis areas which distinguish the engineer from the scientist. The applications occur in the areas of energy conversion and transfer, mechanical design, and systems analysis.

The energy conversion and transfer area deals primarily with applications of the thermal sciences; thermodynamics, heat transfer, and fluid mechanics to various processes. For instance, one might consider the conversion of the chemical energy of fuels of other forms of energy to power ground transportation, high-speed commercial or military aircraft, or space vehicles. One might also consider means of converting this energy to a means of powering various refrigeration, air-conditioning and environmental control systems or evaluate systems for the direct use of solar energy to provide power, fresh water, and food for the underdeveloped countries of the world.

In the mechanical design area the student applies his recently acquired knowledge of strength of materials; mechanisms for converting motion; stress, strain, and deflection theories; automatic control theory; and lubrication and wear concepts to mechanical systems ranging from prosthetic devices for the handicapped to completely automated machines for manufacturing plants. Included in the range of applications which the student may pursue is the analysis of artificial knee, hip, and shoulder joints; an evaluation of new construction techniques for low-cost housing development; or study of remote manipulating schemes for work on the ocean floor. The applications in this area are numerous and bear on all man's basic problems.

The systems analysis area involves the use of mathematics, computer sciences (both analog and digital types), instrumentation, and a basic understanding of both mechanical and energy-conversion areas in the analytical and mathematical analysis of complex, real-world, physical systems. These systems may be made up of various electrical, mechanical, thermal, and hydraulic components.

In this activity the student begins to apply *all* the fundamentals and applications previously acquired to the solution to *real* problems.

As an integral part of the entire program, and particularly near the conclusion of his study, the student is immersed in the relevant problem-solving aspects of engineering. He is shown that life does not present problems in a well-defined fashion and is taught the methodology of attacking problems not presented in "textbook" format. The "nontechnical" aspects of human factors, costs, environmental impact, and esthetics are considered in real problems taken from industry, the medical profession, or faculty interests. As the student attacks these problems he develops, under close faculty guidance, a methodology of thinking, planning, and implementing that will serve him in his career regardless of the particular field he chooses to enter. The student then possesses the fundamentals and the problem-solving methodology which will serve him for a career which may see aerospace wax and wane; the environment be a cause of alarm and then become well managed; foodstuffs change drastically in content and appearance; man rebuild his own body; and housing and communications be totally different from anything projected today. He is technically well prepared to manage, plan or perform any of the technical duties involved.

However, the mechanical engineer is not a totally technical being. His problem-solving skills are of great worth to his community and to society, and it is a goal of our educational process to broaden these skills and to instill in each graduate a sense of responsibility to society. The technical "loner" cannot be tolerated in the high technology society of tomorrow, no more so than today. Therefore, a significant portion of the Mechanical Engineering curriculum is devoted to study in the humanistic-social areas. The student may elect, with departmental approval, courses in political science, economics, philosophy, sociology, history, etc., in order to acquire a better understanding of his "nontechnical" world. Thus, those students who pursue a degree in Mechanical Engineering are trained in engineering fundamentals, their applications, and the "nontechnical" areas to assume a position of leadership in industry and society. In fact, these same thought processes and problem-solving skills developed in the mechanical engineering program serve as good preparation for a number of professions including politics, sales, human relations or general business areas, and many highly successful "nontechnical" individuals in society today are graduates of mechanical engineering programs.

Beyond the Bachelor of Science level discussed above, the Department of Mechanical Engineering offers study leading to the Master of Engineering, the Master of Science, and the Doctor of Philosophy degrees.

See page 169 for Freshman Year.

SOPHOMORE YEAR

First Semester

EM 201 Engr. Mech. (Statics)...	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)
ME 201 Innovative Design I	2	(1,3)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)
Humanistic–Social Elective	3	
Elective	1	
	19	

Second Semester

EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 208 Engineering Math. I..	4	(5,0)
ME 202 Innovative Design II ...	3	(2,3)
PHYS 222 Optics and Mod. Phys.	3	(3,0)
Elective	1	
	17	

JUNIOR YEAR

CRE 310 Intro. to Material Sci...	3	(3,0)
E&CE 307 Basic Elec. Engr.	3	(3,0)
EM 320 Fluid Mechanics	3	(3,0)
ME 301 Engr. Systems Analysis..	3	(3,0)
ME 311 Engineering Thermo. I..	3	(3,0)
ME 313 Instrumentation and Meas.	2	(1,2)
	17	

EM 304 Mechanics of Materials..	3	(3,0)
ME 304 Heat Transfer I	3	(3,0)
ME 312 Engineering Thermo. II .	3	(3,0)
ME 314 Engr. Experimentation ..	2	(1,2)
ME 316 Dynamic System Anal. ..	4	(3,3)
ME 324 Engr. Numerical Anal ..	2	(2,0)
	17	

SENIOR YEAR

ME 401 Design of Machine Elem.	3	(3,0)
ME Option Course I	3	(3,0)
ME Option Course II	3	(3,0)
ME Option Course III 4–3		
Humanistic–Social Elective	3	(3,0)
Elective	2	
	18–17	

ME 402 Innovative Design III...	2	(1,2)
ME Option Course IV	3	(3,0)
ME Option Course V	3	(3,0)
SE 484 Engr. Economic Analysis .	3	(3,0)
Humanistic–Social Elective	3	(3,0)
Elective	3	
	17	

The student elects either a Thermal or Mechanical option sequence:

Thermal

Course I	Fluid Dynamics (ME 403)†
Course II	Thermal Power Systems (ME 411)†
Course III	Technical Elective
Course IV	Applied Heat Trans. (ME 407)†
Course V	Technical Elective

Mechanical

Course I	Automatic Control (ME 404)†
Course II	Kinematics and Dynamics of Machinery (ME 405)†
Course III	Technical Elective
Course IV	Mechanical Design (ME 409)
Course V	Technical Elective

138 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Requires at least one student "hands on" experiment.
Note: All electives must be approved in advance by departmental advisers.

COLLEGE OF FOREST AND RECREATION RESOURCES

The College of Forest and Recreation Resources is concerned with the management, use, and stewardship of all of our forest resources and with man's well-being through wise use of his leisure. These two general areas of study offer broad opportunities in the management of our forest and recreation resources for their maximum service to the present and future generations of man.

The College of Forest and Recreation Resources offers curricula designed to prepare students for professional careers in the following areas:

1. The Forest Management curriculum prepares graduates for employment as managers and administrators of forest lands for production of timber, water, wildlife, esthetic values, and recreational use.

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2. The Recreation and Park Administration curriculum prepares recreation directors for counties, towns and cities, institutions, industries, and youth-serving agencies, as well as managers for park systems at the municipal, county, state, or federal levels.

FORESTRY

The Forest Management curriculum combines a broad education in liberal arts and the physical, mathematical, and biological sciences with the applied forestry sciences needed in the management of the forest and forest environment for their products and services. Foresters of professional standing are employed in various capacities by private concerns and by federal, state, and other public agencies.

Because of the nature of their education, foresters are qualified for a broad spectrum of employment possibilities. They may be engaged as managers, administrators, or owners of forest lands or forest-based businesses; as technical specialists in the production of timber, useable water, wildlife, and esthetic values, and in the recreational use of the forest; or as professionals in other areas where the conservation of our natural resources is a matter of concern. Foresters earning advanced degrees find employment in academic work and in research conducted both by public and private agencies.

The undergraduate curriculum provides a strong program in the basic knowledge and skills required of a professional forester. The curriculum is also designed to provide the necessary prerequisites for those students that desire to continue in graduate study. The Department of Forestry offers graduate programs that lead to a Master of Science in Forestry or a Master of Forestry degree.

The Forest Management curriculum is accredited by the Society of American Foresters.

FOREST MANAGEMENT CURRICULUM

FRESHMAN YEAR

First Semester			Second Semester		
BOT 101 Plant Biology†	3	(3,0)	CH 102 General Chemistry†	4	(3,3)
BOT 103 Plant Biology Lab.†	1	(0,2)	EG 105 Engineering Graphics†	2	(0,6)
CH 101 General Chemistry†	4	(3,3)	ENGL 102 English Composition	3	(3,0)
ENGL 101 English Composition	3	(3,0)	FOR 102 Introduction to Forestry	1	(1,0)
FOR 101 Introduction to Forestry	1	(1,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
MATH 106 Calculus of One Var.	4	(4,0)	ZOOL 101 Animal Biology	3	(3,0)
Elective	1		Elective	1	
	17			18	

SOPHOMORE YEAR

AGRON 202 Soils† 3 (2,2)	CE 201 Surveying† 3 (2,3)
ECON 201 Principles of Economics 3 (3,0)	COMP SC 205 Elem. Comp. Prog. 3 (3,0)
FOR 205 Dendrology† 4 (3,3)	ENGL 301 Public Speaking 3 (3,0)
Literature Requirement° 3 (3,0)	FOR 206 Silvics† 4 (3,3)
PHYS 207 General Physics 4 (3,2)	GEOL 219 Geology for Foresters. 3 (3,0)
Elective 1	Elective 1
—	—
18	17

FORESTRY SUMMER CAMP

FOR 251 Forest Plants 2
FOR 252 Forest Engineering 2
FOR 253 Forest Mensuration 4
FOR 254 Forest Products 1
—
9

JUNIOR YEAR

ENT 307 Forest Entomology 3 (2,3)	BOT 352 Plant Physiology 4 (3,3)
EX ST 301 Introductory Statistics 3 (2,2)	FOR 302 Forest Mensuration‡ .. 3 (2,3)
FOR 308 Aerial Photos in For.‡ .. 3 (2,3)	FOR 304 Forest Economics 3 (3,0)
WB 412 Wildlife Management .. 3 (2,3)	FOR 306 Wood and Wood Fiber
Emphasis Area 3	Identification 2 (1,3)
Social Science Elective 3 (3,0)	FOR 310 Silviculture‡ 4 (3,3)
—	—
18	16

SENIOR YEAR

FOR 417 Forest Mgt. and Reg... 4 (3,3)	FOR 401 Logging and Milling .. 3 (2,3)
FOR 420 Forest Products 2 (2,0)	FOR 412 Forest Protection 2 (2,0)
PL PA 405 Forest Pathology ... 3 (2,3)	FOR 414 Management Plans ... 1 (0,3)
POL SC 101 Intro. to Pol. Sci. 1.. 3 (3,0)	FOR 416 Forest Policy and Admin. 2 (2,0)
Emphasis Area 6	FOR 418 Forest Valuation 3 (3,0)
	Elective 6
—	—
18	17

148 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Courses generally prerequisite to summer camp.
‡ Summer Camp generally prerequisite to these courses.
Note: The emphasis areas are forest management, forest economics and marketing, forest biology, forest wildlife management, forest recreation, forest harvesting, forest influences, forest protection, forest biometrics, forest soils, and the humanities. The student selects one of these and in consultation with his adviser schedules approved courses for that particular emphasis area.

RECREATION AND PARK ADMINISTRATION

The curriculum in Recreation and Park Administration prepares students for a variety of careers in leisure-service agencies. The undergraduate curriculum is designed to provide a broad exposure to courses in the social, physical and biological sciences as well as develop the basic knowledge and skills required to manage and administer leisure-service resources.

Flexibility within the curriculum is achieved by permitting the student the opportunity to select coursework from among several emphasis areas that include recreation resource management, rehabilitative recreation, and recreation and park administration. The latitude in area and course selection permits maximum accommodation of the individual student's interests and professional career objectives.

Graduate study leading to a Master of Recreation and Park Administration is also offered by the Department.

FRESHMAN YEAR

First Semester

BOT 101 Plant Biology 3 (3,0)
ENGL 101 English Composition. . 3 (3,0)
HIST 102 American History 3 (3,0)
MATH 101 Math. Analysis I . . . 3 (3,0)
RPA 101 Introduction to
  Community Recreation 3 (3,0)
Elective 1
                                          —
                                          16

Second Semester

ENGL 102 English Composition. . 3 (3,0)
POL SC 101 Intro. to Pol. Sci. I . . 3 (3,0)
RPA 102 History and Principles of
  Outdoor Recreation 3 (3,0)
RPA 203 Personal and Community
  Health 3 (3,0)
ZOOL 101 Animal Biology 3 (3,0)
Elective 1
                                          —
                                          16

SOPHOMORE YEAR

ECON 200 Economic Concepts. . . 3 (3,0)
Literature Requirement° 3 (3,0)
Physical Science† 4
PSYCH 201 General Psychology. . 3 (3,0)
RPA 204 Sports in Recreation. . . . 3 (2,3)
Elective 1
                                          —
                                          17

ACCT 200 Managerial Accounting 3 (3,0)
Physical Science† 4
PSYCH 211 Growth and Develop. 3 (3,0)
RPA 205 Prog. Plan. for Rec. . . . 3 (2,3)
SOC 201 Introductory Sociology. . 3 (3,0)
Elective 1
                                          —
                                          17

JUNIOR YEAR

RPA 302 Camp Org. and Admin. 3 (2,3)
RPA 306 Principles of Outdoor
  Education 3 (3,0)
Emphasis Area‡ 6
Elective 3
                                          —
                                          15

ENGL 301 Public Speaking 3 (3,0)
RPA 308 Methods and Techniques
  of Recreation Leadership 3 (3,0)
Emphasis Area‡ 6
Elective 3
                                          —
                                          15

SUMMER

RPA 405 Field Training in Recreation. 8

SENIOR YEAR

RPA 402 Recreation Administration 3 (3,0)
RPA 409 Meth. of Rec. Research I 3 (3,0)
Emphasis Area‡ 8
Elective 2
                                          —
                                          16

RPA 403 Facility and Site Plan. . . 3 (2,3)
RPA 410 Meth. of Rec. Research II 3 (3,0)
Emphasis Area‡ 6
Elective 3
                                          —
                                          15

135 Total Semester Hours

EMPHASIS AREAS—REQUIRED COURSES

Recreation and Park Administration
IM 307 Personnel Management . . 3 (3,0)
RPA 307 Park Maintenance and
  Operation 4 (3,3)
SOC 331 Urban Sociology 3 (3,0)
                                          —
                                          10

Recreation Resource Management
AGRON 403 Soil Gen. and Class. 2 (1,3)
FOR 305 Elements of Forestry . . 2 (2,0)
RPA 307 Park Maintenance and
  Operation 4 (3,3)
RPA 407 Methods of Environ-
  mental Interpretation 3 (2,3)
                                          —
                                          11

Rehabilitative Recreation
ED 471 The Exceptional Child 3 (3,0)
PSYCH 402 Abnormal Psychology. 3 (3,0)
RPA 406 Recreation for the Ill and Handicapped 3 (3,0)
RPA 408 Appl. of Rec. Therapy 3 (3,0)
                                                  —
                                                  12

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Two-semester sequences in chemistry, geology, physical science, or physics.
‡ The emphasis areas in the Department of Recreation and Park Administration include Recreation and Park Administration, Recreation Resource Management, and Rehabilitative Recreation. The student selects one of these areas and in consultation with his adviser schedules the required and approved courses for that particular emphasis area.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

The programs of the College of Industrial Management and Textile Science embrace three major areas, teaching, research, and public service. The College is responsible for seven graduate programs (two in cooperation with other administrative units), eight undergraduate programs, and a series of professional development courses for business and industry. The undergraduate curricula are in the areas of Accounting, Administrative Management, Economics, Financial Management, Industrial Management, Textile Chemistry, Textile Science, and Textile Technology. These curricula are designed to prepare the students for a variety of careers, as well as to furnish an education on which to build for a lifetime. The curricula recognize the need for an understanding of the basic principles of science and appreciation for the nature of human

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beings, and the comprehension of the economic, political, and social environment. Flexibility in course selection and choice of areas for emphasis is made possible by secondary concentrations and minors as indicated.

ACCOUNTING

This curriculum leads to the Bachelor of Science degree in Accounting. The program of courses is designed to prepare students for professional careers in accounting and management. The major study of accounting is well supported by sequential courses in English, mathematics, management, economics, and sociology.

The graduate in Accounting is well prepared for entrance in law school, graduate school, or the practice of accountancy, either public, private, or governmental. The study of Accounting in preparation for a career in other areas of Management will provide mastery over an essential tool which reinforces experience and judgment in the decision-making process.

FRESHMAN YEAR

First Semester	Second Semester
ACCT 201 Principles of Accounting 3 (3,0)	ACCT 202 Principles of Accounting 3 (3,0)
ENGL 101 English Composition.. 3 (3,0)	ENGL 102 English Composition.. 3 (3,0)
HIST 173 Western Civilization... 3 (3,0)	MATH 108 Cal. and Lin. Algebra 4 (4,0)
MATH 106 Calculus of One Var. 4 (4,0)	Science Elective† 4 (3,3)
Science Elective† 4 (3,3)	Elective 3
17	17

SOPHOMORE YEAR

ACCT 301 Intermed. Accounting . 3 (3,0)	ACCT 302 Intermed. Accounting . 3 (3,0)
ECON 201 Principles of Economics 3 (3,0)	COMP SC 205 Elem. Comp. Prog. 3 (3,0)
Literature Requirement° 3 (3,0)	ECON 202 Principles of Economics 3 (3,0)
MATH 207 Multi. Dim. Calculus. 3 (3,0)	IM 201 Intro. to Ind. Mgt...... 3 (3,0)
SOC 201 Introductory Sociology.. 3 (3,0)	Literature Requirement° 3 (3,0)
15	MATH 301 Statistical Theory and Methods I 3 (3,0)
	18

JUNIOR YEAR

ACCT 303 Cost Accounting 3 (3,0)	ACCT 305 Income Taxation 3 (3,0)
ECON 314 Inter. Econ. Theory .. 3 (3,0)	ENGL 304 Advanced Composition 3 (3,0)
IM 306 Corporation Finance 3 (3,0)	IM 313 Commercial Law 3 (3,0)
IM 312 Commercial Law 3 (3,0)	MGT SC 311 Intro. to Econometrics 3 (3,0)
Elective 4	SOC 351 Industrial Sociology 3 (3,0)
16	Elective 3
	18

SENIOR YEAR

ACCT 405 Advanced Fed. Taxes. 3 (3,0)	ACCT 407 Accounting Research . 1 (1,0)
ACCT 410 Budgeting and Executive Control 3 (3,0)	ACCT 415 Auditing 3 (3,0)
ACCT 411 Advanced Accounting. 3 (3,0)	ENGL 301 Public Speaking 3 (3,0)
MGT SC 414 Statistical Analysis.. 3 (3,0)	IM 404 Managerial Economics .. 3 (3,0)
Approved Elective 3	IM 415 Manager. Decision Making 3 (3,0)
15	Approved Elective 3
	16

132 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Science elective includes any natural or physical science.

ADMINISTRATIVE MANAGEMENT

The Bachelor of Science degree in Administrative Management is designed for those students interested in careers as professional managers in the less technical areas of management. Such areas include marketing, personnel administration, purchasing, and public administration at the local, state and national levels. In addition, the qualified graduate of this curriculum will have a background suitable for pursuing graduate study in such areas as marketing, transportation, finance, and economics, as well as the behavioral sciences.

The programs of study included in Administrative Management curriculum is designed to provide the student with (1) an appreciation of the social, political, and economic environments in which business firms must operate; (2) knowledge of the functional areas of business, their interrelationship and use of analytical methods in solving problems; and (3) a facility in the use of mathematics, statistics, and the behavioral sciences in performing managerial functions.

FRESHMAN YEAR

First Semester

CH 101 General Chemistry	4	(3,3)
or PHY SC 101 Physical Sci. 1	4	(3,2)
ENGL 101 English Composition	3	(3,0)
HIST 173 Western Civilization	3	(3,0)
MATH 101 Math. Analysis 1	3	(3,0)
POL SC 101 Intro. to Pol. Sci. I	3	(3,0)
Elective	1	
	17	

Second Semester

CH 102 General Chemistry	4	(3,3)
or PHY SC 102 Physical Sci. II	4	(3,2)
ENGL 102 English Composition	3	(3,0)
MATH 102 Math. Analysis II	3	(3,0)
POL SC 201 Intro. to Pol. Sci. II	3	(3,0)
Elective	4	
	17	

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	(3,0)
ECON 201 Principles of Economics	3	(3,0)
Literature Requirement°	3	(3,0)
MATH 203 Elem. Stat. Inference	3	(3,0)
SOC 201 Introductory Sociology	3	(3,0)
Elective	1	
	16	

ACCT 202 Principles of Accounting	3	(3,0)
COMP SC 205 Elem. Comp. Prog.	3	(3,0)
ECON 202 Principles of Economics	3	(3,0)
IM 201 Intro. to Ind. Mgt.	3	(3,0)
PSYCH 201 General Psychology	3	(3,0)
SOC 202 Social Problems	3	(3,0)
	18	

JUNIOR YEAR

ACCT 303 Cost Accounting	3	(3,0)
ECON 301 Economics of Labor	3	(3,0)
IM 304 Quality Control	3	(3,0)
IM 308 Principles of Marketing	3	(3,0)
IM 312 Commercial Law	3	(3,0)
Elective	1	
	16	

IM 306 Corporation Finance	3	(3,0)
IM 307 Personnel Management	3	(3,0)
IM 313 Commercial Law	3	(3,0)
MGT SC 310 Intro. to Mgt. Sci.	3	(3,0)
POL SC 321 Gen. Public Admin.	3	(3,0)
or SOC 331 Urban Sociology	3	(3,0)
Elective	1	
	16	

SENIOR YEAR

ACCT 410 Budgeting and Executive Control	3	(3,0)	IM 401 Quant. Marketing Anal.	3	(3,0)	
			or IM 412 Marketing Mgt.	3	(3,0)	
ENGL 304 Advanced Composition	3	(3,0)	IM 404 Managerial Econ.	3	(3,0)	
IM 402 Operations Planning and Control	3	(3,0)	or MGT SC 414 Stat. Anal.	3	(3,0)	
			IM 407 Directed Research	1	(1,0)	
IM 405 Econ. of Transportation	3	(3,0)	or IM 410 Marketing Research I	1	(1,0)	
or IM 418 Mgt. Inf. Systems	3	(3,0)	IM 415 Managerial Dec. Making	3	(3,0)	
Elective	3		IM 499 Computer Programming II	1	(0,3)	
	15		Elective	6		
				17		

132 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

ECONOMICS

The curriculum leading to the Bachelor of Arts degree in Economics is designed to combine a broad general education with a thorough understanding of economics.

The degree requirements are given below. The Bachelor of Arts degree in Economics requires 130 semester hours for graduation; and whenever scheduling permits, the student will be required to take the courses in the sequence given. The curriculum shown, however, can be considered adequate preparation for graduate study in economics only if it is taken with the mathematics minor.

FRESHMAN YEAR

First Semester			Second Semester		
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)	HIST 172 or 173 West. Civilization	3	(3,0)
MATH 101 Math. Analysis I†	3	(3,0)	MATH 102 Math. Analysis II†	3	(3,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
Natural Science‡	3–4		Natural Science‡	3–4	
Elective	1		Elective	1	
	17–18			**17–18**	

SOPHOMORE YEAR

ECON 201 Principles of Economics	3	(3,0)	ECON 202 Principles of Economics	3	(3,0)
HIST 101 American History§	3	(3,0)	HIST 102 American History§	3	(3,0)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
MATH 203 Elem. Stat. Inference†	3	(3,0)	MATH 106 Calculus of One Var.†	4	(4,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Elective	1		Elective	1	
	16			**17**	

JUNIOR YEAR

ACCT 200 Managerial Accounting	3	(3,0)	ECON 407 National Income and Employment Analysis	3	(3,0)
ECON 314 Inter. Econ. Theory	3	(3,0)	Humanities¶	3	
Humanities¶	3		Major°°	3	
Major°°	3		Minor°°	6	
Minor°°	3			**15**	
	15				

SENIOR YEAR

Major	 6	Major	 6	
Minor	 6	Elective	11–10	
Approved Elective°°	4–3			
	———		17–16	
	16–15	130 Total Semester Hours		

°To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
°° See department requirements.
† The sequence Math 101, 102, 203, 106 may be replaced by Math 106, 108, 301 or by Math 106, 108, Ex St 301.
‡ Two courses from the same science are required. These may be selected from botany, chemistry, geology, physics, or zoology.
§ Students minoring in political science, psychology, or sociology may substitute Pol Sc 101 or 201; Psych 201, 202; or Soc 201, 202 for Hist 101, 102.
¶ To be selected from English, humanities, modern language, music, philosophy, religion, visual studies.
Note: Those seeking teacher certification will be required to complete more than 130 semester hours.
Twenty-four semester hours above the sophomore level are required, including Econ 314 and 407. (Econ 314 should be scheduled to follow immediately after Econ 202.) Courses also must include 9 semester hours to be selected from Econ 302, 403, 404, 410, 412, and 420. The remaining hours may be selected from Ag Ec 456, Econ 301, 302, 305, 306, 308, 309, 399, 403, 404, 410, 412, 413, 414, 416, 419, 420, 421, 422, 423, 424, Ex St 462, Hist 306, IM 404, 405, 406, Mgt Sc 311, SE 484.

MINOR CONCENTRATIONS

A student pursuing a Bachelor of Arts degree in Economics must select a minor concentration under one of the options as follows:

1. Secondary or minor concentrations

Accounting (to include Acct 202, 301, 302, 303, 410)	Mathematics
Biology	Modern Languages
Chemistry	Philosophy
English	Physics
Fine Arts	Political Science
Geology	Psychology
History	Sociology
	Textiles

Students who consider the Bachelor of Arts curriculum in Economics and desire to go into secondary school teaching should elect to take the degree in Education with a teaching area in Economics. The courses will be those required for teaching certificates as specified by the South Carolina Department of Education as well as those economics courses required for an Economics major.

Specific requirements for most minors may be found under the section on the College of Liberal Arts and the College of Physical, Mathematical and Biological Sciences, Bachelor of Arts curriculum. Requirements for a major in Education with a teaching area in Economics are shown under the College of Education.

A minor in Economics is provided for other degree programs consisting of 15 hours above the sophomore level which must include Econ 314 and 407.

2. "Cluster Minor." This minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the "Cluster Minor" is 15 semester credits in

courses numbered higher than 300 (except where noted differently), chosen according to one of the plans as follows:

Group I—Social Sciences*
    History
    Political Science
    Psychology
    Sociology

Group II—Philosophy and Religion

Group III—Administration *
    Accounting
    Industrial Management

Group IV—Life Sciences †
    Bacteriology
    Botany
    Genetics
    Zoology

Group V—Physical Sciences †
    Chemistry
    Geology
    Physics

APPROVED ELECTIVES

A list of approved electives for both degree and quality requirements may be obtained from the departmental secretary or from an adviser.

FINANCIAL MANAGEMENT

The curriculum for the Bachelor of Science degree in Financial Management provides the student with a course of study in preparation for a career in such areas as banking, insurance, brokerage and related activities. The student should be well prepared to serve on the financial staff of practically any business firm for the purpose of planning, providing, and controlling the capital of the firm. This curriculum should also prepare the student for service in government and agencies and programs of government. The graduate with this degree should be adequately prepared for entrance in law or graduate school.

The coursework consists largely of courses in English, mathematics, accounting, economics, management, and the social sciences. The special interests of the individual student may be pursued through elective credit.

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* At least two courses must be taken in each subject chosen.
† No course in the 100 series is acceptable toward the cluster minor and not more than two courses in the 200 series. At least two courses must be taken in each subject chosen.

FRESHMAN YEAR

First Semester		Second Semester	
ACCT 201 Principles of Accounting 3	(3,0)	ACCT 202 Principles of Accounting 3	(3,0)
ENGL 101 English Composition.. 3	(3,0)	ECON 201 Principles of Economics 3	(3,0)
HIST 173 Western Civilization... 3	(3,0)	ENGL 102 English Composition.. 3	(3,0)
IM 201 Intro. to Ind. Mgt. 3	(3,0)	MATH 102 Math. Analysis II†... 3	(3,0)
MATH 101 Math. Analysis I† ... 3	(3,0)	POL SC 101 Intro. to Pol Sci. 1.. 3	(3,0)
Elective 1		Elective 1	
16		16	

SOPHOMORE YEAR

ACCT 301 Intermed. Accounting. 3	(3,0)	ACCT 302 Intermed. Accounting. 3	(3,0)
ECON 202 Principles of Economics 3	(3,0)	COMP SC 205 Elem. Comp. Prog. 3	(3,0)
Literature Requirement° 3	(3,0)	Literature Requirement° 3	(3,0)
MATH 203 Elem. Stat. Inference† 3	(3,0)	PSYCH 201 General Psychology.. 3	(3,0)
SOC 201 Introductory Sociology.. 3	(3,0)	Elective 3	
Elective 1			
16		15	

JUNIOR YEAR

ACCT 303 Cost Accounting 3	(3,0)	ACCT 302 Intermed. Accounting.. 3	(3,0)
ECON 306 Risk and Insurance .. 3	(3,0)	ECON 302 Money and Banking.. 3	(3,0)
ECON 314 Inter. Econ. Theory .. 3	(3,0)	IM 306 Corporation Finance ... 3	(3,0)
IM 308 Principles of Marketing.. 3	(3,0)	IM 307 Personnel Management .. 3	(3,0)
IM 312 Commercial Law 3	(3,0)	IM 313 Commercial Law 3	(3,0)
SOC 351 Industrial Sociology ... 3	(3,0)	Elective 3	
18		18	

SENIOR YEAR

ACCT 410 Budgeting and		ACCT 415 Auditing 3	(3,0)
Executive Control 3	(3,0)	ECON 412 International Trade .. 3	(3,0)
ECON 422 Monetary Theory		ENGL 301 Public Speaking 3	(3,0)
and Policy 3	(3,0)	Elective 6	
ENGL 304 Advanced Composition 3	(3,0)	15	
IM 415 Managerial Dec. Making . 3	(3,0)		
Elective 6			
18			

132 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Credits earned in Math 106, 108, 207, 301, and Mgt Sc 414 may be substituted toward Math 101, 102, 203, and eight elective credits. See class adviser.

INDUSTRIAL MANAGEMENT

This curriculum is designed to adequately prepare students for positions of major management responsibility in the technologically oriented industries. Graduates are sought for positions as project directors by various government agencies and have successfully filled a wide variety of positions in industry and government research centers. Banks and financial institutions also utilize the Industrial Management graduate in a liason role as between them and their technologically oriented business customers. The degree offers an unexcelled background for those interested in careers as technical sales representatives.

During the first year, education in the mathematical and physical sciences is emphasized. In the second, third, and senior years, the student's work expands into the areas of industrial engineering, financial management, and the social sciences.

FRESHMAN YEAR

First Semester

CH 101 General Chemistry	4	(3,3)
EG 103 Engineering Communica..	3	(1,6)
ENGL 101 English Composition..	3	(3,0)
HIST 173 Western Civilization...	3	(3,0)
MATH 106 Calculus of One Var..	4	(4,0)
	17	

Second Semester

CH 102 General Chemistry	4	(3,3)
ENGL 102 English Composition..	3	(3,0)
MATH 108 Cal. and Lin. Algebra	4	(4,0)
PHYS 122 Mech. and Wave Phen.	3	(3,0)
Elective	3	
	17	

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	(3,0)
ECON 201 Principles of Economics	3	(3,0)
MATH 207 Multi. Dim. Calculus	3	(3,0)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)
PHYS 223 Electron Physics Lab..	1	(0,3)
SOC 201 Introductory Sociology..	3	(3,0)
	16	

ACCT 202 Principles of Accounting	3	(3,0)
COMP SC 205 Elem. Comp. Prog.	3	(3,0)
ECON 202 Principles of Economics	3	(3,0)
IM 201 Intro. to Ind. Mgt.	3	(3,0)
MATH 301 Statistical Theory and Methods I	3	(3,0)
Elective	2	
	17	

JUNIOR YEAR

ACCT 303 Cost Accounting	3	(3,0)
ECON 314 Inter. Econ. Theory..	3	(3,0)
IE 307 Survey of Engineering....	3	(3,0)
IM 322 Legal Environment of Business	3	(3,0)
Literature Requirement°	3	(3,0)
Area Concentration† or Elective	3	
	18	

IM 304 Quality Control	3	(3,0)
IM 308 Principles of Marketing..	3	(3,0)
MGT SC 311 Intro. to Econometrics	3	(3,0)
SOC 351 Industrial Sociology	3	(3,0)
Area Concentration† or Technical Elective	3	
Elective	2	
	17	

SENIOR YEAR

ACCT 410 Budgeting and Executive Control	3	(3,0)
ENGL 304 Advanced Composition	3	(3,0)
IM 408 Work Simplification and Standardization	3	(3,0)
or IM 418 Mgt. Inform. Sys. ...	3	(3,0)
MGT SC 414 Statistical Analysis..	3	(3,0)
Area Concentration† or Technical Elective	3	
	15	

IM 402 Operations Planning and Control	3	(3,0)
IM 404 Managerial Economics	3	(3,0)
IM 407 Directed Research	1	(1,0)
or IM 410 Marketing Research I	1	(1,0)
IM 415 Managerial Dec. Making.	3	(3,0)
IM 499 Computer Programming II	1	(0,3)
Area Concentration†	3	
Elective	1	
	15	

132 Total Semester Hours

°To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† A student not selecting an area concentration may, with the approval of his adviser, select instead 9-12 credits from an approved department technical elective list.

AREA CONCENTRATIONS

During the junior and senior years the student may select courses from one of the following areas for the purpose of emphasizing a particular area of the curriculum. Area concentrations constitute 12 credits and may be extended to 18 credits with the approval of the student's major adviser.

Biological Science
Ceramics
Defense Studies
Economics
Environmental Science
Health and Hospital Administration

Human Resources Management
Industrial Engineering
Industrial Statistics
Management Science
Marketing Analysis
Regional Science
Textiles

TEXTILE CHEMISTRY

The Textile Chemistry curriculum prepares students for a wide variety of positions in the textile-fiber-polymer complex of industries that provide so much of the industrial income of the Southeast. The program gives excellent preparation for graduate study in many fields including the sciences, engineerings, management, and the interdisciplines such as textile, fiber, and polymer science. In his first two years, the student acquires the firm foundation in chemistry, physics, mathematics, and English essential to any serious study of science. In his third and fourth years, the student continues his studies of chemistry and begins to apply his knowledge in studies of polymer and fiber science, dyeing, finishing, yarn and fabric formation, and textile structures. Supporting courses in the humanities, English, and economics are included.

A total of 132 semester hours is required for graduation; of these, 32 semester hours are electives which may include up to ten semester hours of Air Science or Military Science. At least 20 semester hours of electives will form a coherent group in an area of particular interest and need to the student in his scientific and professional development. Ordinarily these courses will be junior or senior level courses in textile science, textile chemistry, other sciences, engineering, mathematics, or management. In the second semester of his sophomore year, the student, with the advice and consent of the Head of the Textile Department or the Director of Undergraduate Textile Education, will develop a study plan and will select these elective courses so as to maximize his training and development in his chosen field of study.

Senior students are encouraged to participate in original research and seminar programs. These activities, for which academic credits are given, introduce the student to scientific research and development in the chemistry of textiles, fibers, and polymers.

The Textile Department also offers the advanced degrees, Master of Science in Textile Chemistry, Master of Science in Textile Science, and Doctor of Philosophy in Textile and Polymer Science, and in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

FRESHMAN YEAR

First Semester		
CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
HIST 172 or 173 West. Civilization	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
TEXT 122 Introduction to Textiles	2	(1,3)
Elective	1	
	17	

Second Semester		
CH 112 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
IM 299 Computer Programming I	1	(0,3)
MATH 108 Cal. and Lin. Algebra	4	(4,0)
PHYS 122 Mech. and Wave Phen.	3	(3,0)
Elective	1	
	16	

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	(3,0)	CH 224 Organic Chemistry	3	(3,0)
CH 225 Organic Chemistry Lab. .	2	(0,6)	CH 226 Organic Chemistry Lab. .	2	(0,6)
Literature Requirement°	3	(3,0)	MATH 208 Engineering Math. I . .	4	(5,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	PHYS 222 Optics and Mod. Phys.	3	(3,0)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)	PHYS 224 Modern Physics Lab. .	1	(0,3)
PHYS 223 Electron Physics Lab. .	1	(0,3)	Elective	3	
Elective	1			16	
	17				

JUNIOR YEAR

CH 331 Physical Chemistry	3	(3,0)	CH 332 Physical Chemistry	3	(3,0)
ECON 201 Principles of Economics	3	(3,0)	ENGL 304 Advanced Composition	3	(3,0)
TC 315 Introduction to Polymer			TC 316 Chemical Preparation		
Science and Engineering	3	(3,0)	of Textiles	3	(2,3)
TC 317 Polymer and Fiber Lab. . .	1	(0,3)	TEXT 306 Yarn Formation	3	(3,0)
Elective	6		Elective†	6	
	16			18	

SENIOR YEAR

TC 457 Dyeing and Finishing I . .	3	(3,0)	TC 458 Dyeing and Finishing II .	3	(3,0)
TC 459 Dyeing and Fin. Lab. I .	1	(0,3)	TC 460 Dyeing and Fin. Lab. II	1	(0,3)
TEXT 313 Fabric Formation	3	(3,0)	TEXT 322 Properties of Textile		
TEXT 321 Fiber Science	3	(2,3)	Structures	3	(2,3)
Elective†	6		Elective†	9	
	16			16	

132 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Class advisers have lists of approved electives and will suggest sequences of courses.

TEXTILE SCIENCE

The Textile Science curriculum prepares students for a wide variety of positions in research and development, production, standards, and management in the textile-fiber-polymer complex of industries and in related industries. The program gives excellent preparation for graduate study in many fields. The first two years are devoted to the study of the chemistry, physics, mathematics, and English essential to the study of textile, fiber, and polymer science. In his third and fourth years, the student studies the science and technology necessary for development and production of fibers, yarns, woven, and nonwoven textile structures, and synthetic polymers.

A total of 132 semester hours is required for graduation; of these, 34 semester hours are electives which may include up to 10 semester hours of air science or military science. At least 20 semester hours of electives will form a coherent group in an area of particular interest and need to the student in his scientific and professional development. Ordinarily, these courses will be junior or senior level courses in textile science, textile chemistry, other sciences, engineering, mathematics, or management. In the second semester of his sophomore year, the student, with the advice and consent of the Head of the Textile Department or the Director of Undergraduate Textile Education, will develop a study plan and will select these

elective courses so as to maximize his training and development in his chosen field of study.

Senior students are encouraged to participate in original research and seminar programs. These activities, for which academic credits are given, introduce the student to scientific research and development in textiles, fibers, and polymers.

The Textile Department also offers the advanced degrees, Master of Science in Textile Science, Master of Science in Textile Chemistry, and Doctor of Philosophy in Textile and Polymer Science, and, in cooperation with the Chemistry Department, the Doctor of Philosophy in Chemistry with a major in Textile Chemistry.

FRESHMAN YEAR

First Semester			Second Semester		
CH 101 General Chemistry	4	(3,3)	CH 102 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
HIST 173 Western Civilization	3	(3,0)	IM 299 Computer Programming I	1	(0,3)
MATH 106 Calculus of One Var.	4	(4,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
TEXT 122 Introduction to Textiles	2	(1,3)	PHYS 122 Mech. and Wave Phen.	3	(3,0)
Elective	1		Elective	1	
	17			16	

SOPHOMORE YEAR

Literature Requirement°	3	(3,0)	ECON 201 Principles of Economics	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	MATH 208 Engineering Math. I	4	(5,0)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)	PHYS 222 Optics and Mod. Phys.	3	(3,0)
PHYS 223 Electron Physics Lab.	1	(0,3)	PHYS 224 Modern Physics Lab.	1	(0,3)
TC 303 Textile Chemistry	3	(3,0)	TC 304 Textile Chemistry	3	(3,0)
TC 305 Textile Chemistry Lab.	1	(0,3)	TC 306 Textile Chemistry Lab.	1	(0,3)
Elective	1		Elective	1	
	16			16	

JUNIOR YEAR

TEXT 301 Fiber Processing I	3	(2,3)	ENGL 304 Advanced Composition	3	(3,0)
TEXT 311 Fabric Development I	3	(2,3)	TEXT 302 Fiber Processing II	3	(2,3)
TEXT 321 Fiber Science	3	(2,3)	TEXT 312 Fabric Development II	3	(2,3)
Elective†	8		TEXT 322 Properties of Textile		
	17		Structures	3	(2,3)
			Elective	6	
				18	

SENIOR YEAR

TC 315 Introduction to Polymer			TC 458 Dyeing and Finishing II	3	(3,0)
Science and Engineering	3	(3,0)	TC 460 Dyeing and Fin. Lab. II	1	(0,3)
TC 317 Polymer and Fiber Lab.	1	(0,3)	TEXT 414 Nonwoven and		
TEXT 403 Fiber Processing III	3	(2,3)	Knitted Structures	3	(3,0)
TEXT 411 Fabric Development III	3	(2,3)	Elective†	9	
Elective†	6			16	
	16				

132 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Class advisers have lists of approved electives and will suggest sequences of courses.

TEXTILE TECHNOLOGY

The Textile Technology curriculum prepares students for managerial production, sales, and technical service positions in the textile industry and in the suppliers to this industry. A number of courses pertaining to business practice, and people-to-people relations are included to increase the managerial skill of the student. Enough electives are permitted so that the student may choose to include chemistry and physics courses that will give him technical knowledge.

The curriculum is particularly well-suited to graduates of junior colleges, community colleges, and technical education centers. Such students will often find that they will be given credit for most of their previous courses; they will be able to complete the requirements for the degree in a total of four years.

Seniors participate in a textile research project designed to complement individual interests. This project may include theoretical, experimental, and/or literature work on a timely subject.

FRESHMAN YEAR

First Semester			Second Semester		
Basic Science	4	(3,3)	Basic Science	4	(3,3)
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
HIST 173 Western Civilization	3	(3,0)	MATH 102 Math. Analysis II	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)	TEXT 305 Basic Fibers	3	(3,0)
TEXT 122 Introduction to Textiles	2	(1,3)	Elective	3	
Elective	1				
	16			16	

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3	(3,0)	ACCT 202 Principles of Accounting	3	(3,0)
Literature Requirement°	3	(3,0)	ECON 200 Economic Concepts	3	(3,0)
MATH 203 Elem. Stat. Inference	3	(3,0)	PSYCH 201 General Psychology	3	(3,0)
SOC 201 Introductory Sociology	3	(3,0)	TEXT 324 Textile Statistics‡	3	(3,0)
TEXT 333 The Textile Arts	3	(2,3)	Elective†	3	
Elective	1				
	16			15	

JUNIOR YEAR

ECON 301 Economics of Labor	3	(3,0)	IM 307 Personnel Management	3	(3,0)
TEXT 301 Fiber Processing I	3	(2,3)	TEXT 302 Fiber Processing II	3	(2,3)
TEXT 311 Fabric Development I	3	(2,3)	TEXT 312 Fabric Development II	3	(2,3)
Elective†	6		Elective	6	
	15			15	

SENIOR YEAR

IM 402 Operations Planning and Control†	3	(3,0)	IM 312 Commercial Law	3	(3,0)
TEXT 314 Dyeing and Finishing	3	(3,0)	TEXT 414 Nonwoven and Knitted Structures	3	(3,0)
TEXT 403 Fiber Processing III	3	(2,3)	TEXT 428 Textile Research	3	
TEXT 411 Fabric Development III	3	(2,3)	TEXT 475 Textile Marketing	3	(3,0)
Elective†	5		Elective†	6	
	17			18	

128 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Class advisers have lists of approved electives and will suggest sequences of courses.
‡ Text 324 will satisfy the prerequisite for IM 402.

COLLEGE OF LIBERAL ARTS

The College of Liberal Arts, in addition to its six major curricula leading to the degree of Bachelor of Arts, makes indispensable contributions to the programs of all other divisions of the University, including nearly all the instruction in the humanities and the social sciences. Major concentrations may be elected in English, History, Modern Languages, Political Science, Psychology, and Sociology; minor concentrations are offered in these disciplines, in Music, in Philosophy, in Speech and Drama, and in Spanish-American Area Studies. In cooperation with other colleges of the University minor concentrations are also available in Biology, Chemistry, Economics, Fine Arts, Geology, Mathematics, and Physics. Supporting work is offered in music and in interdisciplinary humanistic studies.

The College of Liberal Arts offers programs leading to graduate degrees in English and History.

BACHELOR OF ARTS CURRICULUM

GENERAL INFORMATION

The curriculum leading to the degree of Bachelor of Arts is designed to meet the needs of students who desire a broad general education, with emphasis upon the humanities and the social sciences, as a preparation for intelligent citizenship, for general commercial and industrial life, for government service, and for teaching. This curriculum also provides excellent background for the study of law, journalism, or medicine.

As soon as feasible in his college career, and not later than the end of his sophomore year, the student seeking the Bachelor of Arts degree will select a major and a minor field of concentration from the following areas:

Major	Minor
English	Biology
History	Chemistry
Modern Languages	"Cluster Minor"
Political Science	Economics
Psychology	English
Sociology	Fine Arts
	Geology
	History
	Mathematics
	Modern Languages
	Music
	Philosophy
	Physics
	Political Science
	Psychology
	Sociology
	Spanish-American Area Studies
	Speech and Drama

To fulfill requirements for a major concentration, a student takes 24 semester hours credit from courses above the sophomore level, including certain courses specified by the major department; the minor concentration requires 15 credits from courses above the sophomore level, including certain specified courses.

The total number of semester credits required for the degree is 130; of these, at least 12 should be earned in humanities courses numbered 300 or higher, and at least 12 in social sciences courses numbered 300 or higher. The humanities are for this purpose considered to include art, English, languages, music, philosophy, and

religion as well as courses entitled humanities; the social sciences are here considered to include economics, geography, history, political science, psychology, and sociology.

Students in the Bachelor of Arts program who expect to teach in the public schools may elect education courses required for teaching certificates by the South Carolina State Department of Education, such courses to be approved by their own departmental advisers.

BACHELOR OF ARTS DEGREE

BASIC CURRICULUM

FRESHMAN YEAR

First Semester			Second Semester		
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)	HIST 172 or 173 West. Civilization	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)	MATH 102 Math. Analysis II	3	(3,0)
Modern Language	4	(3,1)	Modern Language	4	(3,1)
Natural Science†	3–4		Natural Science†	3–4	
	16–17			16–17	

SOPHOMORE YEAR

Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
Modern Language	3	(3,0)	Modern Language	3	(3,0)
Approved Elective	12		Approved Elective	10	
	18			16	

JUNIOR YEAR

Major and Minor Areas	9		Major and Minor Areas	12
Approved Elective	7–6		Approved Elective	3
	16–15			15

SENIOR YEAR

Major and Minor Areas	9		Major and Minor Areas	9
Approved Elective	9–8		Approved Elective	6
	18–17			15
			130 Total Semester Hours	

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Bot 101, 103 or Zool 101, 103, or a two-semester sequence of the same science (chemistry, geology, physical science, or physics).

MAJOR CURRICULA IN THE COLLEGE OF LIBERAL ARTS

ENGLISH

For a *major* concentration in English, the recommended program of study consists of the courses stipulated in the basic curriculum and 24 semester hours of English, arranged as follows:

Group I—Engl 402 or 404, 405, and either 422, 423, or 424

Group II—Nine semester credits according to one of the following plans:

   (A) Engl 461; 425 or 427 or 429 or 431 or 437; 416 or 438 or 439.
   (B) Engl 462; 409 or 443; 445 or 446.
   (C) Engl 461, 462, and one of these courses: 409, 410, 413, 416, 424, 425, 427, 429, 431, 437, 438, 439, 441, 443, 445, 446.

Group III—Six additional semester credits from courses numbered above 400.*

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required. English majors are expected to complete Hist 361, 363, and to complete the third year of a foreign language or the second year of two foreign languages. Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

HISTORY

The recommended program of study consists of the required courses in the Bachelor of Arts curriculum; 24 semester credits in the social sciences † or philosophy at the 100-200 level, including at least 12 credits from Hist 101, 102, 171, 172, 173; completion of the third year of a foreign language; Hist 499; and 21 additional semester credits in history, arranged as follows:

Group I—At least six credits from these courses: Hist 306, 307, 313, 314, 315, 410, 411, 412, 413, 414.

Group II—At least six credits from these courses: Hist 361, 363, 371, 385, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.

Group III—At least six credits from these courses: Hist 331, 332, 340, 341, 342, 431, 441.

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* English 332 may be included in this group by special arrangement with the Head of the Department of English.
† Economics, geography, history, political science, psychology, sociology.

History majors become eligible to take Hist 499 when they have completed 96 semester hours and at least 5 courses in history at the 300-400 level.

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

MODERN LANGUAGES

A student may elect a major concentration in a single language or a concentration split between two languages; however, the department recommends a minor concentration outside the Department of Languages.

1. The recommended program of study for a major in French, German, or Spanish consists of the courses stipulated in the basic Liberal Arts curriculum and 24 hours in the language arranged as follows: 303, 304, 305, and either 306, 307, or 308, plus 12 semester hours on the 400 level. In Spanish, 310, 311 may be substituted for 303, 304.

2. The recommended program for a split major in Modern Languages consists of the courses stipulated in the basic Liberal Arts curriculum, 18 semester hours in the primary language, and 12 semester hours in the secondary language, arranged as follows:

Primary Language. 303, 304, 305, and either 306, 307, or 308, plus 6 semester hours on the 400 level. In Spanish, 310, 311 may be substituted for 303, 304.

Secondary Language. 12 semester hours from courses numbered higher than 300.

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

POLITICAL SCIENCE

For a major concentration in Political Science, the recommended program of study consists of the required courses in the Bachelor of Arts curriculum; Ex St 301, Pol Sc 101 (formerly 202), 201; and 24 semester hours of political science drawn from at least four of these fields:

1. American Government—Pol Sc 302, 403, 405, 409
2. Comparative Governments—Pol Sc 371, 372, 473, 479
3. International Relations—Pol Sc 361, 462, 463, 464, 465, 469
4. Political Behavior—Pol Sc 341, 442, 443
5. Political Thought—Pol Sc 351, 352
6. Public Administration—Pol Sc 321, 422, 423, 426, 428
7. Public Law—Pol Sc 331, 432, 433, 434, 435

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

PSYCHOLOGY

The recommended program of study for a major concentration in Psychology consists of the required courses in the Bachelor of Arts curriculum, Math 203, Psych 201, 202, 363, and 21 additional credits drawn from the following courses: Psych 301, 302, 321, 331, 332, 341, 343, 351, 361, 363, 380, 401, 402, 403, 411, 422, 425, 442, 471, 475, 482, 490, 493, 495, 498, 499, Comp Sc 205, Zool 470, 475.

Additional approved electives are added as needed to meet the minimum of 130 semester hours required for graduation.

SOCIOLOGY

The recommended program of study for a major concentration in Sociology consists of the required courses in the Bachelor of Arts curriculum, Econ 201, 202, Ex St 301, Pol Sc 101, Soc 201, 206, 371, 411, 421, and 15 additional hours drawn from these courses: Pol Sc 341, RS 359, 401, Soc 202, 306, 311, 321, 322, 324, 331, 341, 351, 361, 381, 391, 393, 431, 441, 451, 481, 499.

MINOR CONCENTRATIONS

Students seeking the Bachelor of Arts degree may choose one of several minor concentrations available. The requirements for each area are detailed below.

Biology. A minor concentration in Biology requires 15 semester credits in the biological sciences numbered higher than 200.

Chemistry. A minor concentration in Chemistry requires Ch 101, 102, and 15 additional credits in chemistry, the courses to be selected in consultation with the Department of Chemistry.

"Cluster Minor." This minor concentration is designed to allow students a somewhat wider choice of course materials than is possible with the conventional subject-matter minor. The general requirement for the "Cluster Minor" is 15 semester credits in courses numbered higher than 300 (except where noted differently), chosen according to one of the plans listed below. Courses within the student's major area may not be included in the "Cluster Minor."

Group   I—Social Sciences *
            Economics
            History
            Political Science
            Psychology
            Sociology

Group   II—Philosophy and Religion

* At least two courses must be taken in each subject chosen.

Group III—Administration °
> Accounting
> Economics
> Industrial Management

Group IV—Life Sciences †
> Bacteriology
> Botany
> Genetics
> Zoology

Group V—Physical Sciences †
> Chemistry
> Geology
> Physics

Economics. A minor concentration in Economics requires Econ 201, 202, 314, 407, and 9 credits from these courses: Ag Ec 456, Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 421, 422, 424, Ex St 462, IM 404, 405, 406, Mgt Sc 311.

English. A minor concentration in English requires 15 semester credits in English above the sophomore level, arranged as follows:

Group I—Engl 405 and either 422, 423, or 424.

Group II—One of these courses: Engl 402, 404, 409, 410, 413, 416, 424, 425, 427, 429, 431, 437, 438, 439, 443, 445, 446, 461, 462.

Group III—Six additional credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The minor concentration in Fine Arts requires Hum 201, 202 or Arch 101, 102 and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no more than 9 in any discipline selected:

Art and Architectural History (all courses)

English 305, 308, 309, 310, 311, 331, 332, 333

Humanities 203

Music 151, 152, 205, 206, 210, 251, 252, 305, 306, 311, 315, 316, 362, 365, 421, 422, 423

Philosophy 305

Visual Studies (all courses)

° At least two courses must be taken in each subject chosen.
† No course in the 100 series is acceptable toward the cluster minor and not more than two courses in the 200 series. At least two courses must be taken in each subject chosen.

Geology. A minor concentration in Geology requires 15 semester credits from the following courses: Geol 101, 102, 306, 309, 402, 403, 404, 411, 412.

History. A minor concentration in History requires Hist 101, 102, and 15 additional credits in history including at least one course from each of these groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413, 414.

Group II—Hist 361, 363, 371, 385, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.

Group III—Hist 331, 332, 340, 341, 342, 431, 441.

Mathematics. A minor concentration in Mathematics requires Math 106, 108, 206, and 9 additional credits in mathematics, including at least two of these courses: Comp Sc 205, Math 208, 295, 301, and any 400-level course in mathematics or computer science.

Modern Languages. A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses numbered higher than 300, including at least one course on the 400 level.

Music. A minor concentration in Music requires Mus 151, 152, 205, 206, 2 credits in ensemble (Mus 361, 362, or 365), and 11 additional credits from these courses: Mus 210, 251, 252, 305, 306, 311, 315, 316, 421, 422, 423. Two additional ensemble credits may be included.

Philosophy. A minor concentration in Philosophy requires Phil 201, 302, and 15 semester credits from the following courses: Phil 211, 303, 304, 305, 309, 312, 318, 322, 344, 422, 425.

Physics. A minor concentration in Physics requires Phys 122 and 15 additional semester credits in physics, including Phys 221, 222.

Political Science. A minor concentration in Political Science requires Pol Sc 101 (formerly 202), 201, and 15 additional semester credits selected from at least three of the fields of political science listed above under the major curriculum for Political Science.

Psychology. A minor concentration in Psychology requires Psych 201, 202, and 15 semester credits from the following courses: Comp Sc 205, Psych 302, 303, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 475, 498.

Sociology. A minor concentration in Sociology requires Soc 201, 206, and 15 semester credits from the following courses: RS 359, 401, Soc 202, 306, 311, 321, 322, 324, 331, 341, 351, 361, 381, 391, 393, 411, 421, 431, 441, 451, 481, 499.

Spanish-American Area Studies. A minor concentration in Spanish-American Area Studies requires the equivalent of Span 202, plus 15 semester credits distributed as follows: 6 credits from Hist 340, 341, 342, 441, Pol Sc 473, 475; 6 credits from Span 305, 306, 308, 310, 311; 3 credits from Agric 301, 401, Econ 410, Geog 201, 302.

Speech and Drama. A minor concentration in Speech and Drama requires Engl 303 and 12 additional credits in speech and drama, including at least one course from each of these groups:

Group I—Engl 105, 232, 301, 302, 306, 307, 362, 363.

Group II—Engl 305, 308, 309, 310, 311.

APPROVED ELECTIVES FOR STUDENTS IN THE COLLEGE OF LIBERAL ARTS

Class advisers in the College of Liberal Arts will normally approve the following courses as electives, but the Dean of Liberal Arts retains the prerogative of limiting the total number of credits that may be approved in a discipline or area:

All courses offered in the College of Liberal Arts and the College of Physical, Mathematical and Biological Sciences except: Engl 011, 013, 111, Geol 406, Math 100, 115, 116, 215, 216, Phys 460, Psych 211.

Accounting (all courses)

Aerospace Studies and Military Science (combined maximum of 10 credits)

Agricultural Economics 352

Architecture 253

Art and Architectural History (limit of 12 credits)

Ceramic Arts 101, 102

Computer Science 205, 421

Economics (all courses)

Education (courses required for certification in South Carolina; other courses by special arrangement)

Engineering 220

Experimental Statistics 301, 462

Industrial Education 204, 440

Industrial Management 201, 299, 307, 312, 313, 322, 405

Management Science 311, 413, 414

Recreation and Park Administration 304

Rural Sociology 301

Textile Science 333

Visual Studies (limit of 9 credits)

COLLEGE OF NURSING

The College of Nursing offers two degrees in nursing, baccalaureate and associate, both of which are accredited by the National League for Nursing. These programs are designed to prepare men and women students for careers in nursing.

The program leading to the Bachelor of Science in Nursing degree is designed to prepare nurses for the practice of professional nursing in a variety of settings—hospitals, industry, clinics, and public health agencies. The program offers the foundation for graduate study in nursing, and an unlimited opportunity for men and women for sound career development in professional nursing. The baccalaureate program is four academic years and one six-week summer term in length. The student is enrolled in liberal arts and basic science courses during the first two years. These courses are arranged sequentially in order to provide the founda-

tion for professional courses which are planned for the junior and senior years. In addition, advanced liberal arts courses are taken during the junior and senior years. Clinical nursing experiences under the guidance of the College of Nursing faculty will take place with patients in the Greenville Hospital System and with local public health agencies.

The program leading to the Associate in Arts degree is designed to prepare the graduate at the technical level of nursing for direct patient-centered nursing under supervision in hospitals and other institutional health centers. The associate degree program may be completed in two academic years. Fifty percent of the total credit hours are in nursing courses, and the student is required to earn a grade of "C" or higher in each nursing course. This technical background is balanced by courses in the biological and social sciences and the humanities. Clinical learning experiences planned as an integral part of the program, under the guidance of the College of Nursing faculty, take place with patients in the Anderson Memorial Hospital.

Students enrolled in the College of Nursing must meet the course requirements as described for each program in order to qualify for the degree and for licensure to practice nursing.

BACHELOR OF SCIENCE IN NURSING CURRICULUM

FRESHMAN YEAR

First Semester

CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)
Nurs 100 Orientation	1	(1,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
	15	
Option: Modern Language	4	(3,1)

Second Semester

CH 102 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 102 Math. Analysis II	3	(3,0)
History Elective	3	(3,0)
	13	
Option: Modern Language	4	(3,1)

SOPHOMORE YEAR

BIOCH 210 Elem. Biochemistry	4	(3,3)
Literature Requirement°	3	(3,0)
MICRO 305 General Microbiology	4	(3,3)
PSYCH 201 General Psychology	3	(3,0)
ZOOL 220 Human Anatomy and Physiology I	4	(3,3)
	18	

MATH 203 Elem. Stat. Inference	3	(3,0)
NURS 207 Dynamics of Human Relations	3	(2,3)
PSYCH 211 Growth and Develop.	3	(3,0)
SOC 201 Introductory Sociology	3	(3,0)
ZOOL 221 Human Anatomy and Physiology II	4	(3,3)
	16	

FIRST SUMMER SESSION

NURS 208 Problem Solving in Nursing‡	3	(2,3)
SOC 202 Social Problems	3	(3,0)
	6	

JUNIOR YEAR

NURS 309 Human Values in Nurs. 3 (3,0)
NURS 311 Nursing During Altera-
  tions in Life Patterns 5 (2,9)
NURS 313 Promotion of Health.. 3 (2,3)
NUTR 451 Human Nutrition 3 (3,0)
Elective 3
                      —
                    17

NURS 310 Perspectives in
  Nursing Intervention 3 (3,0)
NURS 312 Nursing of Acute
  and Chronically Distressed 5 (2,9)
NURS 314 Nursing in the Home 3 (2,3)
SOC 311 The Family 3 (3,0)
Elective† 3
                      —
                    17

SENIOR YEAR

NURS 417 Intensive Nursing ... 4 (1,9)
NURS 419 Multiproblem Family . 3 (2,3)
NURS 421 Hist. and Phil. of Nurs. 3 (3,0)
NURS 422 Cur. Research in Nurs. 3 (3,0)
Elective 3
                      —
                    16

NURS 415 Nurs. as a Social Force 3 (3,0)
NURS 425 Independent Study
  in Nursing 7 (3,12)
PSYCH 302 Social Psychology... 3 (3,0)
Elective† 3
                      —
                    16

134 Total Semester Hours

  *To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
  † Electives from the following: humanities, literature, philosophy, music.
  ‡ The physical, biological, and social sciences, and mathematics courses scheduled for the freshman and sophomore years are prerequisite to Nurs 208.
  Note: Nurs 207 and 208 open to students enrolled in the baccalaureate degree program only. Grade-point ratio of 1.8 is required for registration in nursing courses 300 and above.

ASSOCIATE IN ARTS IN NURSING CURRICULUM

FIRST YEAR

First Semester

ENGL 101 English Composition.. 3 (3,0)
NURS 100 Orientation 1 (1,0)
NURS 101 Fund. of Nursing I... 6 (3,9)
ZOOL 110 Integrated Science I.. 4 (3,2)
Elective 3
                      —
                    17

Second Semester

ENGL 102 English Composition.. 3 (3,0)
NURS 102 Fund. of Nursing II.. 6 (3,9)
PSYCH 201 General Psychology.. 3 (3,0)
ZOOL 111 Integrated Science II.. 4 (3,2)
                      —
                    16

SECOND YEAR

NURS 200 Maternal and Child
  Health Nursing 5 (3,6)
NURS 201 Major Health Prob. I. 5 (3,6)
PSYCH 211 Growth and Develop. 3 (3,0)
SOC 201 Introductory Sociology.. 3 (3,0)
                      —
                    16

ENGL 301 Public Speaking 3 (3,0)
NURS 202 Major Health Prob. II 5 (3,6)
NURS 203 Major Health Prob. III 5 (3,6)
NURS 204 Nursing Seminar 1 (1,0)
Elective* 3
                      —
                    17

66 Total Semester Hours

  * Consult catalog or adviser for electives.
  Note: A minimum grade of C is required for Nurs 101-204 for continuance in the Associate in Arts program.

COLLEGE OF PHYSICAL, MATHEMATICAL
AND BIOLOGICAL SCIENCES

The College of Physical, Mathematical and Biological Sciences, attuned to the times and its needs, offers eight major curricula leading to the degree of Bachelor of Science. These are Botany, Chemistry, Geology, Mathematics, Medical Technology, Microbiology, Physics, and Zoology.

In addition, a curriculum in Arts and Sciences with a major emphasis in either Chemistry, Geology, Mathematics, or Physics can be pursued. The fulfillment of the requirements of this curriculum results in a Bachelor of Arts degree.

Not only are the departments in the College of Physical, Mathematical and Biological Sciences concerned with their own programs but they work closely with the other academic departments in the University. This interweaving of the physical, mathematical and

biological sciences with other disciplines, such as economics, engineering, management, and others allow a student greater flexibility and responsibility in designing his own program.

BACHELOR OF ARTS CURRICULA

The curriculum leading to the Bachelor of Arts degree is designed to meet the needs of those students who desire a broad general education. The first two years are spent in introductory work in various areas in order to give the student breadth of view. This type of background enables the student to take a more intelligent part in the selection of his major and minor fields of concentration. The major areas in the College of Physical, Mathematical and Biological Sciences are Chemistry, Geology, Mathematics, and Physics.

There are a great number of choices in the minor area from the different academic departments in the University. Thus, a student has a larger degree of flexibility and responsibility in designing his curriculum in the Bachelor of Arts program. The minor fields are:

Biology	Mathematics
Chemistry	Modern Languages
Economics	Philosophy
English	Physics
Fine Arts	Political Science
Geology	Psychology
History	Sociology

Furthermore, a "Cluster Minor" may be taken. The "Cluster Minor" concentration should consist of 15 semester credits in courses numbered higher than 300 (with some exceptions). The subject area of the major should be excluded from the grouping in the minor. The groups available in the "Cluster Minor" are:

Group   I—Social Sciences
Group   II—Philosophy and Religion
Group III—Fine Arts
Group IV—Administration
Group   V—Life Sciences

The major concentration requires 24 semester hours, and the minor 15 semester hours above the sophomore level unless otherwise indicated. These fit in the basic curriculum for the three upper-class years with minor variations depending on the specific major or minor selected. Consequently, a student not positive of his major or minor field has the advantage of making his decision while in the curriculum with a minimum loss of credit.

MAJOR FIELDS OF CONCENTRATION

CHEMISTRY

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4 (3,3)	CH 112 General Chemistry	4 (3,3)
ENGL 101 English Composition	3 (3,0)	ENGL 102 English Composition	3 (3,0)
MATH 106 Calculus of One Var.	4 (4,0)	MATH 108 Cal. and Lin. Algebra	4 (4,0)
Modern Language	4 (3,1)	Modern Language	4 (3,1)
	15		15

SOPHOMORE YEAR

CH 223 Organic Chemistry†	3 (3,0)	CH 224 Organic Chemistry†	3 (3,0)
CH 227 Organic Chemistry Lab.	1 (0,3)	CH 228 Organic Chemistry Lab.	1 (0,3)
Literature Requirement°	3 (3,0)	HIST 171 or 172 West. Civilization	3 (3,0)
MATH 206 Calculus of Sev. Var.	4 (4,0)	Literature Requirement°	3 (3,0)
Modern Language	3 (3,0)	Modern Language	3 (3,0)
PHYS 122 Mech. and Wave Phen.	3 (3,0)	PHYS 221 Thermal and Elec. Phen.	3 (3,0)
	17		16

JUNIOR YEAR

HIST 172 or 173 West. Civilization	3 (3,0)	Chemistry Elective	4
Chemistry Elective	4	Minor	6
Minor	3	Elective	6
Elective	7		16
	17		

SENIOR YEAR

Chemistry Elective	4	Chemistry Elective	4
Minor	3	Minor	3
Elective	10	Elective	10
	17		17

130 Total Semester Hours

°To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Ch 223, 224 will count toward the 24 hours of the Chemistry major.

GEOLOGY

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

FRESHMAN YEAR

First Semester		Second Semester	
CH 101 General Chemistry	4 (3,3)	CH 102 General Chemistry	4 (3,3)
ENGL 101 English Composition	3 (3,0)	ENGL 102 English Composition	3 (3,0)
MATH 106 Calculus of One Var.	4 (4,0)	MATH 108 Cal. and Lin. Algebra	4 (4,0)
Modern Language	4 (3,1)	Modern Language	4 (3,1)
	15		15

SOPHOMORE YEAR

GEOL 101 Physical Geology	4 (3,3)	GEOL 102 Historical Geology	4 (3,3)
Literature Requirement°	3 (3,0)	HIST 171 or 172 West. Civilization	3 (3,0)
MATH 206 Calculus of Sev. Var.	4 (4,0)	Literature Requirement°	3 (3,0)
Modern Language	3 (3,0)	Modern Language	3 (3,0)
Elective	3	Elective	4
	17		17

JUNIOR YEAR

GEOL 306 Mineralogy 3 (2,3)	GEOL 309 Petrology 3 (2,3)
HIST 172 or 173 West. Civilization 3 (3,0)	Geology Elective 3
Geology Elective 3	Humanities Elective 3
Humanities Elective 3	Minor 3
Minor 3	Elective 4
Elective 3	
18	16

SENIOR YEAR

GEOL 402 Structural Geology ... 3 (2,2)	GEOL 404 Economic Geology ... 3 (3,0)
Geology Elective 3	Geology Elective 3
Minor 6	Minor 3
Social Science Elective 3	Social Science Elective 3
15	Elective 3
	15

128 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

MATHEMATICS

For a major concentration a recommended program of study is shown below, with 130 semester hours required for graduation.

FRESHMAN YEAR

First Semester	Second Semester
ENGL 101 English Composition.. 3 (3,0)	COMP SC 205 Elem. Comp. Prog. 3 (3,0)
HIST 171 or 172 West. Civilization 3 (3,0)	ENGL 102 English Composition.. 3 (3,0)
MATH 106 Calculus of One Var. 4 (4,0)	MATH 108 Cal. and Lin. Algebra 4 (4,0)
Modern Language 4 (3,1)	Modern Language 4 (3,1)
Elective 3	Elective 3
17	17

SOPHOMORE YEAR

Literature Requirement° 3 (3,0)	HIST 172 or 173 West. Civilization 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)	Literature Requirement° 3 (3,0)
MATH 301 Statistical Theory and	MATH 208 Engineering Math. I . 4 (5,0)
Methods I 3 (3,0)	MATH 295 Found. of Analysis† . 3 (3,0)
Modern Language 3 (3,0)	Elective§ 3
Elective§ 3	16
16	

JUNIOR YEAR

ECON 201 Principles of Economics 3 (3,0)	MUS 210 Music Appreciation.... 3 (3,0)
MATH 411 Linear Algebra...... 3 (3,0)	or AAH 303 Evol. of Visual Arts 3 (3,0)
Minor 3	Mathematics Elective 3
Natural Science 4	Minor 3
Social Sciences 3	Natural Science 4
16	Social Sciences 3
	16

SENIOR YEAR

MATH 412 Intro. to Mod. Algebra 3 (3,0)	MATH 454 Adv. Calculus II.... 3 (3,0)
or MATH 419 App. Comb. Alg. I 3 (3,0)	or MATH 464 Math. Analysis II 3 (3,0)
MATH 453 Adv. Calculus I 3 (3,0)	Humanities 3
or MATH 463 Math. Analysis I 3 (3,0)	Mathematics Elective 3
Minor 6	Minor 3
Elective 4	Elective§ 4
16	16

130 Total Semester Hours

°To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Math 295 will count toward the 24 hours of the Mathematics major.
§ Electives must be approved by adviser.

PHYSICS

For a major concentration a recommended program of study is shown below, with 128 semester hours required for graduation.

FRESHMAN YEAR

First Semester

CH 101 General Chemistry 4 (3,3)
ENGL 101 English Composition.. 3 (3,0)
HIST 171 or 172 West. Civilization 3 (3,0)
MATH 106 Calculus of One Var. 4 (4,0)
PHYS 101 Current Topics in
  Modern Physics 1 (0,2)
Elective 1
            16

Second Semester

CH 112 General Chemistry 4 (3,3)
ENGL 102 English Composition.. 3 (3,0)
HIST 172 or 173 West. Civilization 3 (3,0)
MATH 108 Cal. and Lin. Algebra 4 (4,0)
PHYS 132 General Physics I 3 (3,0)
Elective 1
            18

SOPHOMORE YEAR

Literature Requirement° 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)
Modern Language 4 (3,1)
PHYS 223 Electron Physics Lab.. 1 (0,3)
PHYS 231 General Physics II ... 3 (3,0)
Elective 1
            16

Literature Requirement° 3 (3,0)
MATH 208 Engineering Math. I . 4 (5,0)
Modern Language 4 (3,1)
PHYS 224 Modern Physics Lab. . 1 (0,3)
PHYS 232 General Physics III... 3 (3,0)
Elective 1
            16

JUNIOR YEAR

PHYS 321 Mechanics I 3 (3,0)
Humanities 3
Minor 3
Modern Language 3 (3,0)
Elective 3
            15

PHYS 322 Mechanics II 3 (3,0)
PHYS 340 Elec. and Magnetism I 3 (3,0)
Humanities 3
Minor 3
Modern Language 3 (3,0)
            15

SENIOR YEAR

PHYS 455 Quantum Physics I .. 3 (3,0)
Minor 6
Physics Elective 4
Social Science Elective 3 (3,0)
            16

Minor 3
Physics Elective 4
Social Science Elective 3 (3,0)
Elective 6
            16

128 Total Semester Hours

°To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
Note: For a major or minor concentration in Physics, Phys 221 and 222 will count.

MINOR CONCENTRATIONS

Biology. The recommended programs of study consists of 15 semester hours from the field of biological sciences in addition to Biol 100, Bot 101, 103, Zool 101, 103.

Economics. The recommended program of study consists of Econ 201, 202, and 15 semester hours selected from the following (including 314 and 407): Ag Ec 456, Econ 301, 302, 305, 306, 308, 309, 314, 403, 404, 407, 410, 412, 416, 420, 421, 422, 424, Ex St 462, IM 404, 405, 406, Mgt Sc 311.

English. The recommended program of study includes the required courses for the Bachelor of Arts curriculum and 15 semester hours of English, arranged as follows:

Group I—Six semester credits from these courses: Engl 405 and either 422 or 423.

Group II—Three semester credits from these courses: Engl 402, 404, 425, 427, 429, 431, 437, 443, 445, 446, 461, 462.

Group III—Six additional semester credits from English courses numbered higher than 400.

Engl 304, Advanced Composition, or departmental certification of proficiency in composition is required.

Fine Arts. The minor concentration in Fine Arts consists of Hum 201, 202 or Arch 101, 102, and 15 semester credits from the following courses, of which at least 9 must be earned in courses numbered 300 or higher, and no more than 9 in any discipline selected:

Art and Architectural History 315, 316

English 305, 308, 310, 311, 331, 332, 333

Humanities 203

Music 151, 152, 205, 206, 210, 251, 252, 305, 306, 311, 315, 316, 362, 365, 421, 422, 423

Philosophy 305

Visual Studies (all courses)

History. The recommended program of study consists of 15 semester hours with a minimum of three hours from each of the following groups:

Group I—Hist 306, 307, 313, 314, 315, 410, 411, 412, 413.

Group II—Hist 361, 363, 371, 386, 473, 475, 476, 477, 479, 480, 481, 482, 483, 484.

Group III—Hist 331, 332, 340, 341, 342.

Modern Languages. A minor concentration in Modern Languages requires 15 semester credits in one modern language from courses numbered higher than 300, including at least one course on the 400 level.

Philosophy. The recommended program of study consists of 15 semester hours of course work beyond Phil 201, 302—drawn from Phil 211,.303, 304, 305, 309, 312, 318, 322, 344, 422, 425.

Political Science. The recommended program of study consists of 15 semester hours beyond Pol Sc 101 and 201 in courses drawn from at least three of the following fields:

1. American Government—Pol Sc 302, 403, 409
2. Comparative Governments—Pol Sc 371, 372, 473
3. International Relations—Pol Sc 361, 462, 463, 464, 469, 473

4. Political Behavior—Pol Sc 341, 433, 442
5. Political Thought—Pol Sc 351, 352
6. Public Administration—Pol Sc 321
7. Public Law—Pol Sc 331, 432, 433

Psychology. The recommended program of study consists of required courses Psych 201, 202 and 15 semester hours to be selected from Psych 302, 303, 321, 331, 341, 351, 361, 363, 401, 402, 403, 422, 442, 471, 498, Comp Sc 205.

Sociology. A minor consists of 15 semester hours beyond Soc 201, 202 to be selected from Pol Sc 341, Soc 311, 321, 322, 324, 331, 341, 351, 361, 371, 381, 391, 411, 421, 431, 451, 481, 499, RS 359.

"Cluster Minor"

Group   I—Social Sciences

No fewer than two courses in each subject chosen:
Economics
History
Political Science
Psychology
Sociology

Group   II—Philosophy and Religion

Group   III—Fine Arts

Of these courses, 9 semester credits must be taken in courses numbered 300 or higher:
AAH 315, 316
Engl 305, 308, 310, 311, 331, 332, 333
Mus 151, 152, 205, 206, 210, 251, 252, 305, 306, 311, 315, 316, 362, 365, 421, 422, 423
Phil 305
Vis 203, 205, 207, 209, 211, 213, 215, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416

Group   IV—Administration

No fewer than two courses in each subject chosen:
Accounting
Economics
Industrial Management

Group   V—Life Sciences

No course in the 100 series is applicable and not more than two courses in the 200 series. No fewer than two courses in each subject chosen:

> Bacteriology
> Botany
> Genetics
> Zoology

Group VI—Physical Sciences

> No course in the 100 series is applicable and not more than two courses in each subject chosen:
> Astronomy
> Chemistry
> Geology
> Mathematics
> Physics

BACHELOR OF SCIENCE CURRICULA

BOTANY

Botany is that portion of biology dealing with plants, their structure, classification, growth, and development. The Botany major is designed to prepare students for employment as biologists in sales, service, or research in industry or government service. It also provides the background in the fundamental physical and biological sciences necessary for graduate study in the basic and many of the applied plant sciences. Adequate electives are provided so that a student may take additional courses in the area or areas of his special interest.

FRESHMAN YEAR

First Semester			Second Semester		
BIOL 100 Intro. to the Biological Sciences	1	(1,0)	CH 102 General Chemistry	4	(3,3)
BOT 101 Plant Biology	3	(3,0)	ENGL 102 English Composition	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)	MATH 106 Calculus of One Var.	4	(4,0)
CH 101 General Chemistry	4	(3,3)	ZOOL 101 Animal Biology	3	(3,0)
ENGL 101 English Composition	3	(3,0)	ZOOL 103 Animal Biology Lab.	1	(0,2)
MATH 103 College Algebra	2	(3,0)	Elective	1	
MATH 104 Trigonometry	2	(3,0)		16	
Elective	1				
	17				

SOPHOMORE YEAR

ECON 201 Principles of Economics	3	(3,0)	BOT 202 Survey of Plant Kingdom	4	(3,3)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)	PHYS 208 General Physics	4	(3,2)
ZOOL 201 Invertebrate Zoology	4	(3,3)	Social Science Electives	3	(3,0)
or Zool 202 Vertebrate Zoology	4	(3,3)	Approved Electives	4	
Elective	2			18	
	16				

JUNIOR YEAR

BOT 331 Intro. Plant Taxonomy	3	(2,3)	BOT 352 Plant Physiology	4	(3,3)
MICRO 305 General Microbiology	4	(3,3)	ENGL 301 Public Speaking	3	(3,0)
Chemistry Elective	4		Chemistry Elective	4	
Approved Elective	6		Approved Elective	6	
	17			17	

SENIOR YEAR

BOT 406 Plant Anatomy	3	(2,3)	Bot 459 Plant Ecology	3	(2,3)
GEN 302 Genetics	4	(3,3)	Social Science Elective	3	(3,0)
Social Science Elective	3	(3,0)	Approved Elective	10	
Approved Elective	7			16	
	17				

134 Total Semester Hours

*To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

CHEMISTRY

Chemistry, an experimental discipline based on observation guided by molecular theory, is of fundamental importance in much of modern science and technology. Its molecular concepts form the basis for ideas about complex material behavior. Due to the fundamental nature and extensive application of chemistry, an unusually large variety of challenging opportunities to contribute in the science-oriented community are open to the student whose education is built around the principles of this discipline.

The curriculum in chemistry provides, through its advanced chemistry courses and large number of elective hours, a program that may be suited to a student's specific needs, whether he be interested in graduate work; industrial chemistry, sales or supervision; or related professional fields including medicine. Significant features of the program are the student's extensive participation in experimental laboratory work and his association with teachers who also pursue research activities. The undergraduate and graduate studies are closely connected, and an undergraduate may elect to take part in a research investigation during his junior and senior years.

FRESHMAN YEAR

First Semester			Second Semester		
CH 101 General Chemistry	4	(3,3)	CH 112 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
HIST 172 or 173 West. Civilization	3	(3,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
MATH 106 Calculus of One Var.	4	(4,0)	PHYS 122 Mech. and Wave Phen.	3	(3,0)
Elective	3		Elective	3	
	17			17	

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	(3,0)	CH 224 Organic Chemistry	3	(3,0)
CH 225 Organic Chemistry Lab.	2	(0,6)	CH 226 Organic Chemistry Lab.	2	(0,6)
Literature Requirement*	3	(3,0)	Literature Requirement*	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	MATH 208 Engineering Math. I	4	(5,0)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)	PHYS 222 Optics and Mod. Phys.	3	(3,0)
PHYS 223 Electron Physics Lab.	1	(0,3)	PHYS 224 Modern Physics Lab.	1	(0,3)
	16			16	

JUNIOR YEAR

CH 313 Quantitative Analysis .. 3 (3,0)	CH 332 Physical Chemistry 3 (3,0)
CH 315 Quantitative Anal. Lab.. 2 (0,6)	CH 340 Physical Chemistry Lab.. 1 (0,3)
CH 331 Physical Chemistry 3 (3,0)	CH 411 Instrumental Analysis ... 4 (2,6)
CH 339 Physical Chemistry Lab.. 1 (0,3)	CH 442 Chemical Literature 1 (1,0)
GER 101 Elementary German ... 4 (3,1)	GER 102 Elementary German ... 4 (3,1)
Elective 4	Elective† 4
17	17

SENIOR YEAR

CH 402 Inorganic Chemistry. ... 3 (3,0)	CH 435 Atomic and Molec. Struc. 3 (3,0)
CH 421 Adv. Organic Chemistry . 3 (3,0)	CH 436 Physical Chemistry Lab.. 1 (0,3)
Elective† 9	Elective† 11
15	15

130 Total Semester Hours

°To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Electives: For the B.S. in Chemistry degree a student must elect at least 18 hours in economics, English, history, languages, political science, psychology, sociology, etc. At least one advanced lecture course (400 level) in chemistry and one advanced laboratory must be elected.

GEOLOGY

Geology is a relatively young science. The word itself is only about 200 years old. It means the science of the earth. Such a science must be involved with the physics and chemistry of materials which comprise the earth, but equally important it must consider the development of life on earth. Fundamentally, then, the chemical, physical and biological responses to various environments on and in the earth must be thoroughly understood so that the historical development of the earth may be deduced, predictions of the future inferred, and natural resources intelligently developed.

Industry in our modern civilization is dependent on minerals and rocks. Metals have their origin in them as do our chief power sources, coal, petroleum, and radioactive minerals. The power and wealth of nations depend largely on their exploration, control and development of mineral wealth.

Geologists today are entering upon a new era. Widening horizons are indicated by employment not only in mineral-producing industries but by railroads, municipalities, engineering firms, and water authorities. For this reason, it is important that the geologist's education rest on a broad yet rigorous base.

This curriculum provides the student with the fundamentals in the geological sciences and excellent support in the other basic sciences. On successful completion of the Bachelor of Science program the student should be adequately prepared for employment or for graduate study in any field of geology.

FRESHMAN YEAR

First Semester

CH 101 General Chemistry 4 (3,3)
ENGL 101 English Composition.. 3 (3,0)
MATH 106 Calculus of One Var. 4 (4,0)
Modern Language§ 4 (3,1)
15

Second Semester

CH 112 General Chemistry 4 (3,3)
ENGL 102 English Composition.. 3 (3,0)
MATH 108 Cal. and Lin. Algebra 4 (4,0)
Modern Language§ 4 (3,1)
15

SOPHOMORE YEAR

GEOL 101 Physical Geology 4 (3,3)
HIST 171 or 172 West. Civilization 3 (3,0)
Literature Requirement° 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)
Modern Language 3 (3,0)
17

GEOL 102 Historical Geology ... 4 (3,3)
HIST 172 or 173 West. Civilization 3 (3,0)
Literature Requirement° 3 (3,0)
Modern Language 3 (3,0)
PHYS 122 Mech. and Wave Phen. 3 (3,0)
16

JUNIOR YEAR

BOT 101 Plant Biology 3 (3,0)
BOT 103 Plant Biology Lab. ... 1 (0,2)
GEOL 306 Mineralogy 3 (2,3)
PHYS 221 Thermal and Elec. Phen. 3 (3,0)
PHYS 223 Electron Physics Lab... 1 (0,3)
Elective† 4
15

EX ST 301 Introductory Statistics 3 (2,2)
GEOL 309 Petrology 3 (2,3)
GEOL 313 Stratigraphy and Sed. 3 (3,0)
PHYS 222 Optics and Mod. Phys. 3 (3,0)
PHYS 224 Modern Physics Lab... 1 (0,3)
ZOOL 101 Animal Biology 3 (3,0)
ZOOL 103 Animal Biology Lab. . 1 (0,2)
17

Summer Geology Field Camp‡ 6

SENIOR YEAR

GEOL 402 Structural Geology .. 3 (2,2)
GEOL 403 Invert. Paleontology.. 3 (2,3)
Elective† 11
17

GEOL 310 Optical Mineralogy .. 3 (1,4)
GEOL 404 Economic Geology .. 3 (3,0)
Elective 10
16

134 Total Semester Hours

°To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† At least 12 hours must be elected from the humanities and/or social sciences.
‡ Clemson University does not conduct a field camp in geology, but attendance at a camp approved by the geology staff is required.
§ German or French is recommended. Two years in the same language is required.

MATHEMATICAL SCIENCES

The Mathematics curriculum is designed to give basic training to those students whose ultimate goal is the creation of mathematical concepts and methods that are of basic and general applicability to the desired subject whether it be physics, computer science, communication theory, data processing, statistics, operations research, economics, or any branch of the physical sciences in which a strong mathematical background is a prerequisite. In addition to containing basic mathematics courses which are needed to prepare the student for the present day mathematical world, the curriculum allows the student in his junior year to select one of eight optional sets of courses which will provide an introduction to an area where mathematics is applied. These options are Biology, Chemistry, Communications, Computer Science, Managerial Science, Operations Research, Physics, and Statistics.

This curriculum provides an adequate background for the student who plans to pursue graduate study in mathematics and at the

same time adequately prepares the student to fill many interesting positions in space research, computer development, business, or government research. Those electing the Biology option will have the necessary preparation for entering medical school.

MATHEMATICS CURRICULUM

FRESHMAN YEAR

First Semester			Second Semester		
CH 101 General Chemistry	4	(3,3)	CH 102 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)	COMP SC 205 Elem. Comp. Prog.	3	(3,0)
HIST 172 or 173 West. Civilization	3	(3,0)	ENGL 102 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
Elective	3		Elective	3	
	17			17	

SOPHOMORE YEAR

Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	MATH 208 Engineering Math. I	4	(5,0)
MATH 301 Statistical Theory and Methods I	3	(3,0)	MATH 295 Foundation of Analysis	3	(3,0)
PHYS 122 Mech. and Wave Phen.	3	(3,0)	Elective‡	7	
Elective‡	3				
	16			17	

JUNIOR YEAR

FR 101 Elementary French¶	4	(3,1)	ECON 200 Economic Concepts	3	(3,0)
or GER 101 Elem. German¶	4	(3,1)	FR 102 Elementary French¶	4	(3,1)
MATH 411 Linear Algebra	3	(3,0)	or GER 102 Elem. German¶	4	(3,1)
MATH 453 Advanced Calculus I.	3	(3,0)	MATH 402 Theory of Probability	3	(3,0)
or MATH 463 Math. Analysis I	3	(3,0)	MATH 454 Advanced Calculus II	3	(3,0)
Option	3		or MATH 464 Math. Analysis II	3	(3,0)
Elective	4		Option	3	
	17			16	

SENIOR YEAR

ENGL 301 Public Speaking	3	(3,0)	Mathematics Elective†	3	
MATH 412 Intro. to Mod. Algebra	3	(3,0)	Option	3	
or MATH 419 App. Comb. Alg. I	3	(3,0)	Elective‡	9	
Mathematics Elective†	3	(3,0)		15	
Option	3				
Elective‡	3				
	15				

130 Total Semester Hours

OPTIONS

A. Chemistry			B. Communications		
CH 331 Physical Chemistry	3	(3,0)	E&CE 320 Electronics I	2	(2,0)
CH 332 Physical Chemistry	3	(3,0)	E&CE 321 Electronics II	2	(2,0)
CH 339 Physical Chemistry Lab..	1	(0,3)	E&CE 325 Elec. and Electro. Lab.	1	(0,2)
CH 340 Physical Chemistry Lab..	1	(0,3)	E&CE 326 Elec. and Electro. Lab.	1	(0,2)
CH 402 Inorganic Chemistry	3	(3,0)	E&CE 330 Systems I	3	(3,0)
CH 435 Atomic and Mol. Struc	3	(3,0)	E&CE 331 Elec. Cir. Workshop I	3	(2,2)
CH 436 Physical Chemistry Lab..	1	(0,3)	E&CE 332 Systems II	2	(2,0)
	15		E&CE 333 Elec. Cir. Workshop II	3	(2,2)
				17	

C. Computer Science
COMP SC 409 Introduction to
   Numerical Analysis I 3 (3,0)
COMP SC 410 Introduction to
   Numerical Analysis II 3 (3,0)
COMP SC 421 Introduction to
   Assembler Language Prog. 3 (3,0)
COMP SC 422 Adv. Assembler
   Language Programming 3 (3,0)
   or COMP SC 428 Algorithmic
   Languages and Compilers ... 3 (3,0)
MATH 452 Linear Programming.. 3 (3,0)
                     —
                    15

D. Managerial Science°°
IM 402 Oper. Plan. and Control . 3 (3,0)
IM 404 Managerial Economics .. 3 (3,0)
   or IM 418 Mgt. Inform. Sys... 3 (3,0)
MATH 452 Linear Programming . 3 (3,0)
MATH 473 Intro. to Nonlin. Opt. 3 (3,0)
                    —
                    12

E. Operations Research
COMP SC 409 Introduction to
   Numerical Analysis I 3 (3,0)
   or MATH 429 Num. Analysis.. 3 (3,0)
IM 402 Oper. Plan. and Control.. 3 (3,0)
MATH 404 Intro. to Stoch. Proc. 3 (3,0)
MATH 452 Linear Programming . 3 (3,0)
MATH 473 Intro. to Nonlin. Opt. 3 (3,0)
                    —
                    15

F. Physics§
PHYS 321 Mechanics I 3 (3,0)
PHYS 322 Mechanics II 3 (3,0)
   or ASTR 404 Astrodynamics .. 3 (3,0)
   or PHYS 441 Elec. and Mag. II 3 (3,0)
PHYS 340 Elec. and Magnetism I 3 (3,0)
                    —
                    9

G. Statistics
MATH 404 Intro. to Stoch. Proc. 3 (3,0)
MATH 405 Statistical Theory and
   Methods II 3 (3,0)
MATH 409 Statistical Theory and
   Methods III 3 (3,0)
MATH 471 Applied Statistical
   Decision Theory 3 (3,0)
                    —
                    12

  ° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
  °° Should take elective sequence: Mgt Sc 311, Econ 314.
  † To be selected from Math 403, 404, or 405.
  ‡ Electives must be approved by adviser. Included in these electives should be one of
the following sequences: Phys 221, 223 or 222, 224; Bot 101, 103 and Zool 101, 103;
Econ 314, Mgt Sc 311.
  § Should take elective sequence: Phys 221, 222, 223, 224.
  ¶ Those qualifying for advanced placement should take languages during freshman year.

MATHEMATICS CURRICULUM WITH BIOLOGY OPTION

FRESHMAN YEAR

First Semester			Second Semester		
BOT 101 Plant Biology	3	(3,0)	COMP SC 205 Elem. Comp. Prog.	3	(3,0)
BOT 103 Plant Biology Lab.....	1	(0,2)	ENGL 102 English Composition..	3	(3,0)
ENGL 101 English Composition..	3	(3,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
MATH 106 Calculus of One Var.	4	(4,0)	ZOOL 101 Animal Biology	3	(3,0)
PHYS 207 General Physics	4	(3,2)	ZOOL 103 Animal Biology Lab..	1	(0,2)
Elective	2		Elective	3	
	17			17	

SOPHOMORE YEAR

CH 101 General Chemistry	4	(3,3)	CH 102 General Chemistry	4	(3,3)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	MATH 208 Engineering Math. I .	4	(5,0)
MATH 301 Statistical Theory and			MATH 295 Foundation of Anal. .	3	(3,0)
Methods I	3	(3,0)	PHYS 208 General Physics	4	(3,2)
Elective	3			18	
	17				

JUNIOR YEAR

CH 223 Organic Chemistry	3	(3,0)	CH 224 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab..	1	(0,3)	CH 228 Organic Chemistry Lab..	1	(0,3)
FR 101 Elementary French§	4	(3,1)	FR 102 Elementary French§	4	(3,1)
or GER 101 Elem. German§ ..	4	(3,1)	or GER 102 Elem. German§ ..	4	(3,1)
MATH 411 Linear Algebra	3	(3,0)	MATH 402 Theory of Probability	3	(3,0)
MATH 453 Advanced Calculus I.	3	(3,0)	MATH 454 Advanced Calculus II	3	(3,0)
or MATH 463 Math. Analysis I.	3	(3,0)	or MATH 464 Math. Analysis II	3	(3,0)
Elective‡	1		Elective‡	1	
	15			15	

SENIOR YEAR

HIST 172 or 173 West. Civilization 3 (3,0)
MATH 412 Intro. to Mod. Algebra 3 (3,0)
  or MATH 419 App. Comb. Alg. I 3 (3,0)
ZOOL 301 Comp. Vert. Anatomy 3 (2,3)
  or BOT 202 Surv. of Plant King. 4 (3,3)
Mathematics Elective† 3 (3,0)
Elective‡ 3–2
                       ──
                       15

ECON 200 Economic Concepts .. 3 (3,0)
ENGL 301 Public Speaking 3 (3,0)
ZOOL 302 Vertebrate Embryology 3 (2,3)
  or BOT 459 Plant Ecology 3 (2,3)
Mathematics Elective† 3 (3,0)
Elective 4
                       ──
                       16

130 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† To be selected from Math 403, 404, or 405.
‡ Electives must be approved by adviser.
§ Those qualifying for advanced placement should take languages during freshman year.

MATHEMATICS CURRICULUM WITH PSYCHOLOGY OPTION

FRESHMAN YEAR

First Semester

CH 101 General Chemistry 4 (3,3)
ENGL 101 English Composition.. 3 (3,0)
HIST 172 or 173 West. Civilization 3 (3,0)
MATH 106 Calculus of One Var.. 4 (4,0)
Elective† 3
                   ──
                   17

Second Semester

CH 102 General Chemistry 4 (3,3)
COMP SC 205 Elem. Comp. Prog. 3 (3,0)
ENGL 102 English Composition.. 3 (3,0)
MATH 108 Cal. and Lin. Algebra 4 (4,0)
Elective† 2
                   ──
                   16

SOPHOMORE YEAR

ECON 200 Economic Concepts .. 3 (3,0)
Literature Requirement° 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)
MATH 301 Statistical Theory and
  Methods I 3 (3,0)
PHYS 122 Mech. and Wave Phen. 3 (3,0)
                   ──
                   16

BOT 101 Plant Biology 3 (3,0)
BOT 103 Plant Biology Lab. ... 1 (0,2)
Literature Requirement° 3 (3,0)
MATH 208 Engineering Math. I . 4 (5,0)
MATH 295 Found. of Analysis.. 3 (3,0)
PSYCH 201 General Psychology.. 3 (3,0)
                   ──
                   17

JUNIOR YEAR

FR 101 Elementary French 4 (3,1)
  or GER 101 Elem. German ... 4 (3,1)
MATH 411 Linear Algebra 3 (3,0)
MATH 453 Advanced Calculus I. 3 (3,0)
  or MATH 463 Math. Analysis I 3 (3,0)
PSYCH 202 Intro. Exper. Psych... 3 (3,0)
ZOOL 101 Animal Biology 3 (3,0)
ZOOL 103 Animal Biology Lab. .. 1 (0,2)
                   ──
                   17

FR 102 Elementary French 4 (3,1)
  or GER 102 Elem. German.... 4 (3,1)
MATH 402 Theory of Probability. 3 (3,0)
MATH 454 Advanced Calculus II 3 (3,0)
  or MATH 464 Math. Analysis II 3 (3,0)
PSYCH 363 Adv. Exper. Psych. .. 4 (3,3)
Elective† 2
                   ──
                   16

SENIOR YEAR

ENGL 301 Public Speaking 3 (3,0)
MATH 412 Intro. to Mod. Algebra 3 (3,0)
  or MATH 419 App. Comb. Alg. I 3 (3,0)
PSYCH 401 Applied Psychology.. 3 (3,0)
Mathematics Elective‡ 3
Elective† 3
                   ──
                   15

PSYCH 471 Psychometrics 3 (3,0)
Mathematics Elective‡ 3
Elective 10
                   ──
                   16

130 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Electives must be approved by adviser.
‡ To be selected from the following: Math 403, 404, 405.

MEDICAL TECHNOLOGY

Medical technologists are qualified to perform a wide variety of chemical, microscopical, and bacteriological tests to aid physicians in the detection, diagnosis, and treatment of disease. Some medical technologists are responsible to a medical doctor, generally a pathologist, while others work under the supervision of a medical scientist who specializes in a particular branch of clinical science. The largest group of medical technologists work in hospital laboratories.

In cooperation with the Anderson Memorial Hospital, the Greenville General Hospital, and Self Memorial Hospital in Greenwood, Clemson offers a four-year curriculum leading to the Bachelor of Science in Medical Technology. The student spends the first three years of this program in classwork at Clemson and the fourth year at one of the participating hospitals, according to the student's choice and previous agreement with the hospital. While in residence in Anderson, Greenville, or Greenwood, the student will take specified courses under instructors on the hospital staff. During the fourth year of work, both room and board are furnished by the hospital.

Upon satisfactory completion of the prescribed courses, the student will be awarded the Bachelor of Science degree in Medical Technology.

FRESHMAN YEAR

First Semester			Second Semester		
CH 101 General Chemistry	4	(3,3)	CH 112 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)	MATH 102 Math. Analysis II	3	(3,0)
MED TECH 101 Introduction to Medical Technology	1	(1,0)	Modern Language	4	(3,1)
Modern Language	4	(3,1)	ZOOL 101 Animal Biology	3	(3,0)
Elective	1		ZOOL 103 Animal Biology Lab.	1	(0,2)
			Elective	1	
	16			19	

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	(3,0)	CH 224 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab.	1	(0,3)	CH 228 Organic Chemistry Lab.	1	(0,3)
ECON 201 Principles of Economics	3	(3,0)	ECON 202 Principles of Economics	3	(3,0)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)	PHYS 208 General Physics	4	(3,2)
Elective	3		Elective	2	
	17			16	

JUNIOR YEAR

CH 313 Quantitative Analysis	3	(3,0)	GEN 302 Genetics	4	(3,3)
CH 317 Quantitative Anal. Lab.	1	(0,3)	HIST 172 or 173 West. Civilization	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)	MICRO 305 General Microbiology	4	(3,3)
Elective†	8		PSYCH 201 General Psychology	3	(3,0)
			Elective	3	
	15			17	

SENIOR YEAR
(52 Weeks)

	Credit Hours	Lecture Hours	Seminar Hours	Clinical Practice Hours
MED TECH 401 Serology and Immunology	4	21	10	49
MED TECH 402 Microbiology	7	59	6	470
MED TECH 403 Hematology	5	12	32	276
MED TECH 404 Blood Bank	3	8	20	132
MED TECH 405 Cytology	1	2	12	26
MED TECH 406 Histology	3	20	30	190
MED TECH 407 Urinalysis	2	10	8	102
MED TECH 408 Chemistry	10	40	50	470
MED TECH 409 Radioisotopes	1	2	0	7
	36			

136 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† Nine hours of electives to be selected from the following: Bioch 210, Ch 310, Ed 302, H Adm 308, IM 307, Micro 411, 412, Zool 405, 458. (Sixteen hours of approved courses in the biological sciences are required.)

MICROBIOLOGY

Microbiology is the science which deals with the study of microscopic and submicroscopic forms of life, with emphasis on the bacteria and viruses. It also includes the study of yeasts, fungi, protozoa and unicellular algae. Microorganisms are of great importance to man for good or for ill. The microbiologist seeks to describe these minute life forms in terms of their structures, functions and processes of reproduction, growth and death, at both the cellular and molecular levels. He is also concerned with their interactions with the inanimate environment, with other living creatures, including the human, and their economic importance.

The Microbiology major provides a thorough training in the basic microbiological skills. Furthermore, the student receives instruction in the areas of mathematics, physics, chemistry, and biochemistry, all of which are essential to the training of a modern-day microbiologist. At the same time, through a wide choice of electives, the program provides flexibility so that a student may prepare for any of several career choices after graduation. The microbiology graduate may enter graduate school in the fields of microbiology, biochemistry, bioengineering or related disciplines; he may enter a medical or dental school; or pursue a career in one of the many industries or public service departments dependent upon microbiology. Some of these are the fermentation and drug industries, medical and public health microbiology, various food industries, and agriculture.

Students who plan to accept positions directly upon receipt of the bachelor's degree are urged to present themselves for admission to the "National Registry of Microbiologists" of the American Academy of Microbiology. This is accomplished by passing an examination, and students should consult their adviser on this matter during the fall semester of their senior year.

A student intending to continue training at the graduate level in either microbiology or biochemistry, should include courses in physical chemistry, quantitative chemical analysis, statistics, and an additional calculus course among their electives.

Microbiology majors planning to apply for admission to a medical or dental school, should discuss this matter with the appropriate adviser immediately upon entering the Microbiology program. This is to ensure that all requirements for admission to such schools will be met.

FRESHMAN YEAR

First Semester

BIOL 100 Intro. to the Biological Sciences	1	(1,0)
BOT 101 Plant Biology	3	(3,0)
BOT 103 Plant Biology Lab.	1	(0,2)
or ZOOL 101 Animal Biology	3	(3,0)
and ZOOL 103 Ani. Biol. Lab.	1	(0,2)
CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
MATH 103 College Algebra	2	(3,0)
MATH 104 Trigonometry	2	(3,0)
	16	

Second Semester

CH 112 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
MICRO 100 Microbes and Human Affairs	1	(1,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
or BOT 101 Plant Biology	3	(3,0)
and BOT 103 Plant Biology Lab.	1	(0,2)
	16	

SOPHOMORE YEAR

CH 223 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab.	1	(0,3)
Literature Requirement°	3	(3,0)
MICRO 305 General Microbiology	4	(3,3)
Mathematics or Science Elective	3–4	
Social Science Elective§	3	(3,0)
	17–18	

BIOCH 301 Molecular Biology	3	(3,0)
CH 224 Organic Chemistry	3	(3,0)
CH 228 Organic Chemistry Lab.	1	(0,3)
Literature Requirement°	3	(3,0)
Mathematics or Science Elective	4–3	
Microbiology Elective‡	3	
	17–16	

JUNIOR YEAR

ENGL 301 Public Speaking	3	(3,0)
MICRO 401 Adv. Bacteriology	4	(2,6)
Physics Elective†	4–3	
Elective	7–8	
	18	

GEN 302 Genetics	4	(3,3)
MICRO 412 Bacterial Physiology	4	(3,3)
Physics Elective†	4	
Social Science Elective§	3	(3,0)
Approved Elective‡	3	
	18	

SENIOR YEAR

Social Science Elective§	3	(3,0)
Approved Elective‡	13	
	16	

MICRO 411 Pathogenic Bact.	4	(3,3)
Approved Elective‡	12	
	16	

134 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† To be selected from the following courses: First semester either Phys 207 or 122; and second semester either Phys 208 or 221, 223.
‡ A minimum of 15 credits must be selected from the following courses: Bot 451, 457, Micro 402, 404, 410, 413, 414, 415, 416, 491, Pl Pa 456, PS 458, Zool 403, 456.
§ To be selected from the following courses: Econ 201, 202, Hist 102, 171, 172, 173, Phil 201, 302, Pol Sc 101, 210, Psych 201, Rel 301, 302, RS 301, Soc 201.
Note: Credits for sophomore year should total 34 and junior year 36.
This curriculum provides a minimum of 23 open approved electives. Military science or aerospace studies may be elected if desired.

PHYSICS CURRICULUM WITH OPTIONS IN THE PHYSICAL AND MATHEMATICAL SCIENCES

Physics is the fundamental science. The word physics comes from the Greek term meaning nature. Therefore, physics is a science dedicated to the study of all natural phenomena. Physics is the foundation for the other experimental sciences. The physics curriculum is designed with this point of view.

The first two years of the physics curriculum is generally the same as that for mathematics, the other physical sciences and engineering. During the junior and senior years the physics student is given a strong background in the basic physics courses at an advanced level and is allowed to specialize in a variety of other fields by selecting one of eight options. The options are Astrophysics, Biophysics, Chemical Physics, Computer Science, Electronics, Geophysics, Mathematical Physics, and Physics. After completing one of these curriculums the student is prepared for positions in industry (*e. g.*, aircraft, electronics, petroleum, textiles, pharmaceutical) and government laboratories (*e. g.*, space research). Those students who select the physics or mathematical physics options are well-equipped for graduate study in physics.

FRESHMAN YEAR

First Semester			Second Semester		
CH 101 General Chemistry	4	(3,3)	CH 112 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)	ENGL 102 English Composition	3	(3,0)
HIST 172 or 173 West. Civilization	3	(3,0)	MATH 108 Cal. and Lin. Algebra	4	(4,0)
MATH 106 Calculus of One Var.	4	(4,0)	PHYS 132 General Physics I	3	(3,0)
PHYS 101 Current Topics in Modern Physics	1	(0,2)	Elective	4	
Elective	1			18	
	16				

SOPHOMORE YEAR

FR 101 Elementary French¶	4	(3,1)	FR 102 Elementary French¶	4	(3,1)
or GER 101 Elem. German¶	4	(3,1)	or GER 102 Elem. German¶	4	(3,1)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	MATH 208 Engineering Math. I	4	(5,0)
PHYS 223 Electron Physics Lab.	1	(0,3)	PHYS 224 Modern Physics Lab.	1	(0,3)
PHYS 231 General Physics II	3	(3,0)	PHYS 232 General Physics III	3	(3,0)
Elective	1		Elective	1	
	16			16	

JUNIOR YEAR

MATH 309 Engineering Math. II‡	3	(3,0)	PHYS 322 Mechanics II	3	(3,0)
PHYS 321 Mechanics I	3	(3,0)	PHYS 326 Exper. Physics II	4	(2,6)
PHYS 325 Exper. Physics I	4	(2,6)	PHYS 340 Elec. and Magnetism I	3	(3,0)
Option	3		Option	3	
Elective	3		Approved Elective†	3	
	16			16	

SENIOR YEAR

PHYS 441 Elec. and Magnetism II	3	(3,0)	Physics (as approved)	3	(3,0)
PHYS 455 Quantum Physics I	3	(3,0)	Option	3	
PHYS 465 Therm. and Stat. Mech.	3	(3,0)	Approved Elective†	9	
Option	3			15	
Approved Elective†	3				
	15				

128 Total Semester Hours

OPTIONS

A. Astrophysics

ASTR 301 General Astronomy	3	(3,0)
ASTR 302 General Astronomy	3	(3,0)
ASTR 407 Intro. to Astrophysics	3	(3,0)
ASTR 408 Intro. to Galactic Astr.	3	(3,0)
	12	

B. Chemical Physics

CH 331 Physical Chemistry	3	(3,0)
CH 332 Physical Chemistry	3	(3,0)
CH 402 Inorganic Chemistry	3	(3,0)
or PHYS 456 Quantum Physics II	3	(3,0)
CH 435 Atomic and Molec. Struc.	3	(3,0)
	12	

C. Computer Science

COMP SC 205 Elem. Comp. Prog.	3	(3,0)
COMP SC 409 Numerical Analysis	3	(3,0)
COMP SC 421 Introduction to Assembler Language Prog.	3	(3,0)
COMP SC 428 Algorithmic Language and Compilers	3	(3,0)
or MATH 429 Numerical Anal.	3	(3,0)
or PHYS 446 Solid State Phys.	3	(3,0)
	12	

D. Electronics

E&CE 320 Electronics I	2	(2,0)
E&CE 325 Elec. and Electro. Lab I	1	(0,2)
E&CE 330 Systems 1	3	(3,0)
E&CE 331 Elec. Cir. Workshop I	3	(2,2)
E&CE 332 Systems II	2	(2,0)
E&CE 333 Elec. Cir. Workshop II	3	(2,2)
	14	

E. Geophysics

GEOL 101 Physical Geology	4	(3,3)
GEOL 306 Mineralogy	3	(2,3)
Any two:		
GEOL 309 Petrology	3	(2,3)
GEOL 402 Struc. Geology	3	(2,2)
PHYS 446 Solid State Physics	3	(3,0)
	13	

F. Mathematical Physics

MATH 453 Advanced Calculus I	3	(3,0)
MATH 454 Advanced Calculus II	3	(3,0)
PHYS 456 Quantum Physics I1	3	(3,0)
Mathematics (as approved)	3	(3,0)
	12	

G. Physics

PHYS 446 Solid State Physics	3	(3,0)
PHYS 456 Quantum Physics I1	3	(3,0)
Mathematics (as approved)	6	
	12	

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† A minimum of 12 hours of electives must be chosen from course offerings in the humanities and social sciences.
‡ Math 411 may be taken in lieu of Math 309.
¶ Russ 101, 102 may be substituted.

PHYSICS CURRICULUM WITH BIOPHYSICS OPTION

The Biophysics option is designed to provide a substantial background in physics as well as the biological and physical sciences. Thus, a student will be well prepared to pursue graduate study in biophysics or the biological and medical fields.

A total of 25 credit hours of approved biophysics electives is required, of which a minimum of 3 hours must be chosen in physics or mathematics, 6 hours from biological areas, and 12 hours, including 3 credit hours of laboratory, from the following chemistry and biochemistry courses: Ch 223, 224, 227, 228, 331, 332, 339, 340, Bioch 423, 424, 425, 426. Normally, Ch 223 and 227 will be scheduled for the first semester of the sophomore year.

FRESHMAN YEAR

First Semester

CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
PHYS 101 Current Topics in Modern Physics	1	(0,2)
Biology Elective	3	
Elective	1	
	16	

Second Semester

CH 102 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 108 Cal. and Lin. Algebra	4	(4,0)
PHYS 132 General Physics I	3	(3,0)
Biophysics Elective	3	
Elective	1	
	18	

SOPHOMORE YEAR

Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
MATH 206 Calculus of Sev. Var.	4	(4,0)	MATH 208 Engineering Math. I .	4	(5,0)
PHYS 223 Electron Physics Lab..	1	(0,3)	PHYS 224 Modern Physics Lab..	1	(0,3)
PHYS 231 General Physics II ...	3	(3,0)	PHYS 232 General Physics III ..	3	(3,0)
Biophysics Elective	4		Biophysics Elective	4	
Elective	1		Elective	1	
	16			16	

JUNIOR YEAR

FR 101 Elementary French§	4	(3,1)	FR 102 Elementary French§	4	(3,1)
or GER 101 Elem. German§	4	(3,1)	or GER 102 Elem. German§	4	(3,1)
HIST 171 or 172 West. Civilization	3	(3,0)	PHYS 322 Mechanics II	3	(3,0)
PHYS 321 Mechanics I	3	(3,0)	PHYS 340 Elec. and Magnetism I	3	(3,0)
PHYS 325 Experimental Physics I	4	(2,6)	Biophysics Elective	3	
Biophysics Elective	3		Elective	3	
	17			16	

SENIOR YEAR

PHYS 455 Quantum Physics I ..	3	(3,0)	Physics (as approved)	3	(3,0)
PHYS 465 Thermodynamics and			Biophysics Elective	4	
Statistical Mechanics‡	3	(3,0)	Approved Elective†	8	
Biophysics Elective	4			15	
Approved Elective†	5				
	15				

129 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
† A minimum of 12 hours of electives must be chosen from course offerings in the humanities and social sciences.
‡ An approved physics course may be substituted for Phys 465 if the student successfully completes Ch 331, 332.
§ Russ 101, 102 may be substituted.

PREPROFESSIONAL HEALTH EDUCATION
(Pre-medicine and Pre-dentistry)

The health professions, such as medicine and dentistry, need individuals with a diversity of educational backgrounds and a wide variety of talents and interests. The philosophies of education, the specific preprofessional course requirements, the noncognitive qualifications for enrollment, and the systems of training vary among the professional health schools, but all recognize the desirability of a broad education—a good foundation in the natural sciences (biology, chemistry, mathematics, and physics), highly developed communication skills, and a solid background in the humanities and social sciences. The absolute requirements for admission to professional health schools are purposely limited to allow latitude for developing individualized undergraduate programs of study.

At Clemson, rather than having a separate, organized preprofessional health education program, it is felt that an undergraduate student should be allowed to major in any curriculum, so long as the basic professional health school entrance requirements are fulfilled. These schools are not so much concerned about a student's major as they are concerned that the student does well in whichever curriculum he chooses.

Professional health schools have neither preferences nor prejudices concerning any curriculum, which is evidenced by the fact that their students represent a broad spectrum of curricula. The emphasis is placed on the student doing well in the curriculum chosen, and this becomes critical as competition increases for the limited number of places available in professional health schools.

FIVE-YEAR INTEGRATED PROFESSIONAL CURRICULUM IN MEDICINE

Clemson University and the Medical University of South Carolina have established jointly a curriculum in Pre-medicine and Medicine which will permit a student who has successfully completed it to be graduated at the end of five years (60 months) with an M.D. degree from the Medical University and a B.S. degree from Clemson University.

Selection of students to participate in this program is the joint responsibility of Clemson University and the Medical University of South Carolina. Once a student is admitted to the program he continues in it as long as his record of academic achievement meets the minimum requirements as spelled out below.

The admissions process will begin at Clemson. Students who satisfactorily meet Clemson's criteria for admission to the program (graduate in the upper 25 percent of his graduating class, and have a predicted grade-point ratio of 2.8 or better in his freshman year, as determined by Clemson University) will be so notified, and at the same time, will be informed that they must also meet the criteria established by the Medical University for admission to the program. Students will not be considered as having been accepted into this program until they have been notified in writing by both institutions, Clemson University and the Medical University, that they have satisfactorily met the admissions criteria of both institutions. The deadline for applications to the Clemson portion of the program is February 1, and neither nonresident nor transfer students are eligible.

The prescribed curriculum at Clemson University involves two years (24 months) of study. Successful completion of the curriculum at Clemson would include the student's having a cumulative grade-point ratio of at least 3.0, with not less than a grade-point ratio of 2.8 for any one semester. Upon the successful completion of the prescribed curriculum at Clemson University, the student will transfer to the College of Medicine of the Medical University of South Carolina for the completion of the requirements for an M.D. degree, this program to be completed within three years (36 months). Entering and remaining in the first two years (24 months) at Clemson of the proposed five-year program is purely voluntary.

The student can withdraw and transfer to another curriculum at any time. He must withdraw if he fails to meet the grade-point-ratio requirements.

Clemson University will offer a curriculum for the first two years (24 months) as outlined below. During the initial enrollment period at Clemson, however, a plan of study covering the entire period of enrollment at Clemson will be designed for each student. This plan of study will consider the student's individual capabilities and needs and the results of any advanced placement which he may achieve upon entering Clemson. The Medical University will offer to the students coming from Clemson in this program the opportunity to exempt by special examination certain of their required courses in the following areas: Biochemistry, Biometry, Cell Biology, Genetics, Microbiology, and Physiology.

In summary, the plan consists of a five-year integrated curriculum achieved through (1) the use of summers; (2) the possibility of advanced placement at both Clemson University and the Medical University of South Carolina; and (3) the option of basic science courses in the preprofessional curriculum. The key to this curriculum is flexibility.

CURRICULUM AT CLEMSON UNIVERSITY

1. Advanced placement examinations, with credit in biology, chemistry, English, history, and mathematics are offered at Clemson University prior to the student entering the preprofessional curriculum.

2. Core courses required of all those entering the curriculum:

	Hours Credit
Ch 101, 102, 223-227, 224-228	16
Zool 101-103, 301, Micro 305	11
Engl 101, 102, 203, 204, 217	15
Math 106, 108	8
Phys 122, 221-223	7
Psych 201	3
Soc 201	3
Econ 201	3
Hist 171 and 172 or 171 and 173 or 172 and 173	6
Total	72

3. Twenty-one hours, at least nine of which must be concentrated in one of the following areas: at the 200, 300, or 400 level of courses, in addition to those specified in the core: chemistry, economics, English, fine arts, geology, mathematics, microbiology, modern lan-

guages, philosophy, physics, political science, psychology, sociology, zoology.

4. Students in the curriculum are encouraged to strike a balance between the basic sciences and the humanities/social sciences. A total of 93 credits is required in addition to units earned through advanced placement examinations.

5. The following courses are recommended for those preparing for advanced placement examinations at the Medical University of South Carolina: Bioch 423, 424; Gen 302, 451; Math 301 or Ex St 301; Micro 411, 412, 414, 415, 416; Zool 458.

FIVE-YEAR INTEGRATED PROFESSIONAL CURRICULUM IN MEDICINE

FIRST YEAR

First Semester		
CH 101 General Chemistry	4	(3,3)
ENGL 101 English Composition	3	(3,0)
MATH 106 Calculus of One Var.	4	(4,0)
PSYCH 201 General Psychology	3	(3,0)
ZOOL 101 Animal Biology	3	(3,0)
ZOOL 103 Animal Biology Lab.	1	(0,2)
	18	

Second Semester		
CH 112 General Chemistry	4	(3,3)
ENGL 102 English Composition	3	(3,0)
MATH 108 Cal. and Lin. Algebra	4	(4,0)
SOC 201 Introductory Sociology	3	(3,0)
ZOOL 301 Comp. Vert. Anatomy.	3	(2,3)
	17	

SUMMER

CH 223 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab.	1	(0,3)
Literature Requirement°	3	(3,0)
	7	

CH 224 Organic Chemistry	3	(3,0)
CH 228 Organic Chemistry Lab.	1	(0,3)
Literature Requirement°	3	(3,0)
	7	

SECOND YEAR

ECON 201 Principles of Economics	3	(3,0)
ENGL 217 Vocabulary Building	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)
MICRO 305 General Microbiology	4	(3,3)
PHYS 122 Mech. and Wave Phen.	3	(3,0)
Elective	3	
	19	

HIST 172 or 173 West. Civilization	3	(3,0)
PHYS 221 Thermal and Elec. Phen.	3	(3,0)
PHYS 223 Electron Physics Lab.	1	(0,3)
Concentration	6	
Elective	6	
	19	

SUMMER

Concentration	3
Elective	3
	6

Optional (A period in which the student may rest, work, make up deficiencies, or take additional course work.)

93 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

PRE-PHARMACY

Pharmacy is a five-year program, the first two years of which can be taken at Clemson. The student who does Pre-pharmacy here will transfer, as a rule, to the School of Pharmacy at the Medical University of South Carolina, where the final three years will be completed and by which institution the degree in Pharmacy will be awarded.

FIRST YEAR

First Semester			Second Semester		
BOT 101 Plant Biology	3	(3,0)	CH 112 General Chemistry	4	(3,3)
BOT 103 Plant Biology Lab.	1	(0,2)	ENGL 102 English Composition	3	(3,0)
CH 101 General Chemistry	4	(3,3)	HIST 172 or 173 West. Civilization	3	(3,0)
ENGL 101 English Composition	3	(3,0)	MATH 102 Math. Analysis II	3	(3,0)
HIST 171 or 172 West. Civilization	3	(3,0)	ZOOL 101 Animal Biology	3	(3,0)
MATH 101 Math. Analysis I	3	(3,0)	ZOOL 103 Animal Biology Lab.	1	(0,2)
Elective	1		Elective	1	
	18			18	

SECOND YEAR

CH 223 Organic Chemistry	3	(3,0)	CH 224 Organic Chemistry	3	(3,0)
CH 227 Organic Chemistry Lab.	1	(0,3)	CH 228 Organic Chemistry Lab.	1	(0,3)
Literature Requirement°	3	(3,0)	Literature Requirement°	3	(3,0)
PHYS 207 General Physics	4	(3,2)	PHYS 208 General Physics	4	(3,2)
SOC 201 Introductory Sociology	3	(3,0)	SOC 202 Social Problems	3	(3,0)
Elective	2		Elective	4	
	16			18	

70 Total Semester Hours

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

ZOOLOGY CURRICULUM WITH OPTIONS

Zoology is the descriptive and experimental science that investigates all aspects of animal life. Zoology ranges from comprehensive studies by ecologists to intensive studies of the ultra-small by electron microscopists. Knowledge of zoology is necessary to understand the past, control the present, and shape the future.

Zoology majors receive broad classroom, laboratory, and field training in classical and modern zoology, along with the latter's emphasis on physics, chemistry, and mathematics.

Zoology majors planning to enter eventually either: (1) graduate school in Zoology, (2) professional careers in the Health Sciences, (3) graduate school in Bioengineering, or (4) graduate school in Biophysics, Biochemistry, or Biomathematics are advised to select the appropriate specialized option listed in the Zoology curriculum. Zoology majors not planning to enter either the health professions or graduate school in Zoology are advised to select the general option, whose flexibility permits selection of electives useful in business, government, and other occupations. Zoology majors planning to follow Pre-veterinary Medicine curriculum should refer to page 136.

FRESHMAN YEAR

First Semester			Second Semester		
BIOL 100 Intro. to the Biological Sciences	1	(1,0)	BOT 101 Plant Biology§	3	(3,0)
CH 101 General Chemistry	4	(3,3)	BOT 103 Plant Biology Lab.§	1	(0,2)
ENGL 101 English Composition	3	(3,0)	CH 112 General Chemistry	4	(3,3)
MATH 106 Calculus of One Var.	4	(4,0)	ENGL 102 English Composition	3	(3,0)
ZOOL 101 Animal Biology	3	(3,0)	Elective†	7	
ZOOL 103 Animal Biology Lab.	1	(0,2)		18	
Elective	1				
	17				

SOPHOMORE YEAR

CH 223 Organic Chemistry 3 (3,0)
CH 227 Organic Chemistry Lab.. 1 (0,3)
Literature Requirement° 3 (3,0)
PHYS 207 General Physics‡ 4 (3,2)
ZOOL 201 Invertebrate Zoology .. 4 (3,3)
 or ZOOL 202 Vertebrate Zoology 4 (3,3)
Elective 1
                              ――
                              16

CH 224 Organic Chemistry 3 (3,0)
CH 228 Organic Chemistry Lab.. 1 (0,3)
Literature Requirement° 3 (3,0)
PHYS 208 General Physics‡ 4 (3,2)
ZOOL 202 Vertebrate Zoology ... 4 (3,3)
 or ZOOL 201 Inverte. Zoology . 4 (3,3)
Elective 1
                              ――
                              16

JUNIOR YEAR

ENGL 301 Public Speaking 3 (3,0)
GEN 302 Genetics 4 (3,3)
ZOOL 302 Vertebrate Embryology 3 (2,3)
Botany Elective 3
Elective† 3
                              ――
                              16

BIOCH 301 Molecular Biology... 3 (3,0)
Option and Elective 13
                              ――
                              16

SENIOR YEAR

ZOOL 411 Animal Ecology 3 (2,3)
ZOOL 460 General Physiology .. 3 (2,3)
Option and Elective 12
                              ――
                              18

Option and Elective 16
                              ――
                              16

133 Total Semester Hours

OPTIONS
A. PRE-GRADUATE SCHOOL
BIOE 401 Comp. for Bioscientists 1 (1,0)
EX ST 301 Introductory Statistics 3 (2,2)
ZOOL 310 Evolution 2 (2,0)
ZOOL 470 Animal Behavior 3 (2,3)
ZOOL 491 Special Problems in
 Zoology 1–4
                            ――――
                           10–13

C. PRE-BIOMEDICAL ENGINEERING
BIOE 301 Engr. Aspects Biol. Med. 2 (2,0)
COMP SC 205 Elem. Comp. Prog. 3 (3,0)
MATH 108 Cal. and Lin. Algebra 4 (4,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)
PHYS 224 Modern Physics Lab.. 1 (0,3)
PHYS 232 General Physics III .. 3 (3,0)
                             ――
                             17

B. PRE-HEALTH PROFESSIONS
BIOE 401 Comp. for Bioscientists 1 (1,0)
ECON 201 Principles of Economics 3 (3,0)
EX ST 301 Introductory Statistics 3 (2,2)
MICRO 305 General Microbiology 4 (3,3)
ZOOL 301 Comp. Vert. Anatomy. 3 (2,3)
ZOOL 310 Evolution 2 (2,0)
ZOOL 458 Cell Physiology 3 (2,3)
ZOOL 470 Animal Behavior 3 (2,3)
                             ――
                             22

D. PRE-BIOCHEMISTRY,
 -BIOMATHEMATICS, -BIOPHYSICS
COMP SC 205 Elem. Comp. Prog. 3 (3,0)
MATH 108 Cal. and Lin. Algebra 4 (4,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)
PHYS 224 Modern Physics Lab.. 1 (0,3)
PHYS 232 General Physics III .. 3 (3,0)
                             ――
                             15
E. GENERAL PROGRAM
Zoology Elective 21
                             ――
                             21

° To be selected from the following: Engl 203, 204, 205, 206, 207, 208.
 † A minimum of 9 elective hours must be chosen from course offerings in the humanities
and social sciences. A minimum of 21 elective hours must be selected from course offerings
of the Department of Zoology.
 ‡ Phys 132, 223, and 231 replace Phys 207 and 208 for students taking options C or D.
 § Bot 202 may be taken in lieu of Bot 101 and 103.

Description of Courses

This list of courses includes for each course the catalog number, title of course, credit in semester hours, class laboratory hours per week, and the description of the course. In general, courses numbered 100-199 are freshman courses; 200-299, sophomore courses; 300-399, junior courses; and 400-499, senior courses. Courses numbered 600 or above are graduate courses and are open only to students admitted to the Graduate School, except that seniors with exceptional records may be enrolled with special permission. Where courses are offered on a schedule, there is a designation F, S, or SS following the title of each course, indicating whether it is customarily offered in the fall, spring, or summer school.

Accounting

Professor: C. C. Davis
Associate Professors: F. R. Gray, J. M. Wannamaker
Assistant Professors: D. L. Davison, J. A. Turner, Jr.
Instructors: Bettye B. Johnson, H. Pierce, Shirley F. Pierce

ACCT 200   MANAGERIAL ACCOUNTING   3 cr. (3 and 0)
An introduction to the basic accounting cycle and financial statements with emphasis on interpretation and use of accounting data by management in planning and controlling business activities. The course content is designed for the student who intends to complete a single accounting course.

ACCT 201   PRINCIPLES OF ACCOUNTING   3 cr. (3 and 0)
Practice in handling real and nominal accounts, together with an introduction to the use of various types of books of original entry, statements of profit and loss, and balance sheets.

ACCT 202   PRINCIPLES OF ACCOUNTING   3 cr. (3 and 0)
Continuation of Acct 201 with special attention to corporation and partnership accounting with emphasis on adjustment procedures and the analysis of financial statements. *Prerequisite:* Acct 201.

ACCT 301   INTERMEDIATE ACCOUNTING   3 cr. (3 and 0)
A course in the theory of accountancy designed to follow introductory theory presented in the basic principles courses. Intermediate accounting seeks to

broaden the student's knowledge of financial accounting theory and practice. *Prerequisite:* Acct 201, 202.

ACCT 302   INTERMEDIATE ACCOUNTING   3 cr. (3 and 0)

A continuation of Acct 301 with emphasis on managerial accounting. *Prerequisite:* Acct 201, 202.

ACCT 303   COST ACCOUNTING   3 cr. (3 and 0)

The application of cost analysis to manufacturing and distributing problems. Analysis of the behavior characteristics of business costs and a study of principles involved in standard cost systems. Lectures and problems. *Prerequisite:* Acct 201, 202.

ACCT 305   INCOME TAXATION   3 cr. (3 and 0)

Interpretation of Federal Income Tax laws, regulations and court decisions with practice in application of these laws to the returns of individuals, partnerships, and corporations. *Prerequisite:* Junior standing.

ACCT 403   ACCOUNTING RESEARCH   2 cr. (2 and 0)

A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

ACCT 405, 605   ADVANCED FEDERAL TAXES   3 cr. (3 and 0)

Tax planning and research. Advanced phases of income taxation with emphasis on special problems applicable to corporations, partnerships, estates and trusts. *Prerequisite:* Acct 305.

ACCT 407   ACCOUNTING RESEARCH   1 cr. (1 and 0)

A directed research course for those students interested in a career in accounting. *Prerequisite:* Acct 301, 302.

ACCT 410, 610   BUDGETING AND EXECUTIVE CONTROL   3 cr. (3 and 0)

The study and application of selected techniques used in the planning and control functions of business organizations. *Prerequisite:* Acct 303.

ACCT 411, 611   ADVANCED ACCOUNTING   3 cr. (3 and 0)

A study of accounting principles and practices emphasizing parent-subsidiary accounting. *Prerequisite:* 301, 302.

ACCT 415, 615   AUDITING   3 cr. (3 and 0)

Professional and practical auditing theory. Review of internal controls, audit procedures, and development of audit programs for various types of businesses; consideration of auditor's professional and ethical standards. *Prerequisite:* Acct 301, 302.

ACCT 420   CPA REVIEW   3 cr. (3 and 0)

Intensive practice in analyzing and solving CPA level accounting problems. *Prerequisite:* Acct 411.

Aerospace Studies

Professor: Col. D. W. Rabey, Jr., *Head*

Assistant Professors: Lt. Col. R. C. Grant, Maj. A. C. Brock, Maj. L. W. Cash, Capt. H. R. Hubbard, Capt. R. N. Peavler

GENERAL MILITARY EDUCATION PROGRAM

AS 109　WORLD MILITARY SYSTEMS　1 cr. (1 and 1)

An introduction to factors of national power, principles and nature of war; legislation, organization and function of the Department of Defense; history, missions, and organization of the United States Air Force. Corps Training includes drill fundamentals, customs and courtesies of the service.

AS 110　WORLD MILITARY SYSTEMS　1 cr. (1 and 1)

Surveys the history and development of U.S. strategic offensive and defensive forces including their missions, functions and organization; conventional nuclear weaponry, civil defense, aircraft and missile defense, concepts of present and projections of future strategic defense requirements. Corps Training includes drill and ceremonies and Air Force career opportunities.

AS 209　WORLD MILITARY SYSTEMS　1 cr. (1 and 1)

A continuation of the study of world military forces placing special emphasis on the General Purposes forces of the Air Force, Army and Navy and their role throughout the entire spectrum of warfare. Also included are the roles of the aerospace support forces which enable the combat forces to carry out their primary missions. Corps Training.

AS 210　WORLD MILITARY SYSTEMS　1 cr. (1 and 1)

A study of the trends and implications in international affairs highlighting the struggle, the search and the prospects for peace. Special emphasis is given the conflict between democracy and communism, the alliances and collective security agreements of the United States to preserve peace and some of the specific problems and solutions involved in the search for peace. Corps Training.

PROFESSIONAL OFFICER EDUCATION PROGRAM

AS 309　GROWTH AND DEVELOPMENT OF AEROSPACE POWER 3 cr. (3 and 1)

A comprehensive study of the development of Aerospace Power and the USAF, its doctrine, mission and organization. Course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training emphasizes leadership development and Air Force career opportunities.

AS 310　GROWTH AND DEVELOPMENT OF AEROSPACE POWER 3 cr. (3 and 1)

A study of current and planned space programs. Reviews the characteristics of the solar system and operating principles associated with the major components of space exploration systems. As in AS 309, course objectives are accomplished through a student-centered program with emphasis on all phases of communicative skills development. Corps Training includes drill and ceremonies and the environment of the Air Force officer.

AS 409　CONCEPTS OF AIR FORCE LEADERSHIP　3 cr. (3 and 1)

A study of military professionalism, leadership, and discipline. Covers leadership theory and practice. Compares leadership in the military with

private enterprise. Flight instruction and ground school for pilot candidates. Corps Training provides cadets experience in the guidance, direction, and control of an Air Force unit.

AS 410   CONCEPTS OF AIR FORCE MANAGEMENT   3 cr. (3 and 1)

A continuation of the study of professionalism with the stress on management principles and functions. An introduction to systems and approaches to decision making and resource control used in the Air Force. Includes participation in problem-situation exercises. The course concludes with instruction to prepare cadets for active duty in the Air Force. Corps Training emphasizes advanced leadership functions.

Agricultural Economics

Professors: L. M. Bauknight, Jr., W. J. Lanham, *Head;* J. M. Stepp

Associate Professors: B. L. Dillman, J. C. Hite, J. W. Hubbard, J. S. Lytle, H. C. Spurlock, G. R. von Tungeln

Assistant Professors: R. K. DeHaven, R. A. Jobes, III

AG EC 202   AGRICULTURAL ECONOMICS   3 cr. (3 and 0) F, S

An analytical survey of the various subdivisions of agricultural economics, to include farm organization, enterprise analysis, land economics, marketing, farm prices, governmental farm policies, and the relation of agriculture to the national and international economy. *Prerequisite:* Econ 201.

AG EC 302   AGRICULTURAL FIRM MANAGEMENT   3 cr.
(2 and 3) F, S

Economic principles underlying the organization and operation of agricultural firms and related business enterprises. Particular emphasis is directed to management aspects of the farm as a production unit. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 305   AGRICULTURAL BUSINESS ANALYSIS   3 cr.
(2 and 3) F, S

The principles of financial statement analysis applied to management of farms and other agricultural business firms. Emphasis is placed on enterprise analysis, profitability determination, and other aspects of internal financial operations. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 309   ECONOMICS OF AGRICULTURAL MARKETING   3 cr.
(3 and 0) F, S

A general course in marketing agricultural commodities, with particular emphasis upon food products. Efficiency criteria, consumer behavior, market organizations and institutions, and marketing functions are analyzed. *Prerequisite:* Econ 201.

AG EC 351   ADVERTISING AND MERCHANDISING   3 cr. (3 and 0) F

A general introduction to advertising and merchandising theories and some practice with basic techniques. A partial list of subjects covered includes: function of advertising, propriety in advertising, institutions, media, market research, consumer appeals, loss leaders, mass displays, trademarks and brands, writing copy, color, layout, agencies and integrated advertising campaigns. *Prerequisite:* Junior standing.

AG EC 352   PUBLIC FINANCE   3 cr. (3 and 0) F, S, SS

Principles of financing government, sources of public revenue, objects of public expenditures, problems of fiscal administration, and the application of fiscal policies in stabilizing the national economy.

AG EC 357   NATURAL RESOURCE ECONOMICS   3 cr. (3 and 0) F, S, SS

The principles and problems involved in the use of soil, water, forest, and mineral resources, with special emphasis on economic aspects of alternative methods of resource utilization. *Prerequisite:* Econ 201.

AG EC 402, 602   ECONOMICS OF AGRICULTURAL PRODUCTION   3 cr. (3 and 0) F

An economic analysis of agricultural production involving (a) the concept of the farm as a firm, (b) principles for decision making, (c) the quantitative nature and use of production and cost functions and their interrelations and application of these principles to resource allocation in farms and among areas. *Prerequisite:* Permission of instructor.

AG EC 403, 603   LAND ECONOMICS   3 cr. (3 and 0)

A study of the characteristics of land and of the physical, legal, social and economic principles and problems relating to the control and use of land resources. *Prerequisite:* Permission of instructor.

AG EC 405   SEMINAR   1 cr. (1 and 0) F

An examination of the relation of economics and sociology to specific problems. *Prerequisite:* Major in Agricultural Economics.

AG EC 406   SEMINAR   1 cr. (1 and 0) S

A continuation of Ag Ec 405.

AG EC 451, 651   AGRICULTURAL COOPERATION   2 cr. (2 and 0) F

The principles and practices of business organization and management governing the successful operation of cooperative business enterprises. Major emphasis is placed upon cooperative selling, processing, purchasing, and service enterprises that serve farm people. *Prerequisite:* Econ 201.

AG EC 452, H452, 652   AGRICULTURAL POLICY   3 cr. (3 and 0) F, S

A review of public agricultural policy programs in the United States and a critical examination of current and proposed government policies and programs affecting the agricultural sector of the economy. Included are economic considerations as related to past and current farm price and income problems. Admission to HONORS section by invitation. *Prerequisite:* Ag Ec 202 or Econ 202.

AG EC 456, H456, 656   PRICES   3 cr. (3 and 0) F, S

A review of the basic theory of price under competitive conditions and various modifications; nature, measurement and causes of daily, seasonal and cyclical price fluctuations; geographical price relationships; nature, function and behavior of future markets; government price programs. Admission to HONORS section by invitation. *Prerequisite:* Ag Ec 202 or Econ 200 or 202.

AG EC 460, 660   AGRICULTURAL FINANCE   2 cr. (2 and 0) F, S

The financial needs of agriculture and of the organization, functions and interrelationships of agencies developed to meet these needs. *Prerequisite:* Econ 201.

AG EC 701   AGRIBUSINESS MANAGEMENT PRINCIPLES
3 cr. (3 and 0)

AG EC 802   AGRICULTURAL PRODUCTION ECONOMICS PROBLEMS
3 cr. (3 and 0)

AG EC 804   WATER RESOURCE POLICIES   3 cr. (3 and 0)

AG EC 805   SEMINAR IN MARINE RESOURCES MANAGEMENT AND
POLICY   3 cr. (3 and 0)

AG EC 806   ECONOMIC DEVELOPMENT IN AGRICULTURAL AREAS
3 cr. (3 and 0)

AG EC 807   MARKET STRUCTURE IN AGRICULTURAL INDUSTRIES
3 cr. (3 and 0)

AG EC 808   APPLIED QUANTIFICATIONS IN AGRICULTURAL
ECONOMICS   3 cr. (3 and 0)

AG EC 809   PROBLEMS IN THE ECONOMICS OF WASTE DISPOSAL
AND MANAGEMENT   3 cr. (3 and 0)

AG EC 814   CONTEMPORORY ECONOMIC PROBLEMS   3 cr. (3 and 0)

AG EC 851   SEMINAR IN RESEARCH METHODOLOGY   1 cr.
(1 and 0)

AG EC 881   INTERNSHIP IN COMMUNITY AND RESOURCE
DEVELOPMENT   1-6 cr.

AG EC 891   RESEARCH.   Credit to be arranged.

AG EC 904   SEMINAR IN RESOURCE ECONOMICS   3 cr. (3 and 0)

AG EC 906   SEMINAR IN AREA ECONOMIC DEVELOPMENT   3 cr.
(3 and 0)

AG EC 907   AGRICULTURAL MARKETING PROBLEMS   3 cr. (3 and 0)

AG EC 991   DOCTORAL RESEARCH.   Credit to be arranged.

Agricultural Education

Professors: E. T. Carpenter, *Head;* J. H. Rodgers
Associate Professor: J. A. Hash
Assistant Professors: L. H. Blanton, R. E. Linhardt

AG ED 201   INTRODUCTION TO AGRICULTURAL EDUCATION
3 cr. (2 and 2)

Principles of education, development of agricultural education, and an introduction to the formulation of instructional programs for the teaching of agricultural courses.

AG ED 401, 601   METHODS IN AGRICULTURAL EDUCATION   3 cr.
(2 and 2)

Appropriate methods of teaching vocational agriculture in high schools. The course includes procedures for organizing teaching programs, teaching high school students, and directing F.F.A. activities.

NOTE: Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.

AG ED 406   DIRECTED TEACHING   6 cr. (0 and 18)
Guided participation in the professional responsibilities of a teacher of vocational agriculture including an intensive study of the problems encountered and the competencies developed. A half semester of directed teaching in selected schools is required. *Prerequisite:* Ag Ed 401.

AG ED   423, 623   CURRICULUM   2 cr. (2 and 0)
Curriculum goals and related planning for career and continuing education programs.

AG ED 425, 625   TEACHING AGRICULTURAL MECHANICS   2 cr. (1 and 3)
Organizing course content, conducting and managing an agricultural mechanics laboratory, shop safety, microteaching demonstrations of psychomotor skills, and methods of teaching manipulative abilities.

AG ED 431, 631   METHODS IN ENVIRONMENTAL EDUCATION   3 cr. (3 and 0)
A study of various techniques appropriate for teaching environmental education. Instruction is applicable to elementary, high school, and adult-level teachers. (Offered in Summer School only.)

AG ED 463, 663   ADVANCED CONSERVATION EDUCATION   3 cr. (3 and 0)
The broader aspects of conservation education. The course includes historical, geographical, and national conservation problems. (Offered in Summer School only.)

AG ED 465, 665   PROGRAM DEVELOPMENT IN AGRICULTURAL EDUCATION   3 cr. (3 and 0)
Each student will determine needs and resources in a specific community and plan a program to meet these needs.

AG ED 467, 667   ADULT EDUCATION IN AGRICULTURE   3 cr. (2 and 3)
Principles and practices appropriate to the solution of problems encountered in instructional programs for adult farmers.

AG ED 726   AGRICULTURAL MECHANIZATION FOR INSERVICE TEACHERS   3 cr. (3 and 0)

AG ED 727   AGRICULTURAL EDUCATION SHOP MANAGEMENT   3 cr. (1 and 6)

AG ED 736   INTERNSHIP: TEACHING   3 cr. (1 and 6)

AG ED 737   INTERNSHIP IN AGRIBUSINESS FIRMS   3 cr. (1 and 6)

AG ED 803   EVALUATION IN AGRICULTURAL EDUCATION   3 cr. (2 and 3)

AG ED 804   SPECIAL PROBLEMS   3 cr. (2 and 3)

AG ED 805   ADMINISTRATION AND SUPERVISION IN AGRICULTURAL EDUCATION   3 cr. (3 and 0)

AG ED 815   TEACHING AGRICULTURAL AND POWER MECHANICS   3 cr. (2 and 3)

AG ED 820   TEACHING YOUNG FARMERS   3 cr. (3 and 0)

AG ED 825   SUPERVISION OF STUDENT TEACHING   3 cr. (3 and 0)

AG ED 869   SEMINAR   1-3 cr. (1-3 and 0)

AG ED 891   RESEARCH.   Credit to be arranged.

Agricultural Engineering

Professors: T. H. Garner, J. R. Lambert, J. T. Ligon, A. W. Snell, *Head;*
B. K. Webb, T. V Wilson

Associate Professors: J G. Alphin, C. L. Barth, J. T. Craig, C. E. Hood, Jr.,
E. B. Rogers, Jr.

AGE 212   FUNDAMENTALS OF MECHANIZATION   3 cr. (2 and 3) S

Functional analysis of selected agricultural equipment and the economic performance of machine systems; also, the utility and principles of applied technology and processes essential to providing a background for engineering design, research and development. *Prerequisite:* EG 109.

AGE 221   SOIL AND WATER RESOURCES ENGINEERING I   3 cr.
(2 and 3) F

Physical relationships of factors governing rainfall disposition are used as bases for defining the hydrology of agricultural watersheds. The surveying necessary for design and application of resource management measures and structures is taught. *Prerequisite:* Math 106.

AGE 353   COMPUTATIONAL SYSTEMS   2 cr. (1 and 3)

This course involves the advanced utilization of digital computation for the solution of agricultural engineering problems including simulation of biological systems. Basic operating principles and applications of analog computation will be stressed. *Prerequisite:* Engr 180, Math 208.

AGE 355   ENGINEERING ANALYSIS AND CREATIVITY   2 cr. (1 and 3)

The creative and analytical portions of the engineering design process are developed in a problem approach. Application of physical and mathematical principles, analytical and experimental modeling and intelligent assumption making are stressed. Students are also introduced to the techniques of systems analysis. *Prerequisite:* Math 208, Phys 221.

AGE 362   ENERGY CONVERSION IN AGRICULTURAL SYSTEMS   3 cr.
(2 and 3) S, '75 and alternate years.

The energy requirements of agricultural systems with emphasis upon energy conversion methods. Characteristics of various sources of energy will be considered including economic aspects. The present energy conversion mechanisms used in agriculture will be studied and their limitations considered. *Prerequisite:* ME 311.

AGE 416, 616   AGRICULTURAL MACHINERY DESIGN   3 cr. (2 and 3) S

Engineering analysis of machines and basic agricultural operations and systems requiring machine functions. Fundamentals of machine design with applications to agricultural machinery. Velocity and acceleration, analyses, dimension determination, power transmission, and vibrations in machinery are studied. *Prerequisite:* EM 304.

NOTE: Agricultural Engineering is jointly administered by the College of Agricultural Sciences and the College of Engineering.

AGE 422, 622   SOIL AND WATER RESOURCES ENGINEERING II
3 cr. (2 and 3) S

Basic soil-water-plant relationships are used to establish criteria for the analysis and design of facilities and structures for conservation, water control, drainage and irrigation. Engineering relationships involved in the design of such facilities are emphasized. *Prerequisite:* Math 208, EM 320.

AGE 431, 631   AGRICULTURAL STRUCTURES DESIGN   3 cr. (2 and 3)
F, '73 and alternate years.

Analytic and synthetic design of building components, including fastening devices, as determined by both live and dead loads with emphasis on statically determinant members and their positions and utilization in frames and trusses. Major materials considered are wood, steel, and concrete. *Corequisite:* EM 304.

AGE 433, 633   DESIGN CRITERIA FOR PLANT AND ANIMAL
ENVIRONMENT   3 cr. (3 and 0)

This course evaluates, develops, and interprets criteria for the environmental design of selected agricultural production facilities by studying environment as it relates to the physiology of plants, animals, and microorganisms. Environmental design as it relates to the response of biological systems to factors such as temperature, humidity, light intensity, pH, and available nutrients will be studied. Modeling of physiological systems will be emphasized. *Prerequisite:* Bot 101, Zool 101 and/or consent of instructor.

AGE 442, 642   AGRICULTURAL PROCESS ENGINEERING   3 cr.
(2 and 3) S, '74 and alternate years.

Design of unit operations components used in agricultural processing. Engineering principles and instrumentation as applied to control systems, heat transfer, materials handling, storage and related subjects are emphasized. *Prerequisite:* ME 311, E&CE 308.

AGE 465, 665   ENGINEERING PROPERTIES OF BIOLOGICAL
MATERIALS   3 cr. (2 and 3) S, '75 and alternate years.

The thermal, electrical, mechanical, and chemical characteristics of biological materials, organisms, and metabolic processes are studied in relationship to engineering analysis and synthesis. The effects of environmental factors imposed by engineering processes are evaluated. *Prerequisite:* Math 208, EM 304, Biol 100.

AGE 471   UNDERGRADUATE RESEARCH   1 cr. (0 and 3) F

A course to acquaint senior students in Agricultural Engineering with the scientific method. Literature investigations, planning and executing of an experiment are integral parts of the course. *Prerequisite:* Senior standing in Agricultural Engineering.

AGE 473, H473   SPECIAL TOPICS IN AGRICULTURAL ENGINEERING
3 cr. (3 and 0)

A comprehensive study of special topics in the field of agricultural engineering not covered in other courses. Special emphasis will be placed on independent pursuit of detailed investigations. Admission to HONORS section by invitation.

AGE 801   SPECIAL PROBLEMS IN AGRICULTURAL ENGINEERING
3 cr. (3 and 0)

AGE 806   INSTRUMENTATION IN AGRICULTURAL AND BIOLOGICAL RESEARCH   3 cr. (2 and 3)

AGE 811   TILLAGE AND SOIL DYNAMICS   3 cr. (3 and 0)

AGE 822   WATER MOVEMENT IN SOILS   3 cr. (3 and 0)

AGE 865   HEAT AND MOISTURE TRANSFER IN BIOLOGICAL MATERIALS   3 cr. (3 and 0)

AGE 873   RADIOLOGICAL HEALTH   3 cr. (2 and 3)

AGE 874   RADIOLOGICAL HEALTH ENGINEERING   3 cr. (2 and 3)

AGE 882   SYSTEMS ENGINEERING   3 cr. (2 and 3)

AGE 891   RESEARCH.   Credit to be arranged.

AGE 901   SPECIAL PROBLEMS IN AGRICULTURAL ENGINEERING   3 cr. (3 and 0)

AGE 991   DOCTORAL RESEARCH.   Credit to be arranged.

Agricultural Mechanization

Professors: T. H. Garner, J. R. Lambert, J. T. Ligon, A. W. Snell, *Head;* B. K. Webb, T. V. Wilson

Associate Professors: C. L. Barth, J. T. Craig, C. E. Hood, Jr., E. B. Rogers, Jr.

AGM 205   PRINCIPLES OF FARM SHOP   3 cr. (2 and 3)

Principles, techniques, and methods in the selection, proper use and maintenance of hand and power tools. Principal topics include: welding, tool fitting, metalwork, woodworking, finishing and preserving, pipe fitting, and farm masonry.

AGM 206   AGRICULTURAL MECHANIZATION   3 cr. (2 and 3)

The agricultural student is taught to apply physical principles and sound reasoning to the mechanization of modern agricultural production and processing enterprises. Planning efficient operational systems and wise selection of equipment, based on function and economic suitability are stressed. *Prerequisite:* Math 103, 104, Phys 207.

AGM 301   SOIL AND WATER CONSERVATION   3 cr. (2 and 3)

Water management in agriculture is studied by applying principles of elementary surveying, mathematics and fluid flow as related to soil-water-vegetation complexes in erosion control, conservation, drainage, and irrigation.

AGM 303   CALCULATIONS FOR MECHANIZED AGRICULTURE   2 cr. (2 and 0)

A course dealing primarily with principles and techniques for solving problems associated with mechanized farming. Topics include the use of slide rules and nomographs, graphical presentation of results, and simple force analyses.

AGM 308   MECHANICAL AND HYDRAULIC SYSTEMS   3 cr. (2 and 3)

The characteristics, nomenclature, and arrangements of certain power transmission devices including mechanical linkages and power trains and hydraulic motors and supply circuits.

AGM 404   FARM STRUCTURES   3 cr. (2 and 3)

Farmstead planning, including space and environmental needs for livestock and poultry. Additional topics include elements of crop processing, materials handling, and animal waste disposal.

AGM 405, 605   ADVANCED INTEGRATED SHOP   3 cr. (2 and 3)

An advanced course in general shopwork, designed for vocational agriculture students interested in a unified vocational program. Topics include drawing, woodwork and building construction, concrete, masonry, and fabrication with metals.

AGM 408   EQUIPMENT SALES AND SERVICE   3 cr. (3 and 0)

Agricultural equipment sales and service techniques, inventory and accounting procedures followed by the farm machinery industry.

AGM 452, 652   FARM POWER   3 cr. (2 and 3)

A study of tractors with emphasis upon internal combustion engine principles and the support systems necessary for its proper functioning. The application of power, maintenance, adjustment, and general repair are also considered.

AGM 460, 660   FARM AND HOME UTILITIES   3 cr. (2 and 3)

A course for juniors, seniors, and graduate students in Agriculture and related curriculums, involving a study of electric and other utilities on the farm and in the home. Selection, installation, and maintenance of wiring systems, lighting systems, motors and controls, home water systems, and waste disposal systems are emphasized. *Prerequisite:* Junior standing and permission of instructor.

AGM 712   FARM MACHINERY MANAGEMENT   3 cr. (2 and 3)

AGM 733   ANALYSIS OF AGRISTRUCTURES   3 cr. (3 and 0)

AGM 781   SPECIAL TOPICS IN AGRICULTURAL MECHANIZATION 3 cr. (3 and 0)

Agriculture

Professors: B. D. Barnett, G. R. Craddock, W. M. Epps, S. B. Hays, J. W. Jones, W. A. King, W. J. Lanham, J. T. Lazar, Jr., T. L. Senn, A. W. Snell, R. F. Wheeler, W. P. Williams, Jr.

Associate Professors: J. B. Cooper, J. C. Hite, M. W. Jutras, B. J. Skelton, G. R. von Tungeln

Assistant Professor: J. C. McConnell, Jr.

AGRIC 101   INTRODUCTION TO AGRICULTURE   1 cr. (1 and 0) F

Guides to effectively study; agricultural sciences; scope of the agricultural industry; agriculture of South Carolina and the United States; organization and function of the land-grant institution and other agencies serving agriculture; career opportunities.

AGRIC 201   INTRODUCTION TO ANIMAL INDUSTRIES   3 cr. (2 and 3) F, S

Fundamental and descriptive aspects of the animal industries as applied biology and major segments of food production and distribution systems. The subject matter will be presented by Animal Science, Dairy Science, and Poultry Science Departments.

AGRIC 202, H202 INTRODUCTION TO PLANT SCIENCES 3 cr. (2 and 3) F, S

A fundamental course in plant sciences, including agronomic and horticultural crops of the major agricultural areas of the world, and emphasizing the crops of South Carolina. Included in the laboratory exercises are applications of the basic biological concepts of morphology, heredity, physiology and ecology to the production of food, fiber, and ornamentals for an expanding population. The laboratory exercises are mostly self-tutorial; the students take the labs on their own, any time during the semester at their own discretion. Admission to HONORS section by invitation.

AGRIC 301 INTERNATIONAL AGRICULTURE 3 cr. (3 and 0) F

This course is designed to acquaint the student with current international agriculture. Topics covered include: international agricultural production and consumption patterns, stage of agricultural and industrial development in various countries of the world, current and projected future production-consumption-population balance, world trade patterns in agricultural products, world agricultural marketing problems (including tariffs, balance of trade, import quotas, and common markets). Also included are allied subjects such as population trends and agricultural mechanization.

AGRIC 401 INTERNATIONAL AGRICULTURE SEMINAR 1 cr. (1 and 0) S

This seminar will be directed toward current topics in international agriculture. Seminar speakers will include invited guests from such agencies as the Foreign Agricultural Service, the Food and Agriculture Organization, the Ford Foundation, the Rockefeller Foundation, and the Agency for International Development. Other speakers will include staff members in the College of Agricultural Sciences that have had foreign assignments in their professional fields. Some sessions will be devoted specifically to employment opportunities in international agriculture.

AGRIC H491 SENIOR HONORS RESEARCH 3 cr. (1 and 6)

Senior Division Honors Research in an Agricultural Sciences curriculum. Open to approved Honors Program students only. In consultation with and under the direction of a professor, the student selects a research topic, conducts an experiment, and records the data. Research topic must be approved by the College Honors Program Committee. A professor-student discussion period of one hour will be arranged each week and will deal with selected topics. These topics will be taught by members of the College faculty with expertise in those fields related to the student's research interest. An oral presentation of the research will be given to the College Honors Program Committee.

AGRIC H492 SENIOR HONORS RESEARCH 3 cr. (1 and 6)

Senior Division Honors Research in an Agricultural Sciences curriculum. Continuation of Agric H491. A written report will be prepared by the student upon the termination of the research project and placed on file in the office of the Dean of the College of Agricultural Sciences. The professor-student discussion period of one hour each week will be continued and will deal with additional selected topics including the preparation of written research reports. An oral presentation of the research will be given to the College Honors Program Committee. *Prerequisite:* Agric H491.

Agronomy—Crops and Soils

Professors: G. R. Craddock, *Head;* B. J. Gossett, C. M. Jones, U. S. Jones, T. C. Peele

Associate Professors: E. B. Eskew, W. D. Graham, Jr., M. W. Jutras, K. S. LaFleur, J. D. Maxwell, J. R. Woodruff

Assistant Professor: E. F. McClain

AGRON 202   SOILS   3 cr. (2 and 2) F, S

A basic foundation in soil science is presented with emphasis on the chemical and physical properties of soil, the activities of the living soil organisms, and the origin and classification of soils. *Prerequisite:* Ch 101, 102, or a geology sequence including Geol 101 or permission of instructor.

AGRON 301, 601   FERTILIZERS   3 cr. (3 and 0) F

Mining, manufacture, and properties of minerals and chemicals that are sources of elements essential for plant growth. How these elements are taken by roots from the soil and converted to plants for food, fiber, shelter, and ornamentals.

AGRON 308, 608   SOIL AND PLANT ANALYSIS   3 cr. (1 and 6) S

A laboratory study of the physical and chemical properties of soils and methods of their determination. The relation of these properties to the potential fertility and management of soils is emphasized. Methods of plant analysis and the use of plant analysis data as a diagnostic tool in plant nutrition is also studied. *Prerequisite:* Agron 202.

AGRON 320, 620   FORAGE AND PASTURE CROPS   3 cr. (3 and 0) S

The characteristics, establishment, utilization and maintenance of crops for hay, silage, and pasture. Crops valuable in South Carolina are emphasized. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 322, 622   FORAGE CROPS LABORATORY   1 cr. (0 and 2) S

Identification, rating, and management of the important forage and pasture species of the Southeast. Research methodology is emphasized and a research problem required. *Prerequisite:* Agric 202.

AGRON 402, 602   LAND POLLUTION CONTROL   3 cr. (3 and 0)

Application of the principles of soil science to the use of land for the purpose of disposing of an ever increasing quantity of pollutants and wastes from an ever increasing population of animals, plants, and man. The practices now in use and their limitations will be discussed with regard especially to the maximum capacity of land to consume wastes and its ability to rejuvenate itself. A mission-oriented course to emphasize the quality of land and how it influences the lives of us all. *Prerequisite:* Agron 202, 403, or permission of instructor.

AGRON 403, 603   SOIL GENESIS AND CLASSIFICATION   2 cr. (1 and 3) F

Theoretical and practical phases of soil survey, formation and classification in relation to land usage and plant adaptability. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 405, 605   PLANT BREEDING   3 cr. (2 and 2) S

The application of genetic principles to the development of improved crop plants. Principal topics include the genetic and cytogenetic basis of plant

breeding, mode of reproduction, techniques in selfing and crossing, methods of breeding, inheritance in the major crops, and biometrical methods.

AGRON 407, 607   PRINCIPLES OF WEED CONTROL   3 cr. (2 and 2) F

Weeds, their introduction, ecology, methods of reproduction, dissemination, and control; chemistry and mode of action of herbicides, equipment and techniques of application; a characterization of the common weeds of the Southeast. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 410, 610   COTTON AND OTHER FIBER CROPS   2 cr. (2 and 0) S, '75 and alternate years.

History, morphology, physiology, and fundamental principles and practices of production, harvesting, marketing, processing, and utilization of cotton and certain other fiber crops. Emphasis will be placed on the effect of environmental and production factors as they affect fiber quality and subsequent utilization. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 411, 611   GRAIN CROPS   2 cr. (2 and 0) F, '74 and alternate years.

A fundamental study involving principles of production, harvesting, processing, marketing, and utilization of soybeans, corn, sorghum, and the small grains. Emphasis will be placed on factors affecting grain quality as related to utilization of grain. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 412, 612   TOBACCO AND SPECIAL USE CROPS   2 cr. (2 and 0) S, '74 and alternate years.

Principles involved in the production, harvesting, curing, grading, and marketing of high quality flue-cured tobacco. Brief coverage of special use crops, such as peanuts, sugar cane, etc. *Prerequisite:* Agric 202, Agron 202, or consent of instructor.

AGRON 452, 652   SOIL FERTILITY AND MANAGEMENT   2 cr. (2 and 0) S

Principles of crop rotations, soil fertility, soil management, and other factors necessary for the practical utilization of soils. *Prerequisite:* Agron 202 or consent of instructor.

AGRON 455, 655   SEMINAR   1 cr. (1 and 0) F

Student presentation of current agronomic topics of special interest in crop production appearing in recent scientific journals and other publications.

AGRON 456, 656   SEMINAR   1 cr. (1 and 0) S

Student presentation of current topics of special interest in the field of soil science appearing in recent scientific journals and other publications.

AGRON 801   CROP PHYSIOLOGY AND NUTRITION   3 cr. (3 and 0)

AGRON 802   PEDOLOGY AND SOIL CLASSIFICATION   3 cr. (2 and 3)

AGRON 804   THEORY AND METHODS OF PLANT BREEDING   3 cr. (3 and 0)

AGRON 805   SOIL FERTILITY   3 cr. (3 and 0)

AGRON 806   SPECIAL PROBLEMS.   Credit to be arranged.

AGRON 807   SOIL PHYSICS   3 cr. (2 and 3)

AGRON 808   SOIL CHEMISTRY   3 cr. (2 and 3)

AGRON 812   CROP ECOLOGY AND LAND USE   3 cr. (3 and 0)

AGRON 820   PESTICIDE RESIDUES IN THE ENVIRONMENT   3 cr. (3 and 0)

AGRON 825   SEMINAR   1 cr. (1 and 0)

AGRON 891   RESEARCH.   Credit to be arranged.

AGRON 991   DOCTORAL RESEARCH.   Credit to be arranged.

Animal Physiology

Professors: T. R. Adkins, Jr., B. D. Barnett, M.A. Boone,* S. B. Hays, J. R. Hill, Jr., W. A. King, G. C. Skelley, Jr., R. F. Wheeler

Associate Professors: J. F. Dickey, D. M. Henricks, J. E. Jones, A. S. Tombes

Assistant Professors: W. E. Bachop, C. A. Gauthreaux, Jr., Ruth L. Hays, J. C. McConnell, Jr., R. Noblet

(See courses listed under Animal Science, Dairy Science, Entomology, Poultry Science, and Zoology)

AN PH 801   ELECTRON MICROSCOPY OF ANIMAL AND PLANT TISSUES   3 cr. (1 and 6)

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 PH 805   PHARMACOLOGY   3 cr. (2 and 3)

AN PH 806   EXPERIMENTAL ANIMAL PHYSIOLOGY   3 cr. (1 and 6)

AN PH 807   SPECIAL PROBLEMS IN ANIMAL PHYSIOLOGY   1-3 cr.

AN PH 808   MAMMALIAN AND AVIAN ENDOCRINOLOGY   3 cr. (3 and 0)

AN PH 851   ANIMAL PHYSIOLOGY SEMINAR I   1 cr. (1 and 0)

AN PH 852   ANIMAL PHYSIOLOGY SEMINAR II   1 cr. (1 and 0)

AN PH 991   DOCTORAL RESEARCH.   Credit to be arranged.

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* On leave.

Animal Science

Professors: W. C. Godley, J. R. Hill, Jr., G. C. Skelley, Jr., R. F. Wheeler, *Head*

Associate Professors: R. L. Edwards, D. L. Handlin

Assistant Professor: J. C. McConnell, Jr.

AN SC 201   INTRODUCTION TO ANIMAL SCIENCE   2 cr. (2 and 0)

This course deals with basic principles concerning the breeding, feeding, management and marketing of beef cattle, swine, sheep, and horses.

AN SC 203   INTRODUCTION TO ANIMAL SCIENCE LABORATORY
1 cr. (0 and 3)

A course designed to demonstrate the basic elements of livestock breeding, feeding and management. Beef cattle, swine, sheep, and horses will be used. Evaluation of slaughter animals and carcasses is included.

AN SC 205   LIGHT HORSE MANAGEMENT   2 cr. (1 and 3)

The light horse industry—development of breeds and their uses. Breeding, feeding, and management of light horses. Fundamental instruction in equitation.

AN SC 301   FEEDS AND FEEDING   3 cr. (3 and 0) F, S

Feed nutrients, digestion, metabolism of feed stuffs, nutritive ratios, feeding standards, and the balancing of rations. *Prerequisite:* An Sc 201, 203 or equivalent, and Ch 201 or consent of instructor.

AN SC 303   FEEDS AND FEEDING LABORATORY   1 cr. (0 and 3) S

Practical work in mixing and balancing rations and identifying feed stuffs. *Prerequisite:* An Sc 201, 203 or equivalent, and Ch 201, or consent of instructor.

AN SC 305   MEAT GRADING AND SELECTION   2 cr. (1 and 3)
F, '74 and alternate years.

Classification, grading and selection of beef, lamb and pork carcasses, and wholesale cuts. Factors influencing quality and value. Students enrolled in this course are eligible to compete in Intercollegiate Meat Judging Contests. *Prerequisite:* An Sc 201, 203.

AN SC 306   LIVESTOCK SELECTION AND EVALUATION   2 cr.
(1 and 3) S

Selection, breed characteristics and grading of beef cattle, sheep and swine. Students enrolled in this course are eligible to compete in the Southeastern Intercollegiate Livestock Judging Contest. *Prerequisite:* An Sc 201, 203.

AN SC 351   MEAT IDENTIFICATION AND UTILIZATION   1 cr.
(0 and 3)

Selection of meat and identification of cuts, processing techniques, nutritive value, meat preservation, research techniques, muscles, and bones.

AN SC 353   MEATS   2 cr. (2 and 0) F

The chemical and physical composition of meat, meat hygiene; nutritive value; curing; freezing; and meat by-products. *Prerequisite:* An Sc 201, 203.

AN SC 355   MEATS LABORATORY   1 cr. (0 and 3) F

The selection and grading of meat animals and carcasses. Practical work in slaughtering of animals and in the cutting, curing, and freezing of meats. Emphasis is placed on the identification of wholesale and retail cuts. *Prerequisite:* An Sc 201, 203.

AN SC 401, 601   BEEF PRODUCTION   3 cr. (3 and 0) F

Breeding, feeding, management, and grading of beef cattle. Emphasis is placed on year-round grazing. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 403, 603   BEEF PRODUCTION LABORATORY   1 cr. (0 and 3) F

Practical application of beef production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 405   ADVANCED LIVESTOCK SELECTION AND EVALUATION   1 cr. (0 and 3) F, '73 and alternate years.

A continuation of An Sc 306 for students who are interested in participating in judging contests or in receiving special training in the selection of breeding cattle, sheep, and swine. Judging and grading of market classes are considered. *Prerequisite:* An Sc 306.

AN SC 406   SEMINAR   2 cr. (2 and 0) S

Special problems in animal production. Each student is given a subject on which he makes weekly reports before a seminar group. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 408, 608   PORK PRODUCTION   3 cr. (3 and 0) S

Feeding, breeding, management, and marketing of hogs. Emphasis is placed on winter and summer forages, protein supplements, mineral mixtures, and sanitation practices. In laboratory grading, selection, feeding, management and care of swine is given attention. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 410, 610   PORK PRODUCTION LABORATORY   1 cr. (0 and 3) S

Practical application of swine production practices. *Prerequisite:* An Sc 301 or consent of instructor.

AN SC 412   HORSE SCIENCE   3 cr. (2 and 3)

Anatomy and physiology of the horse, emphasizing nutrition, reproduction, genetics, and management. Selection, unsoundness, parasites, and diseases are discussed.

AN SC 452, 652   ANIMAL BREEDING   3 cr. (3 and 0) S

The fundamental principles relating to the breeding and improvement of livestock including variation, heredity, selection line-breeding, inbreeding, crossbreeding, and other related subjects.

AN SC 802   TOPICAL PROBLEMS   1-3 cr. (1-3 and 0)

AN SC 803   MEAT TECHNOLOGY   3 cr. (3 and 0)

AN SC 804   METHODS IN ANIMAL BREEDING   3 cr. (3 and 0)

AN SC 805   NUTRITION OF MEAT ANIMALS   3 cr. (3 and 0)

AN SC 891   RESEARCH.   Credit to be arranged.

Architecture

Professors: H. E. McClure, G. C. Means, Jr., J. L. Young

Associate Professors: K. E. Carpenter, J. E. Dalton, R. D. Eflin, M. D. Egan, P. Lee, W. A. Phillips, K. J. Russo, J. R. Washburn, G. B. Witherspoon, *Head*

Assistant Professors: D. L. Collins, H. B. Gantt, F. K. Mooney

Instructor: R. L. Chartier

Visiting Professor: T. K. Doruk

Visiting Associate Professor: A. Macgregor

Visiting Assistant Professor: D. W. Hutchinson

ARCH 101   ARCHITECTURAL ANALYSIS   3 cr. (1 and 6)

An introduction to the elements of architecture with lectures, demonstrations, and limited studio exercises conducted by representative faculty of the major study areas of the College of Architecture.

ARCH 102   ARCHITECTURAL ANALYSIS   3 cr. (1 and 6)

Continuation of Arch 101.

ARCH 253   ARCHITECTURAL DESIGN I   5 cr. (0 and 15)

Studio work with adjunct demonstrations and lectures concerned with basic architectural design problems. *Prerequisite:* Arch 102 or permission of instructor.

ARCH 254   ARCHITECTURAL DESIGN II   5 cr. (0 and 15)

Continuation of Arch 253.

ARCH 331   ARCHITECTURAL APPLICATIONS OF COMPUTER SCIENCE   2 cr. (2 and 0)

A two-semester course sequence, including computer theory and programming. Architectural applications of the computer as a resource will be studied, including use in problem solving in functional relationships of space, materials performance specifications, structural design and graphic usage.

ARCH 332   ARCHITECTURAL APPLICATIONS OF COMPUTER SCIENCE   2 cr. (2 and 0)

A continuation of Arch 331. *Prerequisite:* Arch 331.

ARCH 353   ARCHITECTURAL DESIGN III   5 cr. (0 and 15)

Studio work with adjunct demonstrations and lectures concerned with intermediate architectural design problems. *Prerequisite:* Arch 254.

ARCH 354   ARCHITECTURAL DESIGN IV   5 cr. (0 and 15)

Continuation of Arch 353.

ARCH 403, 603   SEMINAR IN THE ANALYSIS AND CRITICISM OF ARCHITECTURAL AND TOWN BUILDING WORKS   3 cr. (3 and 0)

A seminar in the analysis and criticism of architectural and town building works. The course sequence will include historic and contemporary examples, literary searches, field trips, essays, and oral reports. *Prerequisite:* Fourth year design standing or permission of instructor.

ARCH 421   ARCHITECTURAL SEMINAR   2 cr. (2 and 0)

A seminar dealing with pertinent topics related to environmental and technological considerations in architecture and the building industry. Conducted

by representative faculty of the College of Architecture. *Prerequisite:* Senior standing or permission of instructor.

ARCH 422   ARCHITECTURAL SEMINAR   2 cr. (2 and 0)
Continuation of Arch 421.

ARCH 453   ARCHITECTURAL DESIGN V   5 cr. (0 and 15)
Studio work with adjunct demonstrations and lectures concerned with advanced architectural design problems. *Prerequisite:* Arch 354.

ARCH 454   ARCHITECTURAL DESIGN VI   5 cr. (0 and 15)
Continuation of Arch 453.

ARCH 475, 675   MECHANICAL PLANT   3 cr. (3 and 0)
The water supply, plumbing, heating and ventilating systems of present-day buildings.

ARCH 476, 676   MECHANICAL PLANT   3 cr. (3 and 0)
Air-conditioning, electrical systems, lighting, mechanical transportation and acoustics as applied to contemporary buildings.

ARCH 481, 681   ARCHITECTURAL OFFICE PRACTICE   3 cr. (3 and 0)
General consideration of architectural office procedure. Study of the professional relationship of the architect to client and contractor, including problems of ethics, law, and business.

ARCH 482, 682   ARCHITECTURAL OFFICE PRACTICE   3 cr. (3 and 0)
A continuation of Arch 481.

ARCH 485, 685   HEALTH CARE DELIVERY SYSTEMS AND HEALTH CARE FACILITIES SEMINAR   3 cr. (3 and 0)
This course introduces the concepts, organization, and direction of health and health care services within the context of health care delivery systems. Special emphasis is placed on mental and physical health care facilities concepts.

ARCH 488, 688   HEALTH CARE FACILITIES PROGRAMMING TECHNIQUES   3 cr. (2 and 3)
Seminar on recent research and innovations in health care facilities programming, and original investigation of assigned programming problems.

ARCH 490   DIRECTED STUDIES   1-5 cr.
Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in architecture.

ARCH 853   ARCHITECTURAL STUDIES   6 cr. (0 and 18)

ARCH 854   ARCHITECTURAL STUDIES   6 cr. (0 and 18)

ARCH 857   ARCHITECTURAL STUDIES   9 cr. (0 and 27)

ARCH 861   CONSTRUCTION ECONOMIC SEMINAR   3 cr. (3 and 0)

ARCH 881   ARCHITECTURAL STRUCTURAL SEMINAR   3 cr. (3 and 0)

ARCH 882   ARCHITECTURAL STRUCTURAL SEMINAR   3 cr. (3 and 0)

ARCH 883   ARCHITECTURAL STRUCTURAL SEMINAR   3 cr. (3 and 0)

ARCH 886   HEALTH CARE FACILITIES COMPONENTS AND FUNCTIONS   3 cr. (2 and 3)

ARCH 890   DIRECTED STUDIES   1-5 cr.

ARCH 891   ARCHITECTURAL THESIS   3-15 cr.

Art and Architectural History

Professors: H. N. Cooledge, Jr., V. S. Hodges, R. H. Hunter

Associate Professors: J. T. Acorn, R. D. England, T. E. McPeak, *Head;* I. G. Regnier, S. Wang

Instructor: T. G. Turner, Jr.

AAH 215   ARCHITECTURAL HISTORY I   3 cr. (3 and 0)

Total Environment: its demands and restrictions, as evidenced by the building and planning of men from ancient times to the present.

AAH 216   ARCHITECTURAL HISTORY II   3 cr. (3 and 0)

Continuation of AAH 215.

AAH 302   ART AND ARCHITECTURE TOUR   3 cr. (3 and 0)

A tour of selected cities, either foreign or American, will be organized periodically primarily in a Summer Session. The purpose of the tour is to provide students with firsthand experience with the dynamic qualities of original works of painting and sculpture and especially the spatial qualities of architecture and the relationships of great works of architecture to their environment. The tour will be accompanied by lectures and will require examinations and/or reports.

AAH 303   THE EVOLUTION OF THE VISUAL ARTS   3 cr. (3 and 0)

A consideration of man's necessity for and development of the visual arts with particular attention to the environmental factors in society which demand art as a medium of communication. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* Sophomore standing.

AAH 304   THE EVOLUTION OF THE ENVIRONMENTAL ARTS   3 cr. (3 and 0)

A consideration of man's necessity for and development of the environmental arts (Architecture, Landscape Architecture, City and Regional Planning) with particular attention to the total environment of man and its demands and restrictions upon the architect and planner. Illustrated lectures and collateral reading. Not open, except by special permission, to students in the College of Architecture. Preference to students in Education. *Prerequisite:* AAH 303 or permission of instructor.

AAH 315   ARCHITECTURAL HISTORY III   3 cr. (3 and 0)

Cultural Focus: its problems and expression, as evidenced by selected examples of architecture and planning from ancient times to the present, considered in depth.

AAH 316   ARCHITECTURAL HISTORY IV   3 cr. (3 and 0)

Continuation of AAH 315.

AAH 411, 611   DIRECTED RESEARCH IN ART HISTORY   3 cr.
(3 and 0)

Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in art history.

AAH 412, 612   DIRECTED RESEARCH IN ART HISTORY   3 cr.
(3 and 0)

Continuation of AAH 411.

AAH 413, 613   TWENTIETH CENTURY VISUAL ARTS   3 cr. (3 and 0)

A seminar course dealing with twentieth century visual art forms in relation to the factors that have influenced the artist and the consequence of his production on society.

AAH 417   STUDIES IN THE ART AND ARCHITECTURE OF THE
ANCIENT WORLD I   3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome), with a study in depth of selected examples from the period.

AAH 418   STUDIES IN THE ART AND ARCHITECTURE OF THE
ANCIENT WORLD II   3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Ancient World (Egypt, the Near East, Greece, and Rome), with a study in depth of selected examples from the period.

AAH 419   STUDIES IN THE ART AND ARCHITECTURE OF THE
EARLY MIDDLE AGES I   3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th centuries), with a study in depth of selected examples from the period.

AAH 420   STUDIES IN THE ART AND ARCHITECTURE OF THE
EARLY MIDDLE AGES II   3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Early Middle Ages (Byzantium and Western Europe from the 4th through 12th centuries), with a study in depth of selected examples from the period.

AAH 421   STUDIES IN THE ART AND ARCHITECTURE OF THE
LATE MIDDLE AGES I   3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th centuries), with a study in depth of selected examples from the period.

AAH 422   STUDIES IN THE ART AND ARCHITECTURE OF THE
LATE MIDDLE AGES II   3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Late Middle Ages (Western Europe from the 12th to the 15th centuries), with a study in depth of selected examples from the period.

AAH 423   STUDIES IN THE ART AND ARCHITECTURE OF THE
RENAISSANCE I   3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Renaissance (Western Europe from the 15th through the 18th centuries), with a study in depth of selected examples from the period.

AAH 424 STUDIES IN THE ART AND ARCHITECTURE OF THE
RENAISSANCE II 3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the
Renaissance (Western Europe from the 15th through the 18th centuries), with
a study in depth of selected examples from the period.

AAH 425 STUDIES IN THE ART AND ARCHITECTURE OF THE
TECHNOLOGICAL REVOLUTION I 3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Tech-
nological Revolution (Western Europe and America from 1685 to 1935), with
a study in depth of selected examples from the period.

AAH 426 STUDIES IN THE ART AND ARCHITECTURE OF THE
TECHNOLOGICAL REVOLUTION II 3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of the Tech-
nological Revolution (Western Europe and America from 1685 to 1935), with
a study in depth of selected examples from the period.

AAH 427 STUDIES IN THE DEVELOPMENT OF ARCHITECTURAL
TECHNOLOGY I 3 cr. (3 and 0)

A consideration of the development of architectural technology from ancient
through contemporary times with a study in depth of selected examples from
each period.

AAH 428 STUDIES IN THE DEVELOPMENT OF ARCHITECTURAL
TECHNOLOGY II 3 cr. (3 and 0)

A consideration of the development of architectural technology from ancient
through contemporary times with a study in depth of selected examples from
each period.

AAH 429 STUDIES IN THE ART AND ARCHITECTURE OF INDIA
AND THE FAR EAST I 3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of India and
the Far East, with a study in depth of selected examples from the period.

AAH 430 STUDIES IN THE ART AND ARCHITECTURE OF INDIA
AND THE FAR EAST II 3 cr. (3 and 0)

A consideration of the visual arts and architectural monuments of India and
the Far East, with a study in depth of selected examples from the period.

AAH 815 HISTORY SEMINAR I 3 cr. (3 and 0)

AAH 816 HISTORY SEMINAR II 3 cr. (3 and 0)

Astronomy

Associate Professors: Beverly B. Bookmyer, J. R. Ray
Assistant Professor: T. F. Collins

ASTR 201 SOLAR SYSTEM ASTRONOMY 3 cr. (3 and 0)

A nonmathematical survey of the universe, with emphasis on the objects in
our solar system. Related topics of current interest will be included. For
nonscience majors.

ASTR 202 STELLAR ASTRONOMY 3 cr. (3 and 0)

A nonmathematical survey of the universe, with emphasis on galactic and
extragalactic objects outside our solar system. Related topics of current inter-
est will be included. For nonscience majors.

ASTR 203   SOLAR SYSTEM ASTRONOMY LABORATORY   1 cr.
(0 and 2)

Optional laboratory to accompany Astr 201. An introduction to lunar, stellar, and planetary observing for an understanding of the various celestial objects. Demonstrations, laboratory exercises, and planetarium visits will supplement the lecture course. Field trip to Fernbank Science Center. *Prerequisite:* Registration in Astr 201.

ASTR 204   STELLAR ASTRONOMY LABORATORY   1 cr. (0 and 2)

Optional laboratory to accompany Astr 202. Introduction to the astronomical techniques that are used to gain knowledge of our universe. Demonstrations, laboratory exercises, and planetarium visits will supplement the lecture courses. Field trip to Fernbank Science Center. *Prerequisite:* Registration in Astr 202.

ASTR 301   GENERAL ASTRONOMY   3 cr. (3 and 0)

A study of the astronomical universe for physical science, mathematics or engineering majors. The solar system and celestial coordinates will be emphasized. Planetarium visits and night observing sessions will supplement the text. *Prerequisite:* One year of college physics.

ASTR 302   GENERAL ASTRONOMY   3 cr. (3 and 0)

A study of stellar and galactic astronomy. A brief introduction to cosmology will be included. *Prerequisite:* One year of college physics.

ASTR 307   COSMOLOGY   3 cr. (3 and 0)

A study of the large-scale structure of the universe. Discussion of experimental results includes optical, microwave, and radio observations. Evolutionary models which agree with current observations are discussed. *Prerequisite:* Astr 202.

ASTR 404, 604   ASTRODYNAMICS   3 cr. (3 and 0)

Astronomical coordinate systems, orbit determinations, multiple body problems, perturbations, nongravitational and relativistic effects and observational theory. Special attention to problems of artificial satellites. *Prerequisite:* Phys 321.

ASTR 407, 607   INTRODUCTION TO ASTROPHYSICS   3 cr. (3 and 0)

Selected topics in astrophysics including motions and magnitudes of stars, radiation laws, and details of stellar spectra. *Prerequisite:* Astr 302 or permission of instructor.

ASTR 408, 608   INTRODUCTION TO GALACTIC ASTRONOMY   3 cr.
(3 and 0)

Survey of the fundamental observational data necessary to an understanding of the structure of our Milky Way system. Emphasis on the physical properties of stars, stellar distribution, distance determination, and solar motion. *Prerequisite:* Astr 302 or permission of instructor.

ASTR 412, 612   SPHERICAL ASTRONOMY   3 cr. (3 and 0)

Selected topics in spherical astronomy, including the applications of spherical trigonometry to the celestial sphere. Time, refraction, aberration, precession, nutation, stellar motions, and instrumental errors will be discussed. *Prerequisite:* Astr 302.

ASTR 421, 621   INTRODUCTION TO RADIO ASTRONOMY   3 cr.
(3 and 0)

A survey of the fundamentals of radio astronomy. Wave propagation, polarization, emission mechanisms and receiver characteristics are discussed. A

summary of astronomical radio sources will be included. *Prerequisite:* Astr 302.

ASTR 704 ASTRONOMY FOR HIGH SCHOOL TEACHERS 3 cr. (3 and 0)

Biochemistry

Professor: J. M. Shively, *Head*
Associate Professor: D. M. Henricks
Assistant Professors: J. J. Jen, G. L. Powell, J. K. Zimmerman
Adjunct Associate Professor: D. E. Turk

BIOCH 101 MOLECULES AND MAN 1 cr. (1 and 0)
An introduction to the structure and function(s) or effect(s) of some biological molecules important to man.

BIOCH 102 MOLECULES AND MAN 1 cr. (1 and 0)
An introduction to the structure and function(s) or effect(s) of some biological molecules important to man.

BIOCH 210 ELEMENTARY BIOCHEMISTRY 4 cr. (3 and 3)
A discussion of the kinds of compounds found in living organisms, their biochemical reactions and significance. The laboratory work parallels classroom study. *Prerequisite:* Ch 102.

BIOCH 301 MOLECULAR BIOLOGY 3 cr. (3 and 0)
An introduction to the nature, production, and replication of biological structure at the molecular level, and its relation to function. *Prerequisite:* Organic chemistry.

BIOCH 406, 606 PHYSIOLOGICAL CHEMISTRY 4 cr. (3 and 3)
The chemical basis of the mammalian physiological processes of muscle contraction, nerve function, respiration, kidney function, and blood homeostasis is studied. Composition of specialized tissue such as muscle, nerve, blood and bone, and regulation of water, electrolytes and acid-base balance is discussed. This course is oriented toward the student who needs an introduction to certain aspects of mammalian biochemistry to more fully understand a related discipline. *Prerequisite:* Bioch 210 or organic chemistry.

BIOCH 423, 623 PRINCIPLES OF BIOCHEMISTRY 3 cr. (3 and 0)
The study of the organic chemistry of amino acids, monosaccharides, fatty acids, purines, pyrimidines and associated compounds lead to a fuller understanding of the chemical properties of proteins. carbohydrates, lipids, and nucleic acids that made them so important in biological processes. Relationships between the structure and function of these molecules and the modern techniques used to establish them are stressed. *Prerequisite:* Ch 224 or equivalent.

BIOCH 424, 624 PRINCIPLES OF BIOCHEMISTRY 3 cr. (3 and 0)
A continuation of Bioch 423.

BIOCH 425, 625 GENERAL BIOCHEMISTRY LABORATORY 1 cr. (0 and 3)
Experiments selected to illustrate current methods used in biochemical research.

BIOCH 426, 626 GENERAL BIOCHEMISTRY LABORATORY 1 cr. (0 and 3)

A continuation of Bioch 425.

BIOCH 491 SPECIAL PROBLEMS IN BIOCHEMISTRY 1-3 cr. (0 and 3-9)

Orientation, i. e., experimental planning, execution, and reporting in biochemical research. *Prerequisite:* Senior standing.

BIOCH 810 ADVANCED BIOCHEMICAL TECHNIQUES 1-3 cr. (0 and 3-9)

BIOCH 815 LIPIDS 2 cr. (2 and 0)

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

BIOCH 819 INTERMEDIARY METABOLISM 3 cr. (3 and 0)

BIOCH 820 NUCLEIC ACIDS 2 cr. (2 and 0)

BIOCH 821 PROTEINS 2 cr. (2 and 0)

BIOCH 822 ENZYMES 3 cr. (3 and 0)

BIOCH 823 CARBOHYDRATES 2 cr. (2 and 0)

BIOCH 831 PHYSICAL BIOCHEMISTRY 3 cr. (3 and 0)

BIOCH 851 BIOCHEMISTRY SEMINAR 1 cr. (1 and 0)

BIOCH 852 BIOCHEMISTRY SEMINAR 1 cr. (1 and 0)

BIOCH 871 ADVANCED TOPICS 1-3 cr. (1-3 and 0)

BIOCH 891 RESEARCH. Credit to be arranged.

BIOCH 991 DOCTORAL RESEARCH. Credit to be arranged.

Bioengineering

Professors: D. W. Bradbury, D. F. Bruley, H. R. Bungay, III, R. C. Harshman, S. F. Hulbert, L. C. Wilcox, M. L. Wolla, T. T. Yang

Associate Professors: W. E. Castro, F. W. Cooke, *Head;* B. E. Gilliland, J. S. Wolf

Assistant Professors: D. C. Amoss, J. J. Klawitter, J. S. Love, Jr., D. D. Moyle, B. W. Sauer, A. M. Weinstein

Adjunct Professors: J. S. Dusenbury, Jr., T. S. Hargest, R. R. Moore, J. R. Pruitt, F. H. Stelling, R. G. Topazian

Visiting Professor: S. Lyng

Visiting Assistant Professor: R. B. Leonard

BIOE 301 ENGINEERING ASPECTS OF BIOLOGY AND MEDICINE 2 cr. (2 and 0)

The relationships of various branches of engineering to biology and medicine. Structural engineering fluid flow, and mass transfer in living systems. Artificial organs, biomaterials, implants, instrumentation, microbial systems, and other engineering challenges are discussed.

BIOE 302 BIOMATERIALS 2 cr. (2 and 0)

Engineering testing and classification of biomaterials (stress, strain, viscosity, impact resistance, ductility, corrosion resistance, wear resistance); pros-

theses; artificial organs; effect of body environment on synthetic materials; methods for designing new materials. *Prerequisite:* BioE 301.

BIOE 303   ARTIFICIAL ORGANS   3 cr. (3 and 0)

This course is designed to provide engineering, and biological and physical science students with an insight into the problems associated with replacing parts of the human body with artificial devices. Lectures will be supplemented with demonstrations, medical films, and field trips. *Prerequisite:* Junior standing or consent of instructor.

BIOE 305   SURVEY OF MICROBIAL PROCESS ENGINEERING   2 cr. (2 and 0)

The importance of microbial processes to ecology, pollution, industry, and inexpensive foods. Descriptions of large-scale processes. Prospects for unconventional protein sources. Biochemical engineering, elementary process design, mass transfer problems, simple computer models, economic significance, and environmental consequences. *Prerequisite:* BioE 301.

BIOE 320   INTRODUCTION TO STRUCTURAL BIOMECHANICS   2 cr. (2 and 0)

An introduction to the analysis of the mechanical functions of the human body and of devices such as braces and artificial limbs. Topics will include movement of the musculoskeletal system (walking, throwing, grasping), effect of vibration and impact on the body (crash accidents, pilot ejection, jumping, contact sports), function of mechanical assist devices. *Prerequisite:* BioE 301.

BIOE 401, 601   COMPUTERS FOR BIOSCIENTISTS   1 cr. (1 and 0)

Analog and digital simulation of biochemical and biological processes. Systems approaches, dynamic analysis, interactions between laboratory research and computer models. *Prerequisite:* One semester of calculus or permission of instructor.

BIOE 402, 602   MEDICAL APPLICATIONS OF ENGINEERING SCIENCE   3 cr. (3 and 0)

A survey of the applications of physical principles to health science. Topics included are X-radiation, production and detection of X-rays, diagnostic radiology and radiation therapy, radioactivity, nature of radioactive emissions, relative biological effectiveness (RBE) and linear energy transfer, nuclear medicine, high energy and particle therapy, radiobiology, radiation damage, survival curves, radiation protection, surgical uses of lasers, cryogenics, cryobiology and cryosurgery, electronic techniques and ultrasound. *Prerequisite:* General chemistry.

BIOE 450, 650   SPECIAL TOPICS IN BIOMEDICAL ENGINEERING   1-4 cr. (0-4 and 12-0)

A comprehensive study of a topic of current interest in the field of biomedical engineering. May be taken for credit more than one time. *Prerequisite:* Permission of instructor.

BIOE 460   BIO-PROCESS DEVELOPMENT   2 cr. (1 and 3)

Theory and practice process development for biological operations such as vaccine production, fermentation, microbial conversions, and product isolation. *Prerequisite:* One semester of organic chemistry.

BIOE 800   SEMINAR IN BIOENGINEERING   1 cr. (1 and 0)

BIOE 801   BIOMATERIALS   3 cr. (3 and 0)

BIOE 802   RESEARCH TECHNIQUES IN BIOMATERIALS
EVALUATION   3 cr. (1 and 6)

BIOE 803   POLYMERS AS BIOMATERIALS   3 cr. (3 and 0)

BIOE 810   BIOCHEMICAL ENGINEERING   3 cr. (3 and 0)

BIOE 812   BIOELECTROCHEMISTRY   3 cr. (3 and 0)

BIOE 820   STRUCTURAL BIOMECHANICS   3 cr. (3 and 0)

BIOE 846   ELEMENTS OF BIOENGINEERING I   3 cr. (3 and 0)

BIOE 847   ELEMENTS OF BIOENGINEERING II   3 cr. (3 and 0)

BIOE 850   SPECIAL TOPICS IN BIOMEDICAL ENGINEERING   3 cr.
(3 and 0)

BIOE 860   ECOLOGICAL MODELS   3 cr. (2 and 3)

BIOE 870   BIOINSTRUMENTATION   3 cr. (2 and 2)

BIOE 871   BIOELECTRIC PHENOMENA   3 cr. (2 and 2)

BIOE 891   RESEARCH.   Credit to be arranged.

BIOE 980   INTERNSHIP   1-5 cr. (5-0 and 0-40)

BIOE 991   DOCTORAL RESEARCH.   Credit to be arranged.

Biology

BIOL 100   INTRODUCTION TO THE BIOLOGICAL SCIENCES   1 cr.
(1 and 0)

A brief description (degrees, curriculum, opportunities, etc.) of each of
the biological science disciplines: biochemistry, botany, microbiology, zoology.

BIOL 801   ELECTRON MICROSCOPY OF BIOLOGICAL MATERIAL
3 cr. (3 and 0)

Botany

Professors: R. P. Ashworth, A. C. Mathews, C. J. Umphlett, *Head;* J. B.
Whitney, Jr.

Assistant Professors: C. R. Dillon, J. E. Fairey, III, T. M. McInnis, Jr.

Adjunct Associate Professor: N. D. Camper

BOT 101   PLANT BIOLOGY   3 cr. (3 and 0)

Studies of basic biological concepts and principles as exemplified by classi-
cal and modern investigations of plants including developmental, functional,
ecological, and evolutionary considerations.

BOT 103   PLANT BIOLOGY LABORATORY   1 cr. (0 and 2)

Observation, demonstration and experimentation in the biology of plants
to illustrate developmental, functional, ecological, and evolutionary principles
through the study of selected species of plants.

BOT 145   ENVIRONMENTAL DYNAMICS   2 cr. (2 and 0)

A nontechnical, nonlaboratory course designed to instill a sense of appre-
ciation for the finiteness of our planet and the extent to which it may be

exploited. Introduction will be made to basic concepts underlying population growth characteristics, genetic adaptations, energy relationships between producers and consumers, the description of pollutants and their causes and effects. A survey will be made of the various types of environments.

BOT 202   SURVEY OF THE PLANT KINGDOM   4 cr. (3 and 3)

A survey of the major groups of plants, their structure, development, and reproduction. Evolutionary relationships as exemplified by comparisons of body organization and life cycles will be emphasized. *Prerequisite:* Bot 101.

BOT 331, 631   INTRODUCTORY PLANT TAXONOMY   3 cr. (2 and 3)

The identification, classification, distribution, and interrelationships of vascular plants, with emphasis on the flora of South Carolina. *Prerequisite:* Bot 101, 103.

BOT 352, H352, 652   PLANT PHYSIOLOGY   4 cr. (3 and 3)

The relations and processes which have to do with the maintenance, growth and reproduction of plants, including absorption of matter and energy, water relations of the plant, utilization of reserve products and liberation of energy. Admission to HONORS section by invitation. *Prerequisite:* Bot 101, Ch 101, 102, Phys 207, or 221, and 223.

BOT 355   HISTOLOGY   2 cr. (0 and 6)

The principles of fixing, cutting and staining plant tissues and the various other processes of micro-technique and their application to specific forms of plants with emphasis on the flora of South Carolina. *Prerequisite:* Bot 101.

BOT 404, H404, 604   CYTOLOGY   3 cr. (3 and 0)

A detailed consideration of the morphology and ultrastructure of cells. Admission to HONORS section by invitation. *Prerequisite:* Bot 352, Zool 101, 103, or permission of instructor.

BOT 406, H406, 606   PLANT ANATOMY   3 cr. (2 and 3)

The origin and development of the organs and tissue systems of vascular plants and a comparative study of the structure of roots, stems, leaves, flowers, and fruits. Admission to HONORS section by invitation. *Prerequisite:* Bot 101.

BOT 446, 646   BIOLOGICAL OCEANOLOGY   4 cr. (3 and 3)

A study of the biological constituents of the oceans and the chemical and physical characteristics of salt water as related to the marine biota. Laboratories will provide practical experience in the analysis of biological communities and the physical-chemical factors controlling them. *Prerequisite:* Bot 202, Zool 201, general chemistry, or permission of instructor.

BOT 451, 651   MORPHOLOGY OF THE FUNGI   3 cr. (2 and 3)

The morphology and taxonomy of the fungi, with special emphasis on species of economic importance. *Prerequisite:* Bot 101.

BOT 455   VASCULAR PLANT MORPHOLOGY   3 cr. (2 and 3)

Consideration of the structure, reproduction, and phylogenetic relationships of representative vascular plants. *Prerequisite:* Bot 101, 202.

BOT 457, H457, 657   PHYCOLOGY   3 cr. (2 and 3)

The taxonomy, morphology, and ecology of freshwater algae with emphasis on the local flora. Admission to HONORS section by invitation. *Prerequisite:* Bot 101 or permission of instructor.

BOT 459, H459, 659   PLANT ECOLOGY   3 cr. (2 and 3)
The fundamental principles of the relations between plants and their environment. Although autecology is discussed, the basic emphasis throughout the course is synecology. Admission to HONORS section by invitation. *Prerequisite:* Bot 101.

BOT 491   SPECIAL PROBLEMS IN BOTANY   2 cr. (0 and 6)
Research problems in selected areas of botany to provide an introduction to research planning and techniques for Botany majors. *Prerequisite:* Senior standing and permission of the department head.

BOT 701   EVOLUTIONARY BOTANY FOR TEACHERS   4 cr. (3 and 3)

BOT 702   MODERN BOTANICAL CONCEPTS FOR TEACHERS   2 cr. (2 and 0)

BOT 802   MYCOLOGY   4 cr. (3 and 3)

BOT 805   SPECIAL PROBLEMS IN BOTANY.   Credit to be arranged.

BOT 807   SEMINAR   1 cr. (1 and 0)

BOT 811   INORGANIC PLANT METABOLISM   4 cr. (3 and 3)

BOT 812   ORGANIC PLANT METABOLISM   3 cr. (3 and 0)

BOT 813   PLANT GROWTH AND DEVELOPMENT   3 cr. (3 and 0)

BOT 814   MODE OF ACTION OF PLANT GROWTH REGULATING CHEMICALS   4 cr. (3 and 3)

BOT 821   PLANT TAXONOMY I   4 cr. (2 and 6)

BOT 822   PLANT TAXONOMY II   4 cr. (2 and 6)

BOT 891   RESEARCH.   Credit to be arranged.

BOT 991   DOCTORAL RESEARCH.   Credit to be arranged.

Building Science

Associate Professors: L. H. Brown, J. L. Clark, R. D. Eflin, M. D. Egan, R. E. Knowland, *Head;* M. G. Melaragno

Instructor: C. L. Addison

Adjunct Assistant Professor: C. R. Mitchell

BLDSC 201   BUILDING SCIENCE I   3 cr. (3 and 0)
Analysis of physical and environmental requirements of architectural spaces. Consideration of factors and resources involved in the selection of systems materials and controls.

BLDSC 202   BUILDING SCIENCE II   3 cr. (3 and 0)
Continuation of BldSc 201.

BLDSC 241   CONSTRUCTION ORGANIZATIONS AND ESTIMATING   5 cr. (2 and 9)
An introduction to the construction process. Evaluation of plans, specifications and resource requirements and preparations of detailed quantity surveys.

BLDSC 242   CONSTRUCTION PLANNING AND SCHEDULING   5 cr. (2 and 9)
Study and analysis of construction projects with specific emphasis on resource planning and manual methods for critical path scheduling. *Prerequisite:* BldSc 241.

BLDSC 301   BUILDING SCIENCE III   3 cr. (3 and 0)
Theory and design of simple, determinate structures and the design of environmental systems and controls.

BLDSC 302   BUILDING SCIENCE IV   3 cr. (3 and 0)
Continuation of BldSc 301. *Prerequisite:* BldSc 202.

BLDSC 341   CONSTRUCTION DATA SYSTEMS   5 cr. (2 and 9)
An introduction to machine programming. Emphasis on construction applications of data processing equipment and the utilization of existing information systems. *Prerequisite:* BldSc 242.

BLDSC 342   CONSTRUCTION LABOR MANAGEMENT   5 cr. (2 and 9)
A study of labor-management relations in the construction industry. Evaluation of productivity, incentive methods and bargainings processes. *Prerequisite:* Junior standing.

BLDSC 401   BUILDING SCIENCE V   4 cr. (3 and 3)
A study of complex structural and environmental systems. *Prerequisite:* BldSc 302.

BLDSC 402   BUILDING SCIENCE VI   4 cr. (3 and 3)
Continuation of BldSc 401.

BLDSC 432   CONCRETE FORMWORK   2 cr. (2 and 0)
The study of materials, methods design and estimating of formwork for concrete situations. *Prerequisite:* EM 304 or BldSc 202.

BLDSC 441   CONSTRUCTION ECONOMICS   5 cr. (2 and 9)
A study of construction economics with specific emphasis on capital budgeting, decision making and investment theory. *Prerequisite:* Acct 202, Econ 202.

BLDSC 442   CONSTRUCTION MANAGEMENT   5 cr. (2 and 9)
Preparation of detailed estimates, resource allocation, scheduling and contractual documents. Comprehensive studies and research in special topics selected by individual students. *Prerequisite:* BldSc 441.

BLDSC 490   DIRECTED STUDIES   1-5 cr.
Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current development in building sciences.

Ceramic Arts

Professor: G. C. Robinson
Associate Professor: H. G. Lefort

CR AR 101   POTTERY MATERIALS   3 cr. (2 and 3)
The occurrence and properties of pottery raw materials. Attention is devoted to the occurrence of natural pottery materials in South Carolina, and the methods and equipment used in preparing these materials.

CR AR 102   POTTERY DRYING AND FIRING   3 cr. (3 and 0)
The drying and firing processes used in pottery making. A discussion is included on the design and construction of simple pottery kilns and the stu-

dent is required to build and operate a small outdoor kiln. The laboratory work demonstrates the drying and firing behavior of pottery.

CR AR 301 POTTERY GLAZES 3 cr. (3 and 0)

The materials and methods used in preparing glazes and a study of the methods used in decorating pottery products. *Prerequisite:* Cr Ar 101, 102.

CR AR 401, 601 ADVANCED POTTERY 3 cr. (2 and 3)

An advanced study of clay and pottery materials designed to use science to understand creative pottery techniques. Included are understanding clay material workability and forming techniques, the physical aspects of finishing formed ware and also of drying, the function of auxiliary pottery materials, heat and temperature measurements, the chemistry and physical aspects of firing, glazing, jewelry enameling, kiln, and other pottery equipment construction with emphasis on topics useful to teachers in establishing school laboratories. Not open to engineering students.

Ceramic Engineering

Professors: G. C. Robinson, *Head;* H. H. Wilson [*]
Associate Professors: W. W. Coffeen, C. C. Fain, H. G. Lefort

CRE 201 INTRODUCTION TO CERAMIC ENGINEERING 2 cr. (2 and 0)

An introduction to ceramic engineering together with a study of ceramic forming operation. Exercises are provided in the analysis of processing problems, the evaluation of background information and the creation of new solutions to processing problems.

CRE 202 CERAMIC MATERIALS 3 cr. (3 and 0)

The properties and uses of commonly used ceramic materials. Equilibrium diagrams are used to gain an understanding of the effect of heat on the materials.

CRE 204 LABORATORY PROCEDURES 1 cr. (0 and 3)

An introduction to ceramic laboratory procedures. Primary consideration will be given to the evaluation of sources of error and significance of measurement in the major ceramic test procedures.

CRE 299 DIGITAL COMPUTATION 1 cr. (0 and 3)

An introduction to digital computer programming for students majoring in Ceramic Engineering. Emphasis is placed on the computer languages in use at Clemson University, and their application to the solution of simple problems in ceramic engineering. *Prerequisite:* Sophomore standing.

CRE 302 THERMO-CHEMICAL CERAMICS 3 cr. (3 and 0)

High-temperature equilibrium using the laws of physical chemistry as applied to ceramic systems in both solid and liquid states. An introduction to the crystal chemistry of ceramic raw materials, and the effect of crystalline form on their high-temperature behavior.

CRE 303 CERAMIC PRODUCTS 2 cr. (2 and 0)

The application of ceramic products to a variety of use environments. Refractories, structural ceramics, coated metals and corrosion-resistant products are included. The course is for both engineering and nonengineering majors.

[*] On leave.

CRE 304   EXPERIMENT DESIGN   1 cr. (0 and 3)
An exercise in the planning and organization of experiments in the ceramic field.

CRE 306   FUELS COMBUSTION AND HEAT TRANSFER   1 cr. (0 and 3)
Combustion devices, the calculation of combustion problems and heat transfer.

CRE 307   THERMAL PROCESSING OF CERAMICS   3 cr. (3 and 0)
The accomplishment of changes in structure and composition through the application of thermal energy. The course includes a study of simultaneous transfer of heat and mass, fluid flow, determinants of rates in a variety of reactions and calculations of the energy requirements to accomplish change in structure or composition.

CRE 309   RESEARCH METHODS   2 cr. (0 and 6)
The planning and solution of selected research problems.

CRE 310   INTRODUCTION TO MATERIAL SCIENCE   3 cr. (3 and 0)
A beginning course in material science designed primarily for engineering students. The course is a study of the relation between the electrical, mechanical and thermal properties of products and the structure and composition of these products. All levels of structure are considered from gross structures easily visible to the eye through electronic structure of atoms.

CRE 402, 602   SOLID STATE CERAMICS   3 cr. (3 and 0)
The effects of the composition, form, and shape of ceramic raw materials on the manufacturing processes and final properties of ceramic products. Included are fundamental studies of such phenomena as deflocculation, plasticity, sintering and the behavior of ceramic products in electrical circuits. *Prerequisite:* Junior standing.

CRE 403, 603   GLASSES   3 cr. (3 and 0)
Glass structure and composition and their relation to the properties of glasses. Consideration is given to the processing variables which control the properties of glasses including glass products, enamels, glazes, and vitreous bonds.

CRE 404, 604   CERAMIC COATINGS   3 cr. (3 and 0)
The raw materials, methods of manufacture, and properties of ceramic coatings. *Prerequisite:* CrE 302.

CRE 406   CERAMIC PROJECT   2 cr. (0 and 6)
The completion of an original research into a ceramic problem. *Prerequisite:* CrE 302.

CRE 407   PLANT DESIGN   3 cr. (1 and 6)
The application of the fundamentals of ceramic engineering to problems in plant design. *Prerequisite:* Senior standing in Ceramic Engineering.

CRE 410, 610   ANALYTICAL PROCESSES   3 cr. (2 and 3)
An introductory course on the theory and use of X-ray diffraction and spectroscopic methods. *Prerequisite:* Junior standing.

CRE 412, 612   RAW MATERIAL PREPARATION   3 cr. (3 and 0)
The equipment and processes used in the crushing and grinding of raw materials, the separation and classification of particle sizes, and the separation and purification of minerals by mineral dressing methods.

CRE 416, 616   ELECTRONIC CERAMICS   3 cr. (3 and 0)

The theory and measurement of the electronic properties of ceramic products.

CRE 418, 618   PROCESS CONTROL   3 cr. (3 and 0)

Process control techniques and apparatus with particular emphasis on temperature measurement and control systems. The application of laboratory techniques to the control of product quality and process efficiency is included. *Prerequisite:* Junior standing.

CRE 419, H419, 619   SCIENCE OF ENGINEERING MATERIALS   3 cr. (3 and 0)

This course is planned to acquaint engineers with the thermal, electrical, and chemical characteristics of engineering materials. It emphasizes fundamental consideration of the structure of matter in the solid and glassy states, solid state reactions, and the influence of particle and aggregate structure to speed of reaction and product properties. The reasons for the properties of materials at elevated temperatures and room temperatures are related to these fundamentals. Admission to HONORS section by invitation.

CRE 420, 620   SCIENCE OF ENGINEERING MATERIALS   3 cr. (3 and 0)

A continuation of CrE 419 with emphasis on application of fundamentals in nuclear reactors and nuclear power plants. Consideration is given to the development of ceramics for fuel elements, moderator materials, control rods, shielding and radioactive waste disposal.

CRE 421, 621   EXPERIMENTS IN MATERIAL SCIENCE FOR TEACHERS   3 cr. (2 and 3)

Many of the topics in the earth science, physical science, physics and chemistry courses of grammar school and high school have interesting application in research and production of engineering materials. A series of experiments have been developed which support specific topics in grammar and high school science courses. These experiments have been designed to be suitable for use in schools and with equipment usually present in school laboratories. The laboratory part of this course is devoted to providing the students with experience and background in these experiments while the lecture topics include consideration of the thermal, electrical, chemical properties of materials as determined by their composition and structure. This course has been prepared especially for elementary and high school teachers of science, and is not open to engineering students.

CRE 701   SPECIAL PROBLEMS   3 cr. (1-3 and 0)

CRE 807   SPECIALIZED CERAMICS   3 cr. (3 and 0)

CRE 809   HIGH-TEMPERATURE MATERIALS   3 cr. (3 and 0)

CRE 810   CERAMIC ENGINEERING THERMODYNAMICS   3 cr. (3 and 0)

CRE 811   CERAMIC ENGINEERING KINETICS   3 cr. (3 and 0)

CRE 812   CURRENT TOPICS IN CERAMIC ENGINEERING   1 cr. (1 and 0)

CRE 813   NUCLEAR CERAMICS   3 cr. (3 and 0)

CRE 814   CERAMIC PHYSICAL PROCESSING   3 cr. (3 and 0)

CRE 815   COLLOIDAL AND SURFACE SCIENCE   3 cr. (3 and 0)

CRE 816   CONSTITUTION AND STRUCTURE OF GLASSES   3 cr.
(3 and 0)

CRE 821   ANALYTICAL PROCEDURES AND EQUIPMENT I   3 cr.
(2 and 3)

CRE 822   ANALYTICAL PROCEDURES AND EQUIPMENT II   3 cr.
(2 and 3)

CRE 823   THERMAL PROPERTIES OF CERAMIC MATERIALS   3 cr.
(3 and 0)

CRE 824   MECHANICAL PROPERTIES OF CERAMIC MATERIALS
3 cr. (3 and 0)

CRE 825   MAGNETIC AND ELECTRICAL CERAMIC MATERIAL   3 cr.
(3 and 0)

CRE 826   CERAMIC COATINGS   3 cr. (3 and 0)

CRE 828   SOLID STATE CERAMIC SCIENCE   3 cr. (3 and 0)

CRE 891   RESEARCH.   Credit to be arranged.

Chemical Engineering

Professors: F. C. Alley, W. B. Barlage, Jr., D. F. Bruley, J. W. Hall, R. C.
Harshman, C. E. Littlejohn, *Head*

Associate Professors: W. F. Beckwith, J. C. Mullins

Assistant Professors: J. N. Beard, Jr., S. S. Melsheimer

CHE 201   INTRODUCTION TO CHEMICAL ENGINEERING   3 cr.
(2 and 3)
An introduction to the concepts of chemical engineering and a study of
PVT relations for gases and vapors, material and energy balances, equilibria
in chemical systems, and combined material and energy balances. *Prerequisite:* Ch 102.

CHE 202   STAGEWISE SEPARATION OPERATIONS   4 cr. (3 and 3)
A first course in the theory and design of separation operations using the
stagewise technique. Specific operations studied will be distillation and solvent extraction. A feature of the course is the inclusion of engineering graphical communication by sketching of laboratory separations equipment. *Prerequisite:* ChE 201.

CHE 210   DIGITAL COMPUTATION AND NUMERICAL METHODS
3 cr. (3 and 0)
An introduction to digital computational techniques using a specific procedure oriented language and the use of numerical methods for the solution of
chemical engineering problems. The course will introduce students to computational methods to be used in subsequent chemical engineering courses. *Prerequisite:* ChE 201, Math 108.

CHE 301   UNIT OPERATIONS THEORY I   3 cr. (3 and 0)
The general principles of chemical engineering and a study of the following
unit operations: Fluid Flow, Fluid Transportation, Heat Transmission and

Evaporation. Special emphasis is placed on theory and its practical application to design. *Prerequisite:* ChE 202, and Junior standing.

CHE 302   UNIT OPERATIONS THEORY II—3 cr. (3 and 0)

A study of selected unit operations based on diffusional phenomena. Primary attention will be given to differential contact operations such as absorption, humidification, and gas-liquid contact. *Prerequisite:* ChE 301 and Junior standing.

CHE 306   UNIT OPERATIONS LABORATORY I   1 cr. (0 and 3)

Laboratory work in the unit operations of fluid flow, heat transfer, and evaporation. Stress is laid on the relation between theory and experimental results and on report writing. *Prerequisite:* ChE 301 and Junior standing.

CHE 331, H331   CHEMICAL ENGINEERING THERMODYNAMICS I   3 cr. (3 and 0)

A first basic course in static equilibria. Topics include the First and Second Law of Thermodynamics, real and ideal gases, thermodynamic properties of fluids, phase changes, and heats of reaction. Admission to HONORS section by invitation. *Prerequisite:* Ch 331, ChE 202, Math 208, and Junior standing; or permission of the department head.

CHE 352   CHEMICAL ENGINEERING SYSTEMS ANALYSIS   4 cr. (3 and 3)

Mathematical modeling of lumped and distributed parameter chemical engineering systems and analog computer solutions. The modeling of large-scale systems and an introduction to optimization. *Prerequisite:* Junior standing in Chemical Engineering or permission of instructor.

CHE 401, H401, 601   TRANSPORT PHENOMENA   3 cr. (3 and 0)

Heat, mass, and momentum transport with emphasis being laid on how the three processes are related. A firmer theoretical foundation is laid for the previous work in unit operations. Admission to HONORS section by invitation. *Prerequisite:* ChE 302 and Senior standing.

CHE 407, 607   UNIT OPERATIONS LABORATORY II   2 cr. (0 and 6)

Laboratory work for the diffusional unit operations. Competent technical reports are required. *Prerequisite:* Enrollment in ChE 401 and Senior standing.

CHE 415, 615   INTRODUCTION TO NUCLEAR ENGINEERING I   3 cr. (3 and 0)

Designed to acquaint the nonnuclear engineer with some of the engineering aspects of nuclear science. Topics include a brief survey of particle physics; nuclear reactions; energy transformations; nuclear reactors, their design, construction and use; radiation damage to materials of construction; and special problems in nuclear engineering peculiar to the basic engineering disciplines. *Prerequisite:* Junior or Senior standing in engineering, chemistry, or physics.

CHE 416, 616   INTRODUCTION TO NUCLEAR ENGINEERING II   3 cr. (3 and 0)

A continuation of ChE 415, topics to include reactor principles, plutonium production, reactor types, materials of reactor construction, control instruments, and waste disposal. *Prerequisite:* ChE 415.

CHE 421, 621   PROCESS DEVELOPMENT, DESIGN, AND
OPTIMIZATION OF CHEMICAL ENGINEERING SYSTEMS I
3 cr. (2 and 3)

A study of the steps in creating a chemical process design from the original
concept to successful completion and operation of the plant. Topics include
engineering economics, systems analysis, simulation, optimization, process
equipment sizing and selection, and the application of analog and digital
computers. *Prerequisite:* Completion of all required 200- and 300-level courses
in chemistry, chemical engineering, and mathematics.

CHE 422, 622   PROCESS DEVELOPMENT, DESIGN, AND
OPTIMIZATION OF CHEMICAL ENGINEERING SYSTEMS II
3 cr. (0 and 9)

A continuation of ChE 421. The principles of process development, design,
and optimization are applied in a comprehensive problem carried from a gen-
eral statement of the problem to detailed design and economic evaluations.
Prerequisite: ChE 401, 421, 430, 450.

CHE 424   INTRODUCTION TO INDUSTRIAL POLLUTION   3 cr.
(3 and 0)

An introduction to air and water pollution problems associated with chemical
processing transportation, and power generation. Basic processes and mechan-
isms utilized in the control of liquid and gaseous wastes are discussed from
a standpoint of equipment design and economics. Present and future trends
in pollution legislation are reviewed. *Prerequisite:* Senior standing in chemical
engineering, or permission of instructor.

CHE 425, 625   CHEMICAL PROCESS ENGINEERING   3 cr. (3 and 0)

An advanced treatment of chemical engineering unit operations and unit
processes. The course is designed to give the undergraduate more depth in
these areas. *Prerequisite:* Permission of instructor.

CHE 430, 630   CHEMICAL ENGINEERING THERMODYNAMICS II
3 cr. (3 and 0)

A continuation of ChE 331. Subjects include heat engines, compressors,
refrigeration, phase equilibria, and chemical reaction equilibria. *Prerequisite:*
ChE 331 and Senior standing.

CHE 431   CRYOGENIC ENGINEERING   2 cr. (2 and 0)

A survey of cryogenic phenomena, current industrial processes at low tem-
peratures, and expected future applications of cryogenic technology. *Prere-
quisite:* Junior standing in engineering, chemistry, or physics.

CHE 440   SENIOR INSPECTION TRIP   0 cr.

A three- or four-day trip is made to visit selected chemical plants. Using
lectures by plant personnel supplemented by conducted tours of chemical plant
installations, the student is introduced to current industrial practice. *Prere-
quisite:* Senior standing in chemical engineering.

CHE 450, 650   CHEMICAL ENGINEERING KINETICS   3 cr. (3 and 0)

An introduction to the kinetics of chemical reactions. Topics include homo-
geneous and heterogeneous reactions, batch and flow reaction systems, cata-
lysis, and design of industrial reactors. *Prerequisite:* Senior standing in chemi-
cal engineering or permission of department head.

CHE 452, 652   MOLECULAR AND TURBULENT TRANSPORT   3 cr.
(3 and 0)

A theoretical treatment of the fundamental mechanisms of molecular and turbulent heat, mass, and momentum transport with the major emphasis given to the interrelation of all three mechanisms. Evaluation and correlation of transport properties and both steady state and unsteady state processes are considered. An elective course for nonchemical engineering students. *Prerequisite:* Senior standing in chemistry, engineering, or physics, and Math 208.

CHE 453, 653   PROCESS DYNAMICS   3 cr. (3 and 0)

Basic process control and the effect of feedback in various systems. The mathematical analysis of the dynamic response of process systems to step and sinusoidal changes. Determination of the optimum settings for various combinations of proportional, reset and derivative control. *Prerequisite:* Junior or Senior standing in engineering, physics, or chemistry, and Math 309, or permission of department head.

CHE 456   APPLICATIONS OF OPTIMIZATION THEORY   3 cr. (3 and 0)

An introduction to optimization theory and its applications. Topics include the analytical and numerical techniques used to optimize single variable and multivariable systems, dynamic programming, linear programming, and the difficulties encountered in the optimization of practical systems. *Prerequisite:* Senior standing in chemistry, engineering, or physics, or permission of instructor.

CHE 460, 660   INTRODUCTION TO OCCUPATIONAL SAFETY AND HEALTH   3 cr. (3 and 0)

An introduction to the practice and principles of maintaining a safe work environment. Topics include safety engineering and in-plant control of physical and chemical hazards. Occupational safety and health legislation is reviewed. *Prerequisite:* Junior or Senior standing in science or engineering.

CHE 461, 661   INDUSTRIAL HYGIENE ANALYSIS AND INSTRUMENTATION   3 cr. (2 and 3)

A basic course in the analysis and evaluation of the work environment for toxic materials and physical stresses. Topics include air sampling techniques, analytical methods for gases and suspended particulates, measurement of vibration and nonionizing radiation, and measurement of ventilation requirement factors. *Prerequisite:* Junior or Senior standing in science or engineering.

CHE 462, 662   AIR RESOURCES ENGINEERING   3 cr. (3 and 0)

A basic study of important aspects of control and utilization of the air environment. Topics include air pollution sources and effects, monitoring procedures, dispersion models, engineering controls, and economics of control. Existing legislation and enforcement principles are reviewed.

CHE 491, H491   SPECIAL PROJECTS IN CHEMICAL ENGINEERING   1-3 cr. (1-3 and 0)

As a need arises, special topics requested by students or offered by the faculty will be taught. Review of current research in an area, technological advances and national engineering goals are possible topic areas. Admission to HONORS section by invitation.

CHE 802   PROCESS DYNAMICS AND CONTROL   3 cr. (3 and 0)

CHE 803   HEAT, MASS, AND MOMENTUM TRANSFER   3 cr. (3 and 0)

CHE 804   CHEMICAL ENGINEERING THERMODYNAMICS   3 cr. (3 and 0)

CHE 805   CHEMICAL ENGINEERING KINETICS   3 cr. (3 and 0)

CHE 806   PROCESS SYSTEMS ANALYSIS AND SIMULATION I   3 cr. (3 and 0)

CHE 807   PROCESS SYSTEMS ANALYSIS AND SIMULATION II   3 cr. (3 and 0)

CHE 808   CHEMICAL ENGINEERING DESIGN AND ANALYSIS   3 cr. (1 and 6)

CHE 809   WASTE TREATMENT   3 cr. (3 and 0)

CHE 810   BIOCHEMICAL ENGINEERING   3 cr. (3 and 0)

CHE 814   APPLIED NUMERICAL METHODS IN PROCESS SIMULATION   3 cr. (3 and 0)

CHE 818   POLYMER PROCESSING   3 cr. (3 and 0)

CHE 821   HEAT TRANSPORT   3 cr. (3 and 0)

CHE 822   MASS TRANSFER AND DIFFERENTIAL CONTACT OPERATIONS   3 cr. (3 and 0)

CHE 823   MASS TRANSFER AND STAGEWISE CONTACT OPERATION   3 cr. (3 and 0)

CHE 830   CHEMICAL TECHNOLOGY   3 cr. (3 and 0)

CHE 840   GRADUATE LABORATORY.   Credit to be arranged.

CHE 845   SELECTED TOPICS IN CHEMICAL ENGINEERING   3 cr. (3 and 0)

CHE 846   SELECTED TOPICS IN CHEMICAL ENGINEERING   3 cr. (3 and 0)

CHE 847   SELECTED TOPICS IN CHEMICAL ENGINEERING   3 cr. (3 and 0)

CHE 852   AIR POLLUTION CONTROL PROCESSES   3 cr. (3 and 0)

CHE 853   INDUSTRIAL AIR HYGIENE   3 cr. (3 and 0)

CHE 854   ENVIRONMENTAL INSTRUMENTATION AND MEASUREMENTS   3 cr. (2 and 3)

CHE 891   RESEARCH.   Credit to be arranged.

CHE 902   PROCESS DYNAMICS AND CONTROL   3 cr. (3 and 0)

CHE 903   TRANSPORT PHENOMENA   3 cr. (3 and 0)

CHE 904   CHEMICAL ENGINEERING THERMODYNAMICS   3 cr. (3 and 0)

CHE 905   CHEMICAL ENGINEERING KINETICS   3 cr. (3 and 0)

CHE 945   SELECTED TOPICS IN CHEMICAL ENGINEERING   3 cr. (3 and 0)

CHE 946   SELECTED TOPICS IN CHEMICAL ENGINEERING   3 cr.
(3 and 0)

CHE 947   SELECTED TOPICS IN CHEMICAL ENGINEERING   3 cr.
(3 and 0)

CHE 954   ENVIRONMENTAL SYSTEMS DESIGN   3 cr. (3 and 0)

CHE 991   DOCTORAL RESEARCH.   Credit to be arranged.

Chemistry

Professors: J. C. Fanning, J. H. Hobson, J. W. Huffman, F. J. Lindstrom, A. R. Pinder, H. T. Polk, G. B. Savitsky, H. G. Spencer, *Head*

Associate Professors: J. F. Allen, R. H. Bailey, Jr., A. L. Beyerlein, C. B. Bishop, F. B. Brown, J. F. Geldard, O. J. Jacobus, N. P. Marullo, J. R. Salley, Jr., J. L. von Rosenberg, Jr.

Assistant Professors: Muriel B. Bishop, R. M. Gallivan, Jr., K. S. Landers

CH 101   GENERAL CHEMISTRY   4 cr. (3 and 3)
Students are introduced to the elementary concepts of chemistry through classroom and laboratory experience. The course emphasizes chemical reactions and the use of symbolic representation, the mole concept and its applications and molecular structure.

CH 102, H102   GENERAL CHEMISTRY   4 cr. (3 and 3)
A continuation of Ch 101 which includes solutions, rates of reactions, chemical equilibrium, electrochemistry, survey of some elements and their chemistry, and an introduction to organic chemistry. The laboratory includes the qualitative analysis of selected elements. Recommended for students taking one year of chemistry or continuing in Ch 201. Admission to HONORS section by invitation.

CH 112   GENERAL CHEMISTRY   4 cr. (3 and 3)
A continuation of Ch 101 which emphasizes solutions, thermodynamic concepts, kinetics and oxidation-reduction reactions. The laboratory emphasizes solution chemistry and qualitative analyses. Recommended for students continuing in Ch 223.

CH 201   GENERAL CHEMISTRY   4 cr. (3 and 3)
A continuation of Ch 102 which extends the introduction to organic chemistry and includes the chemistry of carbohydrates, lipids, and proteins and their role in metabolic processes. *Prerequisite:* Ch 102 or permission of instructor.

CH 223   ORGANIC CHEMISTRY   3 cr. (3 and 0)
An ·introductory course covering the principles of organic chemistry and the derivation of these principles from a study of the properties, preparations, and interrelationships of the important classes of organic compounds. *Prerequisite:* Ch 112 or permission of instructor.

CH 224   ORGANIC CHEMISTRY   3 cr. (3 and 0)
A continuation of Ch 223.

CH 225   ORGANIC CHEMISTRY LABORATORY   2 cr. (0 and 6)
The laboratory techniques involved in the synthesis, separation and purification, and characterization of typical examples of the classes of organic compounds. *Prerequisite:* Registration in Ch 223.

CH 226   ORGANIC CHEMISTRY LABORATORY   2 cr. (0 and 6)
A continuation of Ch 225. *Prerequisite:* Registration in Ch 224.

CH 227   ORGANIC CHEMISTRY LABORATORY   1 cr. (0 and 3)
The synthesis and properties of typical examples of the classes of organic compounds. *Prerequisite:* Registration in Ch 223.

CH 228   ORGANIC CHEMISTRY LABORATORY   1 cr. (0 and 3)
A continuation of Ch 227. *Prerequisite:* Registration in Ch 224.

CH 229   ORGANIC CHEMISTRY LABORATORY   1 cr. (0 and 3)
A one-semester laboratory for chemical engineering students. *Prerequisite:* Registration in Ch 224.

CH 310   ELEMENTARY CHEMICAL INSTRUMENTATION   3 cr. (1 and 6)
The elementary principles of instruments and their use in chemical analysis, especially of biological systems, will be presented. Emphasis is on the actual use of the instruments. *Prerequisite:* Ch 224.

CH 313, 613   QUANTITATIVE ANALYSIS   3 cr. (3 and 0)
The fundamental principles of volumetric, gravimetric and certain elementary instrumental chemical analyses. *Prerequisite:* Organic chemistry.

CH 315, 615   QUANTITATIVE ANALYSIS LABORATORY   2 cr. (0 and 6)
The laboratory techniques of volumetric, gravimetric, and elementary instrumental analysis.

CH 317, 617   QUANTITATIVE ANALYSIS LABORATORY   1 cr. (0 and 3)
The standard techniques of analytical chemistry—gravimetric, volumetric, and instrumental.

CH 330   INTRODUCTION TO PHYSICAL CHEMISTRY   3 cr. (3 and 0)
A one-semester treatment of physical chemistry which emphasizes topics that are especially useful in the life sciences, agriculture and medicine: chemical thermodynamics, equilibrium, solutions, kinetics, electrochemistry, macromolecules, and surface phenomena. *Prerequisite:* One semester of calculus.

CH 331, 631   PHYSICAL CHEMISTRY   3 cr. (3 and 0)
Includes the gaseous state, thermodynamics, chemical equilibria, and atomic and molecular structure, from both experimental and theoretical points of view. *Prerequisite:* Math 206, physics.

CH 332, 632   PHYSICAL CHEMISTRY   3 cr. (3 and 0)
Continuation of Ch 331 including chemical kinetics, liquid and solid state, phase equilibria, solutions, electrochemistry and surfaces.

CH 339, 639   PHYSICAL CHEMISTRY LABORATORY   1 cr. (0 and 3)
Experiments are selected to be of maximum value to Chemistry and Chemical Engineering majors. *Prerequisite:* Registration in Ch 331.

CH 340, 640   PHYSICAL CHEMISTRY LABORATORY   1 cr. (0 and 3)
A continuation of Ch 339. *Prerequisite:* Registration in Ch 332.

CH 402, 602   INORGANIC CHEMISTRY   3 cr. (3 and 0)

A comprehensive survey of the field of inorganic chemistry through lectures and lecture experiments. Development of modern theories of atomic structure and valence, and a detailed study of the elements and their compounds, based on the periodic system and including both well-known and rarer elements. *Prerequisite:* Ch 331, 332.

CH 403, 603   INORGANIC CHEMISTRY   3 cr. (3 and 0)

A continuation of Ch 402 with emphasis on the synthesis and properties of inorganic compounds. *Prerequisite:* Ch 402.

CH 411, 611   INSTRUMENTAL ANALYSIS   4 cr. (2 and 6)

Demonstration and operation of modern optical and electronic precision-measuring devices as they apply to the processes and analytical, physical and organic chemistry. *Prerequisite:* Physical chemistry.

CH 421, 621   ADVANCED ORGANIC CHEMISTRY   3 cr. (3 and 0)

A survey of modern organic chemistry with an emphasis on synthesis and mechanism. *Prerequisite:* Ch 224, 332, or equivalent.

CH 422, 622   ADVANCED ORGANIC CHEMISTRY LABORATORY   2 cr. (0 and 6)

Modern laboratory techniques are used in the synthesis and identification of organic compounds. *Prerequisite:* Registration in Ch 421 or permission of instructor.

CH 428, 628   ORGANIC SPECTROSCOPY   3 cr. (2 and 2)

A survey of modern spectroscopic techniques used in the determination of molecular structure. Emphasis is on interpretation of spectra: nuclear magnetic resonance, ultraviolet, infrared and mass spectroscopy, optical rotatory dispersion and circular dicroism. Two hours theory and two hours practical problem solving per week. *Prerequisite:* Organic and physical chemistry.

CH 435, 635   ATOMIC AND MOLECULAR STRUCTURE   3 cr. (3 and 0)

An introduction to the principles of wave mechanics as applied to various forms of spectroscopy and the elucidation of molecular structure. Emphasis is placed upon the quantum aspects of electronic, vibrational, and rotational transitions as well as nuclear magnetic resonance, the Raman effect and photoelectron spectroscopy.

CH 436, 636   PHYSICAL CHEMISTRY LABORATORY   1 cr. (0 and 3)

To be taken in conjunction with Ch 435. Experiments in various areas of spectroscopy are designed for quantitative interpretation of data. Students also gain familiarity with some spectroscopic instruments.

Ch 441   GLASS MANIPULATION   2 cr. (0 and 6)

A course designed to teach the fundamentals of glass manipulation and its application to the construction and repair of simple laboratory apparatus.

CH 442   CHEMICAL LITERATURE   1 cr. (1 and 0)

This course is designed to give the student practice in the use of chemical literature, the writing of technical reports and the presentation of same before the faculty of the Department of Chemistry. *Prerequisite:* Junior standing in chemistry.

CH 443   RESEARCH PROBLEMS   3 cr. (0 and 9)

Original investigation of an assigned problem in a fundamental branch of chemistry. This work must be carried out under the supervision of a member of the staff. *Prerequisite:* Senior standing in chemistry.

CH 444   RESEARCH PROBLEMS   3 cr. (0 and 9)

A continuation of Ch 443.

CH 454, 654   INORGANIC SYNTHESIS   2 cr. (0 and 6)

A laboratory course designed to acquaint the student with various methods and techniques employed in the preparation and handling of inorganic compounds.

CH 472, 672   ORGANIC SYNTHESIS   4 cr. (2 and 6)

A course designed to teach the student techniques and principles as applied in a research laboratory. Both macro and semi-macro methods are used in the preparation of several organic compounds. *Prerequisite:* Organic chemistry.

CH 491, 691   INTRODUCTION TO RADIOCHEMISTRY   3 cr. (2 and 3)

The natural and synthetic radioisotopes, including the consideration of atomic and nuclear structure, properties of radiation and tracer techniques and their application. The laboratory is concerned with the methods of detection and measurement of the various types of radiation and the various applications of tracer techniques. *Prerequisite:* Senior or Graduate standing and permission of instructor.

CH 700   PHYSICAL SCIENCE FOR HIGH SCHOOL TEACHERS   3 cr. (3 and 0)

CH 701   REVIEW OF GENERAL CHEMISTRY I   3 cr. (3 and 0)

CH 702   REVIEW OF GENERAL CHEMISTRY II   3 cr. (2 and 3)

CH 805   THEORETICAL INORGANIC CHEMISTRY   3 cr. (3 and 0)

CH 806   SPECIAL TOPICS IN INORGANIC CHEMISTRY   1-4 cr.

CH 807   CHEMISTRY OF THE TRANSITION ELEMENTS   3 cr. (3 and 0)

CH 808   CHEMISTRY OF THE NONMETALLIC ELEMENTS   3 cr. (3 and 0)

CH 811   ANALYTICAL CHEMISTRY   3 cr. (3 and 0)

CH 812   CHEMICAL SPECTROSCOPIC METHODS   3 cr. (2 and 3)

CH 814   ELECTROANALYTICAL CHEMISTRY   3 cr. (2 and 3)

CH 821   ORGANIC CHEMISTRY I   3 cr. (3 and 0)

CH 822   ORGANIC CHEMISTRY II   3 cr. (3 and 0)

CH 823   ORGANIC REACTION MECHANISMS   3 cr. (3 and 0)

CH 824   FUNDAMENTAL PRINCIPLES OF POLYMER CHEMISTRY   3 cr. (3 and 0)

CH 831   CHEMICAL THERMODYNAMICS   3 cr. (3 and 0)

CH 834   STATISTICAL THERMODYNAMICS   3 cr. (3 and 0)

CH 835   CHEMICAL KINETICS   3 cr. (3 and 0)

CH 837   QUANTUM CHEMISTRY   3 cr. (3 and 0)

CH 851   SEMINAR   0-2 cr.

CH 861   PRINCIPLES OF BIOCHEMISTRY   3 cr. (3 and 0)

CH 891   RESEARCH.   Credit to be arranged.

CH 920   ADVANCED TOPICS IN ORGANIC CHEMISTRY   1-4 cr. (1-4 and 0)

CH 930   ADVANCED TOPICS IN PHYSICAL CHEMISTRY   1-4 cr. (1-4 and 0)

CH 950   MICROANALYTICAL TECHNIQUES   3 cr. (1 and 6)

CH 991   DOCTORAL RESEARCH.   Credit to be arranged.

City and Regional Planning

Professors: S. Carter, E. L. Falk, *Acting Head*
Assistant Professor: H. B. Gantt
Visiting Associate Professor: R. D. Bray

CRP 411, 611   INTRODUCTION TO CITY AND REGIONAL PLANNING   3 cr. (3 and 0)

Overview of urban land-use planning. Analysis of current work in each significant phase of planning. Discussion of goal formulation, foundation studies, land-use planning methods and considerations, and continuing evaluation and modification of an urban-planning process.

CRP 412, 612   CITY AND REGIONAL PLANNING THEORY   3 cr. (3 and 0)

The philosophical, methodological, and ethical aspects of planning will be explored through selected readings, student reports, lectures and discussion. A critical examination of current planning theories.

CRP 421, 621   URBAN SOCIAL STRUCTURE   3 cr. (3 and 0)

The social, economic, and political aspects of communities of varying sizes and types. Elements will include housing, education, recreation, social services, governmental structure, and related community institutions.

CRP 441, 641   HISTORY OF PLANNING   3 cr. (3 and 0)

The development of the urban plan from ancient to modern times.

CRP 472, 672   PLANNING ADMINISTRATION AND PRACTICE   3 cr. (3 and 0)

The organization and administration of types of planning agencies and their relationship to other governmental and private organizations.

CRP 473, 673   GOVERNMENT AND PLANNING LAW   3 cr. (3 and 0)

A complete coverage of the laws and ordinances relating to redevelopment, subdivision control, zoning, official mapping, and other topics including interpretation, philosophy, enabling legislation, and model ordinances. The legal basis of current and long-range planning policy will be discussed. *Prerequisite:* CRP 472.

CRP 483, 683 SEMINAR ON PLANNING COMMUNICATION 2 cr. (2 and 0)

Informal means open for plan implementation. The organization of effective public information and education programs, use of citizens' advisory committees, and application of other implementation techniques. Lectures, student reports, selected readings, and visiting speakers.

CRP 821 INTERGOVERNMENTAL RELATIONS IN THE PLANNING PROCESS 3 cr. (3 and 0)

CRP 822 URBAN SYSTEMS 3 cr. (3 and 0)

CRP 831 ECONOMICS OF LAND USE PLANNING 3 cr. (3 and 0)

CRP 853 INTRODUCTION TO PLANNING STUDIO 3 cr. (3 and 0)

CRP 854 PLANNING STUDIO II 3 cr. (0 and 9)

CRP 863 PLANNING STUDIO III 3 cr. (0 and 9)

CRP 865 PLANNING STUDIO 3 cr. (2 and 12)

CRP 881 SEMINAR IN QUANTITATIVE METHODS I 3 cr. (3 and 0)

CRP 882 SEMINAR IN QUANTITATIVE METHODS II 3 cr. (3 and 0)

CRP 884 PUBLIC FACILITY PLANNING 3 cr. (3 and 0)

CRP 885 CAPITAL IMPROVEMENTS PROGRAMMING 3 cr. (3 and 0)

CRP 890 DIRECTED STUDIES IN CITY AND REGIONAL PLANNING 1-5 cr.

CRP 891 PLANNING THESIS 3-9 cr.

CRP 893 CITY AND REGIONAL PLANNING INTERNSHIP 3 cr.

CRP 894 CITY AND REGIONAL PLANNING INTERNSHIP 3 cr.

Civil Engineering

Professors: J. P. Rostron, A. E. Schwartz

Associate Professors: S. C. Anand, W. Baron, H. W. Busching, *Head;* J. E. Clark, B. L. Edge, R. E. Elling, J. C. McCormac, D. B. Stafford

Assistant Professors: J. S. Love, Jr., F. L. Roberts, M. Spector

CE 201 SURVEYING 3 cr. (2 and 3)

Elementary plane surveying for other than Civil Engineering students. Coverage includes measurement of distance, leveling, horizontal and vertical angles, stadia and topography, area and volume calculations, construction surveying. Field exercises provide practice in the use of surveying instruments. *Prerequisite:* Math 106.

CE 205 CIVIL ENGINEERING METHODOLOGY 2 cr. (1 and 3)

Concepts of civil engineering analysis and design, case histories and project studies, introduction to theory and practice of plane surveying, measurements and errors, differential leveling, and topographic mapping. Laboratory includes typical design and construction problems. *Prerequisite:* Math 106.

CE 206   GEOMETRICS   2 cr. (1 and 3)

Application of geometrics to civil engineering problems, computations and triangulation, coordinate systems, electronic methods of measuring distances, photogrammetry, introduction to digital computation and elementary programming. *Prerequisite:* CE 205.

CE 301   INTRODUCTION TO STRUCTURAL SCIENCE   3 cr. (2 and 2)

Analysis of statically determinate and indeterminate structural elements and systems. Influence lines for beams and trusses, calculation of rotations and deflections by integration, moment area, conjugate beam and unit load methods. Indeterminate analysis by force and displacement methods and moment distribution. *Prerequisite:* EM 304, CE 206.

CE 302   STRUCTURAL DESIGN I   3 cr. (2 and 2)

Design and detail of components and connections for timber and metal structures. *Prerequisite:* CE 301.

CE 310   TRANSPORTATION ENGINEERING   4 cr. (3 and 2)

Planning, location, design, operation, and administration of highways, railroads, airports and other transportation facilities, including economic considerations, pavement design, and digital computer applications to geometric and earthwork computation. *Prerequisite:* CE 206; *corequisite:* CE 330.

CE 320   CONCRETE AND BITUMINOUS MATERIALS   2 cr. (1 and 3)

Investigation and selection of aggregates for portland cement concrete and asphaltic concrete; latest methods of design of portland cement mixes and asphaltic concrete mixes; field control and adjustments; field trips to nearby construction jobs. *Prerequisite:* EM 304 and Junior standing.

CE 330   SOIL MECHANICS   3 cr. (2 and 2)

Mechanical and physical properties of soils and their relation to soil action in problems of engineering, such as classification, permeability, shearing strength, consolidation, stress distribution and bearing capacity of soils. *Prerequisite:* EM 304 and Junior standing.

CE 402   STRUCTURAL DESIGN II   3 cr. (2 and 2)

Design and detail of reinforced concrete members using elastic and ultimate strength theories, introduction to prestressed concrete. *Prerequisite:* CE 301, 320.

CE 410, 610   TRAFFIC ENGINEERING: OPERATIONS   3 cr. (3 and 0)

Basic characteristics of motor-vehicle traffic; techniques for making traffic engineering investigations; design and application of traffic control devices; traffic design of parking facilities; traffic laws and ordinances; public relations. *Prerequisite:* CE 310.

CE 412, 612   URBAN TRANSPORTATION PLANNING   3 cr. (3 and 0) F

Urban travel characteristics; characteristics of transportation systems; transportation and land-use studies; trip distribution and trip assignment models; city patterns and subdivision layout. *Prerequisite:* CE 310.

CE 415, 615   SEMINAR IN TRAFFIC ENGINEERING   1 cr. (0 and 2)

Discussion, readings, and practical applications of the operational methods of traffic engineering and consideration of the problems confronting the city, county, and state traffic engineer.

CE 417, 617   AIRPHOTO INTERPRETATION I   3 cr. (2 and 3)

A brief review of the basic geometry of aerial photographs, characteristics of geologic and topographic features identifiable from aerial photographs, and

site characteristics related to soil profile. Laboratory work includes soil mapping, selection of construction sites, and location of soil deposits for engineering purposes. *Prerequisite:* Junior standing and/or permission of instructor.

CE 419, 619   GENERAL PHOTOGRAMMETRY   3 cr. (2 and 3) S

Fundamentals of mapping by the use of aerial phootgraphs; characteristics, production and use of aerial photographs; study of the operation of popular photogrammetric instruments including aerial cameras, stereoscopic viewing and plotting equipment; practice in the use of stereocomparagraph and multiplex plotting instruments; scale, tilt, and coordinate calculations; construction of photomosaics. *Prerequisite:* Math 108 and Junior standing.

CE 420, 620   MECHANICAL PROPERTIES OF MATERIALS   3 cr. (3 and 0)

The course provides a comprehensive introduction to the analysis of mechanical response of materials. Emphasis is placed on the behavior of solid materials that are used in civil engineering structures but are not considered in depth in other undergraduate courses. Plastics, fibers, and composite materials are studied. Students are assisted in investigating a realistic problem in materials technology. *Prerequisite:* Permission of instructor.

CE 421, 621   ADVANCED BUILDING MATERIALS SELECTION   3 cr. (3 and 0)

Advanced methods of analyzing the structural, acoustic, and thermal performance of building material systems in maintaining a desired environment will be discussed. Computerized optimization techniques for selecting the best material system for a specific application will be implemented. *Prerequisite:* Permission of instructor.

CE 424   CONSTRUCTION METHODS   2 cr. (2 and 0)

A survey of the principal methods and equipment used in the construction industry. Critical path scheduling and short reports are required. *Prerequisite:* Senior standing.

CE 425   ENGINEERING RELATIONS   3 cr. (3 and 0)

Business, legal, and ethical relations in engineering practice. *Prerequisite:* Senior standing.

CE 431, 631   APPLIED SOIL MECHANICS   3 cr. (2 and 2)

Relationship of local geology to soil formations, ground water, planning of site investigation, sampling procedures, laboratory determination of design parameter, foundation design, and settlement analysis. *Prerequisite:* CE 330.

CE 434, 634   CONSTRUCTION COSTS AND ESTIMATES   3 cr. (2 and 2)

Interpretation of specifications and plan reading necessary for the proper estimation of quantities of materials and costs of engineering structures. The course is presented from both the designer's and the constructor's viewpoint in order to fit the young engineer with the essential details an inspector or a construction engineer should have at his command. *Prerequisite:* Senior standing.

CE 435, 635   ENGINEERING PROJECT ANALYSIS   3 cr. (2 and 2)

Advanced analysis of engineering projects. Theory of economic, financial and intangible analysis of large-scale construction projects. Practical exercises in cost-benefit studies and construction decisions. *Prerequisite:* Permission of instructor.

CE 453, 653   ADVANCED STRUCTURAL ANALYSIS   3 cr. (3 and 0)
Slopes and deflections of beams and trusses by energy methods. Analysis of statically indeterminate structures and construction of influence lines by virtual-work method. Application of moment distribution and slope deflection methods. *Prerequisite:* CE 301.

CE 460   CIVIL ENGINEERING SYSTEMS ANALYSIS   3 cr. (2 and 3)
Development of mathematical models for complex civil engineering systems. Digital and analog computer solution techniques. Application to large-scale systems in all phases of civil engineering. Introduction to CSMP and ICES. *Prerequisite:* Math 208 and permission of instructor.

CE 462, 662   PORT AND HARBOR ENGINEERING   3 cr. (3 and 0)
A unified treatment of the basic principles used in the design, construction, and operation of ports and harbors. Emphasis is placed on the philosophy behind port layout and the optimal site and size selections, as well as optimal port operations. The basic principles and economic factors in small craft harbor design are studied. The requirements for harbor maintenance and the design of harbor protection structures are presented. This integrated treatment covers in varying degrees the application of soil, structure, and fluid mechanics as well as some economic optimizing criteria.

CE 490, H490   SPECIAL PROJECTS   1-3 cr. (1-3 and 0)
Studies or laboratory investigations on special topics in the civil engineering field which are of interest to individual students and staff members. Arranged on a project basis with a maximum of individual student effort and a minimum of staff guidance. Admission to HONORS section by invitation. *Prerequisite:* Senior standing.

CE 801   STRUCTURAL ENGINEERING   3 cr. (3 and 0)

CE 802   PRESTRESSED CONCRETE ANALYSIS AND DESIGN   3 cr. (3 and 0)

CE 803   REINFORCED CONCRETE STRUCTURAL SYSTEMS   3 cr. (3 and 0)

CE 804   THEORY AND DESIGN OF THIN PLATES   3 cr. (3 and 0)

CE 805   PLASTIC DESIGN OF STEEL STRUCTURES   3 cr. (3 and 0)

CE 806   DESIGN OF STEEL MEMBERS   3 cr. (3 and 0)

CE 807   NUMERICAL AND APPROXIMATE METHODS OF STRUCTURAL ANALYSIS   3 cr. (3 and 0)

CE 808   FINITE ELEMENT METHODS IN STRUCTURAL ANALYSIS   3 cr. (3 and 0)

CE 811   HIGHWAY GEOMETRIC DESIGN   3 cr. (2 and 3)

CE 812   AIRPHOTO INTERPRETATION   3 cr. (2 and 3)

CE 813   HIGHWAY AND AIRPORT PAVEMENT DESIGN   3 cr. (3 and 0)

CE 814   TRAFFIC FLOW THEORY   3 cr. (3 and 0)

CE 815   HIGHWAY SAFETY ENGINEERING   3 cr. (3 and 0)

CE 816   HIGHWAY PLANNING   3 cr. (3 and 0)

CE 817   MASS TRANSIT PLANNING   3 cr. (3 and 0)

CE 818   AIRPORT PLANNING AND DESIGN   3 cr. (3 and 0)

CE 819   TRANSPORTATION RESEARCH   2-4 cr.

CE 820   CEMENT AND CONCRETE   3 cr. (2 and 3)

CE 821   BITUMINOUS PAVING MATERIALS   3 cr. (2 and 3)

CE 822   AGGREGATES AS CONSTRUCTION MATERIALS   3 cr. (2 and 3)

CE 823   INELASTIC BEHAVIOR OF ENGINEERING MATERIALS 3 cr. (3 and 0)

CE 825   DISTRIBUTION AND PROPERTIES OF SOILS   3 cr. (3 and 0)

CE 831   FOUNDATION ENGINEERING   3 cr. (2 and 3)

CE 832   ADVANCED SOIL MECHANICS   3 cr. (3 and 0)

CE 833   PHYSICAL AND PHYSIO-CHEMICAL PROPERTIES OF SOILS 3 cr. (2 and 3)

CE 835   DESIGN OF EARTH STRUCTURES   3 cr. (3 and 0)

CE 889   SPECIAL PROBLEMS I   1-3 cr.

CE 890   SPECIAL PROBLEMS II   1-3 cr.

CE 891   RESEARCH.   Credit to be arranged.

CE 901   THEORY AND DESIGN OF SHELLS   3 cr. (3 and 0)

CE 902   STRUCTURAL VIBRATIONS   3 cr. (3 and 0)

CE 991   DOCTORAL RESEARCH.   Credit to be arranged.

Computer Science

(Department of Mathematical Sciences)

Professors: R. E. Haymond, A. T. Hind, Jr., J. W. Kenelly

Associate Professors: W. R. Boland, A. S. Cover, C. E. Kirkwood, Jr., M. C. Palmer

Assistant Professors: W. H. Ford, J. C. Peck

Instructor: R. S. Schouest

COMP SC 205   ELEMENTARY COMPUTER PROGRAMMING   3 cr. (3 and 0)

A detailed study of an algebraic computer programming language and its use in solving problems. The language will be selected as appropriate to the computer presently available.

COMP SC 206   ADVANCED PROGRAMMING IN FORTRAN   3 cr. (3 and 0)

A continuing study of computer programming with the Fortran language. Emphasis on subroutine computation with application to problems in science and engineering. *Prerequisite:* Comp Sc 205.

COMP SC 207   ADVANCED PROGRAMMING IN PL/1   3 cr. (3 and 0)

A programming course utilizing the advanced features of the PL/1 language. Topics include dynamic storage allocation, string manipulation, compile-time facilities, error handling, and list processing. *Prerequisite:* Comp Sc 205.

COMP SC 210   DIGITAL COMPUTATION AND NUMERICAL
METHODS FOR ENGINEERS   3 cr. (3 and 0)

An introduction to digital computational techniques using Fortran IV and the use of numerical methods for the solution of engineering problems. Computational methods will be introduced for polynomial interpolation, zeros of equations, solutions of systems of equations, the solution of differential equations, and other problems which are of interest to engineers.

COMP SC 308   DATA PROCESSING FOR BUSINESS APPLICATIONS
3 cr. (3 and 0)

An introduction to the Cobol language with application to business data processing. Emphasis is placed on the organization and processing of data files.

COMP SC 409, 609   INTRODUCTION TO NUMERICAL ANALYSIS I
3 cr. (3 and 0)

An introduction to the problems of classical numerical analysis emphasizing computational procedures and application. Topics include: polynomial interpolation, matrix methods, systems of linear equations, nonlinear equations, numerical solution of ordinary differential equations. *Prerequisite:* Comp Sc 205 or E&CE 299, Math 208.

COMP SC 410, 610   INTRODUCTION TO NUMERICAL ANALYSIS II
3 cr. (3 and 0)

A continuation of Comp Sc 409. Ordinary differential equations boundary value problems, functional approximation, numerical solution of partial differential equations.

COMP SC 421, 621   INTRODUCTION TO ASSEMBLER LANGUAGE
PROGRAMMING   3 cr. (3 and 0)

Computer structure, machine language, assembler language, subroutine linkage, input and output through the operating system, macro definition and conditional assembly. *Prerequisite:* Comp Sc 205.

COMP SC 422, 622   ADVANCED ASSEMBLER LANGUAGE
PROGRAMMING   3 cr. (3 and 0)

A treatment of computer operating systems with special attention being given to IBM systems. This includes a comprehensive study of macro development, job control language, data management, linkage editor, utilities, advanced assembler language and debugging techniques. *Prerequisite:* Comp Sc 421.

COMP SC 423, 623   FUNDAMENTALS OF SOFTWARE DESIGN   3 cr. (3 and 0)

A detailed study of computer organization in terms of both hardware and software. Topics include interrupt systems, primitive level input/output, job control, advanced data management techniques, linkage editor and utility systems, fundamentals of communications systems. In the early part of the course considerable emphasis is placed on a study of the IBM 360 while in the latter part a variety of other manufacturers' equipment is described. *Prerequisite:* Comp Sc 205.

COMP SC 428, 628   ALGORITHMIC LANGUAGES AND COMPILERS
3 cr. (3 and 0)

Formed description of algorithmic languages and the techniques used in their compilation, study of syntax, semantics, procedures, replication, iteration, and recursion in these languages, including comparisons of commonly used languages. *Prerequisite:* Comp Sc 205, Math 295 or equivalent.

NOTE: The following courses are computer related and of interest to computer scientists: Math 428, 429, 452, 628, 629, 652, 861, 862, 863, 864, 987.

Control Theory

CT 410, 610   INTRODUCTION TO DIGITAL CONTROL   3 cr. (3 and 0)

Digital and sampled data systems, including impulse modulation and Z-transform; basic logic circuits; minicomputer architecture, organization and programming; interfacing concepts and application, and operation of digital computers in a real-time environment.

CT 810   MODERN CONTROL THEORY I   3 cr. (3 and 0)

CT 811   MODERN CONTROL THEORY II   3 cr. (3 and 0)

CT 815   NONLINEAR CONTROLS   3 cr. (3 and 0)

CT 820   DIGITAL CONTROL I   3 cr. (3 and 0)

CT 821   DIGITAL CONTROL II   3 cr. (3 and 0)

CT 910   ADAPTIVE AND OPTIMAL CONTROL   3 cr. (3 and 0)

Dairy Science

Professors: R. W. Henningson, V. Hurst, J. J. Janzen, W. A. King, *Head;*
J. T. Lazar, Jr.

Associate Professors: C. C. Brannon, J. F. Dickey, G. D. O'Dell

DY SC 201   INTRODUCTION TO DAIRY SCIENCE   3 cr. (2 and 3) F

A fundamental course designed to give the student a working knowledge of dairy science. Studies include history of dairying, dairy breeds and cattle evaluation, nutrition, physiology, housing, quality milk production, quality control and the evaluation of milk and its products, the manufacture of milk products and their value in the human food supply.

DY SC 306, 606   THE CHEMICAL AND PHYSICAL NATURE OF MILK
3 cr. (2 and 3) S

The nature and properties of the major and minor constituents of milk, the effect of chemical and physical treatment on milk constituents, and analytical methods necessary to determine the composition and properties of ·milk and its constituents. The philosophy and development of quality control.

DY SC 307, 607   MARKET MILK   3 cr. (2 and 3) F, '74 and alternate years.

Composition, procurement, processing, distribution, quality control, public health aspects, basic chemistry and bacteriology of industrial milk supplies and cultured products.

DY SC 310   DAIRY CATTLE SELECTION   1 cr. (0 and 3) F, '74 and
alternate years.

Emphasis is placed upon the selection of dairy cattle for profitable herd
operations. Evaluations of herd classifications, fitting, showing, and true type
are made.

DY SC 402, 602   DAIRY MANUFACTURES   4 cr. (3 and 3) S, '74 and
alternate years.

The principles and practice of the manufacture of ice cream and related
dairy products, the principles of the manufacture of condensed and evaporated
milks and milk powders, and the physical, chemical and biological factors
involved.

DY SC 404, 604   PLANT MANAGEMENT   3 cr. (2 and 3) S, '74 and
alternate years.

The organization and operation of dairy and food plants and the coordina-
tion of all functions into an orderly business enterprise. Emphasis will be given
to management's responsibility concerning the procurement, processing, quality
control and distribution of food products. Business and industrial techniques
are used to develop maximum efficiencies.

DY SC 409   DAIRY SCIENCE SEMINAR   2 cr. (2 and 0) F, '73 and
alternate years.

Special research problems in production and manufactures are studied. In-
dividual topics not fully covered in classwork are assigned for special report
before class and members of Dairy Science staff.

DY SC 410   DAIRY SCIENCE SEMINAR   2 cr. (2 and 0) S, '74 and
alternate years.

A continuation of Dy Sc 409 with emphasis on current research literature
and research methods.

DY SC 452, 652   DAIRY CATTLE FEEDING AND MANAGEMENT
3 cr. (2 and 3) S, '75 and alternate years.

Fundamental principles in the care, feeding, and management of dairy cattle
of all ages. Topics include general consideration in selecting a breed and the
individual cow, calf raising, growth and development of dairy heifers, care and
management of the milking herd and feeding for milk production.

DY SC 453, 653   ANIMAL REPRODUCTION   3 cr. (3 and 0) F

Reproductive physiology and endocrinology of mammals with emphasis on
farm animals and frequent reference to reproduction in laboratory animals and
humans.

DY SC 455, 655   ANIMAL REPRODUCTION LABORATORY   1 cr.
(0 and 3) F

This course will supplement Dy Sc 453. Practical work will include com-
parative anatomy and histology of the male and female reproductive organs;
semen collection, evaluation and processing; techniques of artificial insemi-
nation, sexual behavior and the principles of pregnancy tests for humans.
Prerequisite: To be taken concurrently or to follow Dy Sc 453.

DY SC 801   TOPICAL PROBLEMS   1-3 cr.

DY SC 802   GENETICS OF DAIRY CATTLE IMPROVEMENT   3 cr.
(3 and 0)

DY SC 803   PHYSIOLOGY OF REPRODUCTION AND MILK
SECRETION   3 cr. (3 and 0)

DY SC 805   NEWER KNOWLEDGE OF DAIRY NUTRITION   3 cr.
(3 and 0)

DY SC 807   FERMENTED DAIRY PRODUCTS   3 cr. (2 and 3)

DY SC 808   INDUSTRIAL DAIRY SCIENCE   3 cr. (3 and 0)

DY SC 891   RESEARCH.   Credit to be arranged.

Economics

Professors: H. H. Macaulay, Jr., W. C. Whitten, Jr.

Associate Professors: R. D. Shannon, B. R. Skelton

Assistant Professors: R. T. Byrns, II, R. D. Elliott, R. F. Hebert, F. H. Rueter,
H. H. Ulbrich,° T. B. Yandle, Jr., *Head;* J. A. Ziegler, P. M. Zipin

Instructors: H. Moreno, W. D. Mulkey, L. E. Nordquist, A. Velez

ECON 200   ECONOMIC CONCEPTS   3 cr. (3 and 0)

A comprehensive course including both micro and macro economic con-
cepts for the student not having theoretical course requirements beyond the
principles level or for the student expecting to take a selected group of the
300 level courses in economics.

ECON 201, H201   PRINCIPLES OF ECONOMICS   3 cr. (3 and 0)

The fundamental principles of pricing, stabilization and growth in a modern
economy. Topics include supply and demand, employment theory and fiscal
policy, the banking system and monetary policy, and the economics of growth.
Admission to HONORS section by invitation.

ECON 202, H202   PRINCIPLES OF ECONOMICS   3 cr. (3 and 0)

Continuation of Econ 201 with an intensive study of the economics of the
firm, the pricing of resources, and international economic relations. The theory
is given relevance through the analysis of current economic problems. Admis-
sion to HONORS section by invitation. *Prerequisite:* Econ 201.

ECON 203   CONSUMER ECONOMICS   2 cr. (2 and 0)

A presentation of information and material to facilitate consumer decision
making in such areas as home finance, insurance, banking, investments, taxa-
tion, budgeting, and other areas of immediate concern to the American
consumer.

ECON 301   ECONOMICS OF LABOR   3 cr. (3 and 0)

The economics of the labor market, the problems of the industrial worker,
and the methods of adjusting labor-management disputes. *Prerequisite:* Econ
200 or 201.

ECON 302   MONEY AND BANKING   3 cr. (3 and 0)

Considers the function of money and banking in both the product and
financial markets. Special emphasis is placed on monetary theory and current
problems of monetary policy. *Prerequisite:* Econ 200 or 201, 202.

° On leave.

ECON 305   INVESTMENT ANALYSIS   3 cr. (3 and 0)

A study of techniques useful in analyzing alternative investment opportunities, with emphasis on corporate securities. Investment planning and portfolio management are considered. *Prerequisite:* Econ 200 or 201.

ECON 306   RISK AND INSURANCE   3 cr. (3 and 0)

Studies the nature of risk and the role of insurance in risk management from individual and business viewpoints by considering insurance carriers, contracts, underwriting and regulation. *Prerequisite:* Econ 200 or 201.

ECON 308   COLLECTIVE BARGAINING   3 cr. (3 and 0)

The practices, procedures, legal foundations, and legal structure associated with collective bargaining. The form and content of the labor contract, the grievance machinery, and the mediation and arbitration institutions will also be studied. *Prerequisite:* Econ 200 or 201.

ECON 309   GOVERNMENT AND BUSINESS   3 cr. (3 and 0)

The relationships between government and business, including among other topics, governmental efforts to enforce competition, to regulate public utilities, and to protect the special interests of laborers, farmers, and consumers. *Prerequisite:* Econ 200 or 201.

ECON 314   INTERMEDIATE ECONOMIC THEORY   3 cr. (3 and 0)

An analytical study of the basic concepts of value and distribution under alternative market conditions. *Prerequisite:* Econ 201, 202.

ECON 350, 650   ECONOMICS OF THE CONSUMER AND THE FIRM IN A MARKET SYSTEM   3 cr. (3 and 0)

Scarce resources impose the necessity of choice on society; the rationale of the market system in the allocation of these scarce resources, basic market theory and its application to contemporary economic problems in American society; the solutions of a nonmarket system will be contrasted. Open only to public school teachers of social studies.

ECON 351, 651   ECONOMICS OF EMPLOYMENT, THE PRICE LEVEL AND GROWTH   3 cr. (3 and 0)

National income accounting concepts will be studied; also money and banking, monetary policy, fiscal policy, and an analysis of their relationship to national income, employment, the price level, and economic growth. Open only to public school teachers of social studies.

ECON 399   SENIOR SEMINAR IN ECONOMICS   1-3 cr. (1-3 and 0)

Current economic issues, research, and community service activities will provide the subject matter for the semester. Students may participate in the analysis of issues, development of research, and other activities requiring the use of skills acquired in their undergraduate programs.

ECON 403, 603   DEVELOPMENT OF ECONOMIC THOUGHT   3 cr. (3 and 0)

A study of the origin and evolution of ideas with some emphasis on the historical context, the problems which inspired these ideas, and the nature of the solutions which they provided: from ancient days to the present. *Prerequisite:* Econ 200 or 201, 202.

ECON 404, 604   COMPARATIVE ECONOMIC SYSTEMS   3 cr. (3 and 0)

A comparative analytical and historical study of the principal economic systems which have been important in the modern world including among others, capitalism and socialism. *Prerequisite:* Econ 200 or 201, 202.

ECON 407, 607   NATIONAL INCOME AND EMPLOYMENT ANALYSIS
3 cr. (3 and 0)

An intensive study of selected economic theories with special emphasis on income and employment. Part of the course is devoted to the analysis of national income accounts and income. *Prerequisite:* Econ 200 or 201, 202.

ECON 409   THE ECONOMICS OF INCOME DISTRIBUTION   3 cr.
(3 and 0)

Examines the extent and causes of poverty, the effects of discrimination on income inequality, and studies the various public policy remedies and their economic consequences.

ECON 410, 610   ECONOMIC DEVELOPMENT   3 cr. (3 and 0)

Consideration and analysis of economic and related problems of the under-developed countries. Attention will be given to national and international programs designed to accelerate solution of these problems. *Prerequisite:* Econ 200 or 201, 202.

ECON 412, 612   INTERNATIONAL TRADE   3 cr. (3 and 0)

A study of economic principles particularly applicable to trade between nations. Topics covered include the balance of payments, determination of foreign exchange rates, price and income effects on the composition and level of trade, and commercial policy. *Prerequisite:* Econ 314.

ECON 413, 613   INTERNATIONAL FINANCE   3 cr. (3 and 0)

With primary emphasis upon international monetary relations, the course surveys history and theory. Topics covered include exchange-rate determination, exchange-stability conditions, the purchasing-power-parity doctrine, the effects of devaluation and exchanging speculation. (Not open to students who have taken Econ 412.) *Prerequisite:* Econ 302.

ECON 414   THE ECONOMICS OF INTERNATIONAL COMPETITION
3 cr. (3 and 0)

Analyzes the structural and institutional frameworks under which international competition occurs with emphasis on the comparative economic effects of alternative frameworks on comparative advantage and economic growth.

ECON 416, 616   DEVELOPMENT OF THE MODERN ECONOMY   3 cr.
(3 and 0)

An analysis of the historical forces and influences which have contributed to the emergence and development of the modern economy. *Prerequisite:* Econ 200 or 201, 202.

ECON 419, 619   ECONOMICS OF DEFENSE   3 cr. (3 and 0)

Examines the American defense establishment in terms of resources utilized, the alternative uses of these resources and the contribution to the national economy and scientific progress that is generated by these resources in a defense use. Particular attention is given to economic problems inherent in shifting resources from nondefense to defense uses and vice versa as well as among alternative defense uses. *Prerequisite:* Acct 200, Econ 200 or 201.

ECON 420, 620   ECONOMICS OF TAXATION   3 cr. (3 and 0)

An intensive study of a limited number of problems in taxation with particular emphasis on the economic effects that cause and result from certain taxes. Topics include averaging, incentives to work, incidence, concepts of equity, excess burden, definitions of income, depletion, and capital gains. *Prerequisite:* Econ 314.

ECON 421, 621   URBAN ECONOMICS   3 cr. (3 and 0)

Economic problems associated with the concentration of population in central places are examined. The historical development of cities and the associated economic implications for individuals, firms, and society are studied. Legislation of economic importance to urban living is analyzed. *Prerequisite:* Econ 200 or 201, 202.

ECON 422, 622   MONETARY THEORY AND POLICY   3 cr. (3 and 0)

An intensive study of the role of monetary factors in economic change. Modern monetary theories and their empirical relevance for policy are developed against a background of monetary history and institutions. *Prerequisite:* Econ 302 or permission of instructor.

ECON 423, 623   ECONOMICS OF HOUSING   3 cr. (3 and 0)

A study of the economics of the provision for housing in a growing society. The problem will be examined within the context of economic theory. Empirical evidence will be evaluated; current national, regional, and local situations will be examined. Public policy on housing and various alternative solutions to the problem will be studied.

ECON 424, 624   THE ORGANIZATION OF INDUSTRIES   3 cr. (3 and 0)

Empirical, historical, and theoretical analyses of market structure and concentration in American industry: the effects of oligopoly, monopoly, and cartelization upon price, output and other policies of the firm; antitrust and other public policies and problems will be studied. *Prerequisite:* Econ 314.

ECON 800   ADVANCED ECONOMICS ANALYSIS   3 cr. (3 and 0)

ECON 802   ADVANCED ECONOMIC CONCEPTS AND APPLICATIONS I   3 cr. (3 and 0)

ECON 803   ADVANCED ECONOMIC CONCEPTS AND APPLICATIONS II   3 cr. (3 and 0)

ECON 808   SEMINAR IN PUBLIC EMPLOYEE LABOR RELATIONS   3 cr. (3 and 0)

ECON 811   SEMINAR IN LABOR ECONOMICS   3 cr. (3 and 0)

ECON 812   SEMINAR IN THE DEVELOPMENT OF ECONOMIC THOUGHT   3 cr. (3 and 0)

ECON 813   SEMINAR IN COMMUNITY GOODS AND ENVIRONMENTAL QUALITY   3 cr. (3 and 0)

ECON 814   WELFARE ECONOMICS   3 cr. (3 and 0)

ECON 820   SEMINAR IN THE ECONOMICS OF TAXATION   3 cr. (3 and 0)

ECON 821   ECONOMIC THEORY I   3 cr. (3 and 0)

ECON 822   ECONOMIC THEORY II   3 cr. (3 and 0)

ECON 831   SEMINAR IN URBAN DEVELOPMENT ECONOMICS   3 cr. (3 and 0)

ECON 891   RESEARCH.   Credit to be arranged.

ECON 900   SEMINAR IN ADVANCED ECONOMIC THEORY   3 cr. (3 and 0)

Education

Professors: C. R. Freeze, M. A. King, *Head;* H. F. Landrith, M. A. Packer

Associate Professors: W. O. Corder, G. W. Gray, J. R. Harris, J. A. Hash, O. R. Lumpkin, J. E. Matthews, W. W. Pennscott, B. L. Sandberg

Assistant Professors: I. Carolyn Briscoe, A. D. Brooks, S. L. Buckner, Elizabeth B. Galloway, E. F. Olive, T. H. Parry, R. K. Peden

Instructors: J. H. Adair, T. W. Carpenter

ED 011   BASIC READING   5 cr. (5 and 0)

Designed for students who have not acquired adequate reading skills as demonstrated by scores on entrance examinations or diagnostic tests. Study skills, vocabulary, content reading and diagnosis of students' problems, including counseling for vocational and academic potential. Course meets five hours per week.

ED 013   BASIC READING   5 cr. (5 and 0)

A continuation of Ed 011. Designed for students who have not acquired adequate reading skills as demonstrated by scores on entrance examinations or diagnostic tests. Study habits, vocabulary, content reading and diagnosis of students' problems including counseling for vocational and academic potential. Course meets five hours per week.

ED 100   ORIENTATION   1 cr. (1 and 0)

Lectures and discussions on teaching in addition to serving as teacher aides. Required of all students in Early Childhood Education, Elementary Education, Secondary Education, and Science Teaching.

ED 101   READING IMPROVEMENT   1 cr. (0 and 2)

Developmental reading for University students who desire to improve reading skills; open to any University student, but priority given to referrals.

ED 102   EFFICIENT READING   1 cr. (0 and 3)

Specific goals are to increase reading rate and flexibility of reading rate with a satisfactory level of comprehension, and to broaden general and technical vocabulary. Individual diagnosis provides an individual program developed under the direction of the reading instructor.

ED 301, H301   PRINCIPLES OF AMERICAN EDUCATION   3 cr. (3 and 0)

Development of educational systems, theories and practices against a background of American social and intellectual history. Admission to HONORS section by invitation. *Prerequisite:* Junior standing or permission of instructor.

ED 302, H302   EDUCATIONAL PSYCHOLOGY   3 cr. (3 and 0)

The nature, capacities, equipment, growth, and development of the learner. Admission to HONORS section by invitation.

ED 334   CHILD GROWTH AND DEVELOPMENT   3 cr. (3 and 0)

A study of the physical and emotional growth and development of the child. *Prerequisite:* Ed 302 or Psych 201.

ED 335, H335   ADOLESCENT GROWTH AND DEVELOPMENT   3 cr. (3 and 0)

The physical and emotional growth and development of the adolescent. Admission to HONORS section by invitation. *Prerequisite:* Ed 302 or Psych 201.

ED 336 BEHAVIOR OF THE PRESCHOOL CHILD 3 cr. (2 and 2)

A study of behavior of the preschool child, including observation and participation. *Prerequisite:* Ed 302 or Psych 201.

ED 401, 601 THE COMMUNITY COLLEGE 3 cr. (3 and 0)

History and philosophy of the junior college, its functions, organization and administration.

ED 405, 605 PRINCIPLES OF GUIDANCE 3 cr. (3 and 0)

Principles, procedures, and policies of the guidance services. For all personnel workers. *Prerequisite:* 6 semester hours in education or psychology.

ED 406, 606 HISTORY AND PHILOSOPHY OF EDUCATION 3 cr. (3 and 0)

An analysis of the development of modern education practices and philosophies with emphasis upon the historical and philosophical development in the United States.

ED 412 DIRECTED TEACHING IN SECONDARY SCHOOL SUBJECTS 6 cr. (1 and 15)

A program of supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for prospective teachers to obtain experiences in the subject area. Students to be sectioned according to teaching fields: English, history, social sciences, mathematics, modern languages, science. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio necessary for graduation.)

ED 424 METHODS AND MATERIALS IN SECONDARY SCHOOL INSTRUCTION 3 cr. (3 and 0)

Development of instructional practices and materials appropriate for the secondary school; familiarization with curriculum materials. Students to be sectioned according to teaching area: English, history, social science, mathematics, modern languages, science.

ED 428, 628 THE SYSTEMS APPROACH TO EDUCATION 3 cr. (2 and 3)

The course will include the development of task analysis techniques, development and use of behavioral objectives, writing of the curriculum and incorporation of the various types of media into a systematic instructional program. *Prerequisite:* Ed 497 or consent of instructor.

ED 431, 631 SPECIAL INSTITUTE COURSE: EARLY CHILDHOOD EDUCATION 3 cr. (3 and 0)

Subject areas organized according to Institute needs.

ED 432, 632 SPECIAL INSTITUTE COURSE: ELEMENTARY SCHOOL 3 cr. (3 and 0)

Subject areas organized according to Institute needs.

ED 433, 633 SPECIAL INSTITUTE COURSE: SECONDARY SCHOOL 3 cr. (3 and 0)

Subject areas organized according to Institute needs.

ED 434, 634 SPECIAL INSTITUTE COURSE: CURRENT PROBLEMS IN EDUCATION 3 cr. (3 and 0)

Subject areas organized according to Institute needs.

ED 435, 635   SPECIAL INSTITUTE COURSE: CURRICULUM   3 cr.
(3 and 0)
Subject areas organized according to Institute needs.

ED 436, 636   SPECIAL INSTITUTE COURSE: SUPERVISION AND
ADMINISTRATION   3 cr. (3 and 0)
Subject areas organized according to Institute needs.

ED 458   HEALTH EDUCATION   3 cr. (3 and 0)
A study of the information needed for effective cooperation with parents,
physicians and public health agencies in the promotion and improvement of
community health, including problems of personal hygiene, health records,
immunization, and control of communicable disease.

ED 459, 659   FUNDAMENTALS OF BASIC READING   3 cr. (3 and 0)
Study of reading skills in relation to the psychological bases; developmental
principles; historical and current issues in reading practices.

ED 460, 660   CURRICULUM DEVELOPMENT IN THE ELEMENTARY
SCHOOL   3 cr. (3 and 0)
An analysis and evaluation of newer practices in curriculum planning in the
elementary school.

ED 461, 661   TEACHING READING IN THE ELEMENTARY SCHOOL
3 cr. (1 and 4)
Study of the various phases of reading and their relation to the elementary
program. Emphasis on modern practices in the classroom teaching of reading.
Prerequisite: For Education majors or permission of instructor.

ED 462, 662   READING DIAGNOSIS AND REMEDIATION   3 cr.
(2 and 3)
A clinical course in diagnostic and remedial procedures in the teaching of
reading. Practice in the use of diagnostic instruments, interpretation of results,
and case studies, with recommended remediation. Laboratory hours to be
arranged with each individual. *Prerequisite:* 3 semester hours in reading or
permission of instructor.

ED 465, 665   SECONDARY SCHOOL CURRICULUM   3 cr. (3 and 0)
A study of the principles, techniques, and trends in secondary school cur-
riculum development and evaluation.

ED 466   CURRICULUM FOR EARLY CHILDHOOD EDUCATION   3 cr.
(3 and 0)
Critical study of early childhood curriculum for nursery schools, kinder-
garten and early elementary grades.

ED 469, 669   CHARACTERISTICS OF CHILDREN WITH EMOTIONAL
HANDICAPS   3 cr. (3 and 0)
Intensive study of the meaning and concepts associated with emotionally
handicapped. Analysis of the causes and characteristics of emotionally handi-
capped. *Prerequisite:* Ed 302 or Psych 201 and Ed 471, or permission of
instructor.

ED 470, 670   CHARACTERISTICS OF CHILDREN WITH LEARNING
DISABILITIES   3 cr. (3 and 0)
The nature and extent of perceptual, motor, and conceptual impairments
are examined. Team functions, community role, and family needs are empha-

sized. *Prerequisite:* Ed 302 or Psych 201 and Ed 471, or permission of instructor.

ED 471, 671   THE EXCEPTIONAL CHILD   3 cr. (3 and 0)

Survey of exceptionality including handicapped and gifted children; nature, cause, and treatment of difficulties; educational problems.

ED 472, 672   PSYCHOLOGY OF MENTAL RETARDATION   3 cr. (3 and 0)

Psychological aspects of mental retardation; learning, motivation, and personality development.

ED 473, 673   TEACHING THE MENTALLY RETARDED   3 cr. (3 and 0)

Study, selection, and preparation of curricular materials; methods of teaching retarded children within the preadolescent and adolescent range. *Prerequisite:* Ed 472 or equivalent.

ED 474, 674   EDUCATIONAL PROCEDURES FOR CHILDREN WITH EMOTIONAL HANDICAPS   3 cr. (3 and 0)

Major problems of teaching disturbed children: curriculum and instructional modifications, program planning, facility adaptation, behavior controls, articulation with mental health specialists, and procedures to develop readiness for return to regular class. *Prerequisite:* Ed 302 or Psych 201 and Ed 471, or permision of instructor.

ED 475, 675   EDUCATIONAL PROCEDURES FOR CHILDREN WITH LEARNING DISABILITIES   3 cr. (3 and 0)

Special emphasis is given to educational evaluation and remedial procedures designed to improve the individual's learning abilities. A multisensory approach is emphasized geared to individual need. *Prerequisite:* Ed 302 or Psych 201 and Ed 471, or permission of instructor.

ED 481   DIRECTED TEACHING IN THE ELEMENTARY SCHOOL   6 cr. (1 and 15)

Supervised observation and teaching experiences in cooperation with selected elementary schools. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

ED 483   METHODS AND MATERIALS FOR EARLY CHILDHOOD EDUCATION   3 cr. (3 and 0)

Study of methods and materials applicable to nursery schools, kindergarten, and early elementary grades.

ED 484   DIRECTED TEACHING IN EARLY CHILDHOOD EDUCATION   6 cr. (1 and 15)

Supervised observation and teaching experiences in cooperation with nursery, kindergartens, and early elementary schools. (Enrollment is limited to seniors or graduates who have completed prerequisite courses and who have the accumulated grade-point ratio for graduation.)

ED 485   METHODS AND CURRICULUM IN ELEMENTARY MATHEMATICS AND SCIENCE   3 cr. (3 and 0)

Develop understandings, skills, and attitudes in the elementary mathematics and science curriculum, with emphasis on strategies, techniques, and materials for teaching elementary mathematics and science.

ED 486 METHODS AND CURRICULUM IN ELEMENTARY SOCIAL STUDIES AND LANGUAGE ARTS 3 cr. (3 and 0)

Study of the elementary program with emphasis upon social studies and language arts materials, curriculum, and methodology.

ED 491 DESCRIPTIVE STATISTICS 3 cr. (3 and 0)

Basic descriptive statistics and research methodology applicable to education, psychology, and other social sciences.

ED 494, 694 SCHOOL AND COMMUNITY RELATIONSHIPS 3 cr. (3 and 0)

A study of the interdependence of the school and community, with emphasis on educational implications.

ED 497, 697 AUDIO-VISUAL AIDS IN EDUCATION 3 cr. (3 and 0)

The techniques and uses of audio-visual aids in improving teaching effectiveness.

ED 498, 698 TEACHING SECONDARY SCHOOL READING 3 cr. (1 and 4)

Methods and materials of teaching basic and developmental reading skills; programming special services in reading instruction. Demonstrations of tests and devices. *Prerequisite:* For education majors or permission of instructor.

ED 707 READINGS IN EDUCATION 3 cr. (3 and 0)

ED 720 SCHOOL PERSONNEL ADMINISTRATION 3 cr. (3 and 0)

ED 721 LEGAL PHASES OF SCHOOL ADMINISTRATION 3 cr. (3 and 0)

ED 722 FIELD EXPERIENCES IN SCHOOL ADMINISTRATION AND SUPERVISION 3 cr. (2 and 3)

ED 741 INTRODUCTION TO PUPIL PERSONNEL SERVICES IN HIGHER EDUCATION 3 cr. (3 and 0)

ED 742 PSYCHOLOGY OF POST SECONDARY SCHOOL YOUTH 3 cr. (3 and 0)

ED 776 COLLEGE TEACHING 3 cr. (3 and 0)

ED 801 SEMINAR IN HUMAN GROWTH AND DEVELOPMENT 3 cr. (3 and 0)

ED 802 HUMAN DEVELOPMENT: PSYCHOLOGY OF LEARNING 3 cr. (3 and 0)

ED 803 ADVANCED METHODS OF TEACHING IN THE SECONDARY SCHOOL 3 cr. (3 and 0)

ED 804 ADVANCED METHODS OF TEACHING IN THE ELEMENTARY GRADES 3 cr. (3 and 0)

ED 808 EDUCATIONAL TESTS AND MEASUREMENTS 3 cr. (3 and 0)

ED 809 ANALYSIS OF THE INDIVIDUAL 3 cr. (3 and 0)

ED 810 TECHNIQUES OF COUNSELING 3 cr. (3 and 0)

ED 811 · SCHOOL FINANCE 3 cr. (3 and 0)

ED 813 EDUCATIONAL AND VOCATIONAL INFORMATIONAL SERVICES AND PLACEMENT 3 cr. (3 and 0)

ED 814 FIELD EXPERIENCES IN ELEMENTARY SCHOOL GUIDANCE 3 cr. (2 and 3)

ED 815 FIELD EXPERIENCES IN SECONDARY SCHOOL GUIDANCE 3 cr. (2 and 3)

ED 816 FIELD EXPERIENCES IN PERSONNEL SERVICES IN HIGHER EDUCATION 3 cr. (2 and 3)

ED 817 CLINICAL STUDIES IN COUNSELING AND GUIDANCE 1-3 cr.

ED 818 FIELD PROBLEMS IN SCHOOL ADMINISTRATION AND SUPERVISION OF INSTRUCTION 3 cr. (2 and 3)

ED 819 PSYCHOEDUCATIONAL EVALUATION INTERNSHIP 3 cr. (0 and 6)

ED 830 TECHNIQUES OF SUPERVISION—THE PUBLIC SCHOOLS 3 cr. (3 and 0)

ED 831 EVALUATION OF SECONDARY SCHOOL INSTRUCTION 3 cr. (3 and 0)

ED 832 EVALUATION OF INSTRUCTION IN THE ELEMENTARY SCHOOLS 3 cr. (3 and 0)

ED 840 RESEARCH UTILIZATION 3 cr. (3 and 0)

ED 851 ORGANIZATION AND ADMINISTRATION OF THE ELEMENTARY SCHOOLS 3 cr. (3 and 0)

ED 852 ORGANIZATION AND ADMINISTRATION OF THE SECONDARY SCHOOLS 3 cr. (3 and 0)

ED 861 ORGANIZATION AND SUPERVISION OF READING PROGRAMS 3 cr. (3 and 0)

ED 862 CLINICAL RESEARCH IN READING 3 cr. (3 and 0)

ED 863 PRACTICUM IN READING 3 cr. (2 and 2)

ED 871 INTERPERSONAL AND GROUP RELATIONSHIPS 3 cr. (3 and 0)

ED 881 INDIVIDUAL TESTING I 3 cr. (3 and 0)

ED 882 INDIVIDUAL TESTING II 3 cr. (3 and 0)

ED 890 INTRODUCTION TO RESEARCH IN EDUCATION 3 cr. (3 and 0)

Electrical and Computer Engineering

Professors: A. L. Duke, *Head;* R. W. Gilchrist, J. W. Lathrop, J. T. Long, J. C. Martin, J. N. Thurston, L. C. Wilcox, M. L. Wolla

Associate Professors: W. L. Ball, J. A. Chisman, T. L. Drake, L. T. Fitch, B. E. Gilliland, C. P. Goodin, R. N. Kersey, Jr., H. V. Poe, R. W. Snelsire, I. S. Tolins, W. T. Zink

Assistant Professors: D. C. Amoss, J. N. Gowdy, H. J. Helgert, T. L. Kane, R. D. Stinaff

Instructors: C. W. Malstrom, D. C. Stanzione

E&CE 299   DIGITAL COMPUTATION   2 cr. (1 and 2) F, S

A programming course designed to prepare students for the efficient use of digital computers. Fortran and PL-1 languages are used. An ideal course for those desiring a short but comprehensive introduction to computing.

E&CE 307   BASIC ELECTRICAL ENGINEERING   3 cr. (3 and 0) F, S

A course designed for the student needing a general knowledge of the following topics: electric circuit theory, electronics, and energy conversion devices. *Prerequisite:* Math 206, Phys 221, 223.

E&CE 308   ELECTRONICS AND ELECTROMECHANICS   3 cr. (2 and 2) F, S

A study of electronic devices and systems, as well as magnetic circuits and energy conversion methods. A previous knowledge of basic circuit theories assumed. *Prerequisite:* E&CE 331.

E&CE 312   ELECTROMECHANICS   3 cr. (2 and 2) S

The principles of energy conversion are introduced with emphasis on electromagnetic and electromechanical devices. From these, the mathematical and equivalent circuit models are developed, considering nonlinear magnetic characteristics and linear approximation. These models facilitate representation of the devices in extended systems. In-laboratory studies are made on the characteristics of saturable reactors, magnetic amplifiers, loudspeakers, transformers, d-c motors and generators, and a-c motors and generators. These characteristics are compared with those of the mathematical models. *Prerequisite:* E&CE 330, 331, 340.

E&CE 315   INFORMATION THEORY   3 cr. (3 and 0) S

A course designed for those interested in developing a precise definition of information, and then applying this definition to the study of communication. Coding and the effect of noise on the system will be discussed. In the last part of the course upper bounds on the rate at which a process can transmit information will be obtained. *Prerequisite:* E&CE 327 or Math 301.

E&CE 320   ELECTRONICS I   2 cr. (2 and 0) F, S

Introduction to p-n junction theory and the electrical characteristics of diode and transistor operation of audio-frequency amplifier circuits. Bias stability considerations and the large signal behavior of transistor circuits.

E&CE 321   ELECTRONICS II   2 cr. (2 and 0) F, S

Solid-state circuit theory covering the design of small signal—low frequency amplifiers and multistage and feedback systems; applications involving operational amplifiers, field effect transistors, and integrated circuits are covered. *Prerequisite:* E&CE 320, 330, 331.

E&CE 325   ELECTRONICS AND ELECTROMAGNETICS LABORATORY I   1 cr. (0 and 2) F, S

Laboratory projects dealing with instrumentation and measurement procedures associated with solid-state electronic devices and electromagnetic fields. *Prerequisite:* Concurrent enrollment in E&CE 320, 340.

E&CE 326   ELECTRONICS AND ELECTROMAGNETICS LABORATORY II   1 cr. (0 and 2) F, S

Experimentation in electronics circuits design and electronic systems analysis, including integrated circuits. Projects relating to studies of time varying fields, transmission lines, wave guides, and antennas are included. *Prerequisite:* E&CE 325. Concurrent enrollment in E&CE 321, 341.

E&CE 327   ENGINEERING APPLICATIONS OF PROBABILITY AND RANDOM VARIABLES   3 cr. (3 and 0) F

An introduction to probability and random variables with emphasis on engineering applications. Subjects which will be covered include: probability space, conditional probabilities, independent events, Bernoulii trials, random variables, distribution functions, functions of random variables, and correlation and power spectrum of stationary random processes. *Prerequisite:* Math 208.

E&CE 329   LOGIC AND COMPUTING DEVICES   3 cr. (2 and 2) F, S

A study of logic with an introduction to propositional calculus and Boolean Algebra. Number systems and representation of information. The use of electric devices to implement logic functions and computing elements. The organization and structure of computing systems. *Prerequisite:* Approval of department.

E&CE 330, H330 SYSTEMS I   3 cr. (3 and 0) F, S

A systems approach to engineering problems is presented. A system is considered to be made up of many different interconnected and interacting parts. The parts of the system may involve technology, economics, society, environment, or politics. The system variables and their interactions are quantified in modeling and simulation problems. Alternative solutions are emphasized in presenting decision making and optimization techniques. The various concepts presented in the course are unified using case study type problems. Admission to HONORS section by invitation. *Prerequisite:* Math 208 or approval of department.

E&CE 331, H331   ELECTRIC CIRCUITS WORKSHOP I   3 cr. (2 and 2) F, S

Principles of electric circuit analysis. Resistive circuits, Kirchhoff's Laws. Mesh and nodal analysis. RL, RC, and RLC circuits with various forcing functions. Analog and digital computer methods are used when applicable. Admission to HONORS section by invitation. *Prerequisite:* Math 208, Phys 221.

E&CE 332   SYSTEMS II   2 cr. (2 and 0) F, S

A continuation of E&CE 330, using case studies to present more advanced topics in modeling, simulation, alternative solutions, optimization, decision making, feedback, stability, and man-machine systems. *Prerequisite:* E&CE 330.

E&CE 333   ELECTRIC CIRCUITS WORKSHOP II   3 cr. (2 and 2) F, S

A continuation of E&CE 331. Sinusoidal steady-state analysis. Three-phase systems. Complex frequency, frequency response of networks, magnetically

coupled systems, plus some two-part-network theory. Introduction to Fourier analysis. *Prerequisite:* E&CE 331.

E&CE 340   ELECTRIC AND MAGNETIC FIELDS I   2 cr. (2 and 0) F, S

An introduction to classical electromagnetics. Topics include vector analysis, Coulomb's law, electric field intensity, Gauss's law, potential theory, solution of Laplace's equation, D.C. magnetic fields, magnetic circuits and devices, and forces in magnetic fields. *Prerequisite:* Math 208.

E&CE 341   ELECTRIC AND MAGNETIC FIELDS II   2 cr. (2 and 0) F, S

Continuation of E&CE 340 to include time-varying fields, Maxwell's equations, transmission lines, waveguides, and antennas. *Prerequisite:* E&CE 340.

E&CE 350   PRINCIPLES OF DIGITAL COMPUTER SYSTEMS   3 cr. (2 and 2) F

Introduction to machine structure and programming systems. Topics include: general machine organization and operation, information flow within a machine, internal and external data types and structures, data transfers and communication with external devices, and interrelation between software and hardware. The various levels of programming systems are considered, but the main emphasis is placed on machine language. *Prerequisite:* Approval of department.

E&CE 351   REAL-TIME APPLICATION OF DIGITAL COMPUTERS   3 cr. (2 and 2) S

Introduction to the application and operation of digital computers in a real-time or time-critical environment. Topics include: interrupt and data-break facilities, analog-to-digital and digital-to-analog signal conversion, timing considerations, digital computer interfaces, and on-line acquisition and reduction of data. Software concepts include multitask real-time executives, schedulers, dynamic resource allocation algorithms, level executors, background-foreground systems, and device handlers. *Prerequisite:* E&CE 350 or approval of department.

E&CE 352   MACHINES, LANGUAGES, AND ALGORITHMS   3 cr. (3 and 0) S

An introduction to several theoretical topics necessary for a broad fundamental knowledge of computation. The topics covered fall generally into three major areas: finite state models, formal languages, and computability. Emphasis is placed on relating formalisms to practical considerations such as logical design of digital machines and the limitations of machine computation. *Prerequisite:* Junior standing in Engineering or Physical Science, or approval of department.

E&CE 401   SEMINAR   1 cr. (1 and 0) S

Emphasis is placed on methods of presenting engineering concepts appropriate to an industrial environment. Case study methods are used to examine communication of technical information. Problems in the field of electrical engineering are discussed as examples with consideration being given to their economic as well as scientific significance. *Prerequisite:* Senior standing.

E&CE 403, 603   ENERGY CONVERSION   3 cr. (3 and 0) F

Various methods of energy conversion, both electromechanical and direct. Fuel cells, magnetohydrodynamics, nuclear and other methods are discussed along with more conventional systems. *Prerequisite:* Approval of department.

E&CE 404   SEMICONDUCTOR DEVICES   2 cr. (2 and 0) S

Consideration of the principles of operation, the external characteristics, and the applications of some of the more important semiconductor devices presently available. *Prerequisite:* Introductory electronics course and approval of department.

E&CE 405, H405   SPECIAL PROBLEMS   1-3 cr. F, S

Electrical engineering problems assigned to the student according to his needs and capabilities. The purpose is to give students a chance to do projects, either theoretical or experimental, on subjects not covered in other courses. May be repeated for credit. Admission to HONORS section by invitation. *Prerequisite:* Approval of department.

E&CE 406, 606   INTRODUCTION TO INTEGRATED CIRCUITS   3 cr. (3 and 0) F

Integrated circuit technology, devices and applications. Discussion of fabrication methods, survey of standard circuit characteristics, design and layout principles, linear and digital circuit applications. *Prerequisite:* Senior standing.

E&CE 410, 610   SYSTEMS III   3 cr. (3 and 0) F, S

An extension of E&CE 332 into more advanced topics including flow concepts, stability, synthesis, optimization, and analysis with digital machines, using CSMP-ECAP and other simulation programs. *Prerequisite:* E&CE 332.

E&CE 411, 611   ELECTRICAL SYSTEMS WORKSHOP   2 cr. (0 and 4) F, S

A continuation of E&CE 333. Larger more complex systems are considered. Projects illustrating state space and classical control theory are undertaken. Network synthesis and analysis through digital simulations are also covered. *Prerequisite:* E&CE 333.

E&CE 412, 612   DIGITAL CONTROL SYSTEMS   3 cr. (3 and 0) S

A discussion of the technical and economic aspects of the field of digital control. Major emphasis is placed on the various hardware, installation, and use topics in the field as well as theoretical discussions of the theory of computer automatic control and systems optimization. A comprehensive preview of the status of current theoretical investigations and their place in the industrial control scene. Associated computer control hardware, such as process sensors, signal systems, and final control elements are also examined. Digital and hybrid simulation studies, as well as logic control system designs augment the theoretical presentations.

E&CE 419, 619   ELECTRICAL MACHINERY LABORATORY   1 cr. (0 and 2) F

A laboratory course designed to accompany E&CE 421. Includes measurements of A.C. and D.C. machine parameters, analog computer simulation with emphasis on control. *Prerequisite:* Enrollment in E&CE 421.

E&CE 420, 620   POWER SYSTEMS ANALYSIS I   3 cr. (3 and 0)

A study of the electric power system operation. Subjects covered include three-phase systems, transmission lines, per-unit representation of power systems, system modeling and load flow studies, optimum operating strategies. Also included are associated computer techniques. *Prerequisite:* E&CE 333 and 341.

E&CE 421, 621   ELECTRICAL MACHINERY   3 cr. (3 and 0) F

Characteristics of A.C. and D.C. machines are studied with emphasis on dynamic operation and control. *Prerequisite:* E&CE 333, 341.

E&CE 422, 622   ELECTRONICS III   2 cr. (2 and 0) F, S

An introduction to logic circuits, switching devices, and electronic storage systems. Frequency response of electronic components and systems, oscillator fundamentals, principles of modulation and power supply design are also covered. *Prerequisite:* E&CE 321, 333.

E&CE 424, 624   POWER SYSTEMS ANALYSIS II   3 cr. (3 and 0)

A continuation of E&CE 420. Subjects include synchronous machine model (steady state and transient), the control problem, symmetrical components, fault analysis, and transient stability. *Prerequisite:* E&CE 420 or departmental approval.

E&CE 426, 626   DIGITAL COMPUTER DESIGN   3 cr. (3 and 0) S

Design of the basic arithmetic and logical units of a digital computer. Study of timing and control problems. Design of a small computing system. *Prerequisite:* E&CE 329.

E&CE 427, 627   OPERATIONAL AMPLIFIERS   2 cr. (2 and 0) S

The fundamentals, design, and applications of the operational amplifier. *Prerequisite:* E&CE 320 or equivalent.

E&CE 428, 628   COMMUNICATIONS THEORY I   3 cr. (3 and 0) F

A course in modern communications theory. Topics covered are Fourier transforms, power spectra, correlation, signals in linear networks, amplitude modulation, frequency modulation, sampling and pulse modulation. *Prerequisite:* E&CE 321.

E&CE 429, 629   COMPUTER ORGANIZATION   3 cr. (3 and 0) F

A computer system is organized as a collection of subsystems. The functional characteristics of each subsystem along with the information flow and interactions between these subsystems are studied. The functional specifications of selected computer systems are discussed to illustrate representative computer organizations. The interaction of hardware and software is stressed. Topics include: bus structures, memory organization and heirarchy, memory protection, memory relocation and allocation techniques, interrupt structures, arithmetic units, input-output structures, state generation, central processor organization, and control function implementation. *Prerequisite:* E&CE 350, 351, or approval of department.

E&CE 430, 630   COMMUNICATIONS THEORY II   3 cr. (3 and 0) S

A continuation of E&CE 428 with emphasis on the statistical properties of signals. Topics covered are random signals and noise, signal space and continuous channels, digital data systems, optimum detection theory. *Prerequisite:* E&CE 327, 428.

E&CE 431, 631   DIGITAL ELECTRONICS   3 cr. (3 and 0) S

Electronic devices and circuits of importance to digital computer operation. Active and passive waveshaping, waveform generation, memory, switching, and logic circuits are topics included. *Prerequisite:* E&CE 321.

E&CE 432, 632   INSTRUMENTATION   3 cr. (3 and 0) F

Theory and analysis of transducers and related circuits and instrumentation. Generalized configurations and performance characteristics of instruments will

be considered. Transduction devices for measuring physical parameters such as motion, force, torque, pressure, flow, and temperature will be discussed. *Prerequisite:* E&CE 321 or approval of department.

E&CE 433, 633 DIGITAL ELECTRONICS LABORATORY 1 cr. (0 and 2) S

A laboratory course designed to accompany E&CE 431. *Prerequisite:* concurrent registration in E&CE 431.

E&CE 434, 634 POWER ELECTRONICS 3 cr. (3 and 0) F

A study of electronic devices and systems which are designed to control or regulate large amounts of power. Included are SCR applications to inverters, motor controls, high-current power supplies, frequency converters, etc. Also, high-current switching systems, voltage stabilizers, and other power applications of electronics are considered. *Prerequisite:* E&CE 422.

E&CE 435, 635 COMMUNICATIONS CIRCUITS 3 cr. (3 and 0) S

Communication circuits used in amplification, modulation, detection and other signal processing in modern communication systems. Recent developments in electronic devices, such as integrated circuits, will be considered as circuit components along with other solid state and vacuum electronic devices. *Prerequisite:* E&CE 422.

E&CE 436, 636 RADIATION AND WAVE PROPAGATION 3 cr. (3 and 0) F

Electromagnetic waves, waveguides, and antennas. *Prerequisite:* E&CE 341.

E&CE 437, 637 LASER TECHNOLOGY AND APPLICATIONS 3 cr. (3 and 0) S

An introduction to the design factors and operating principles of solid-state, gas, and semiconductor lasers, couched in the language of electrical engineering and electron physics. Applications of laser technology to such areas as communications, computers, measurements, and medicine are presented. The theory and applications of holography are explored. Special problems and demonstrations relative to electrical engineering application of lasers are designed to augment the theoretical presentations.

E&CE 438, 638 PROCESS INSTRUMENTATION AND CONTROL SYSTEMS 3 cr. (3 and 0) F

The development of process instrumentation and control systems are examined with an emphasis on complete systems planning and design. All aspects of process measurement and control problems are presented beginning with the acquired data and ending with a control signal from a final control element. Hardware concepts and techniques are emphasized. *Prerequisite:* E&CE 432 or consent of instructor.

E&CE 450, 650 SYSTEMS IV 3 cr. (3 and 0) F, S

The final course in the systems sequence summarizes the philosophy and techniques of the systems approach by considering the world as one big dynamic system. The effects of interrelating variables such as population, pollution, food supply, natural resources, and energy requirements are studied. *Prerequisite:* E&CE 410, enrollment in E&CE 451.

E&CE 451, 651 SYSTEM DESIGN WORKSHOP 2 cr. (0 and 4) F, S

A project-oriented course which brings together electrical engineering students of dissimilar training into teams or project groups. Assignments are made to each group which are designed to help develop an appreciation for indi-

vidual and creative thinking as well as team effort. *Prerequisite:* E&CE 411, enrollment in E&CE 450.

E&CE 452, 652   PROGRAMMING SYSTEMS   3 cr. (3 and 0) S

A second course in programming languages and systems. Topics include: assemblers, compilers and syntactical methods; string manipulation and list processing; concepts of executive programs and operating systems; introduction to time-sharing systems. *Prerequisite:* E&CE 350; 352 is recommended.

E&CE 460, 660   COMPUTER-AIDED ANALYSIS AND DESIGN   3 cr. (3 and 0) F

Principles and methods suited to the solution of engineering problems on the digital computer. Topics include widely used methods for the solution of the systems of algebraic and/or differential equations which arise in the modeling of engineering systems, data approximation and curve fitting, continuous system simulation languages, and design-oriented programming systems. *Prerequisite:* E&CE 332 or approval of department.

E&CE 461, 661   ANALOG/HYBRID COMPUTATION AND SIMULATION   3 cr. (2 and 2) S

A continuation of the introductory analog concepts considered in E&CE 331 and 333. Topics include nonlinear modeling, function generation, signal processing, and an introduction to hybrid computing. *Prerequisite:* E&CE 333 or approval of department.

E&CE 802   ANALYSIS OF LINEAR SYSTEMS   3 cr. (3 and 0)

E&CE 803   SEMINAR   1 cr. (1 and 0)

E&CE 804   NETWORK SYNTHESIS I   3 cr. (3 and 0)

E&CE 805   NETWORK SYNTHESIS II   3 cr. (3 and 0)

E&CE 806   NONLINEAR NETWORKS AND SYSTEMS   3 cr. (3 and 0)

E&CE 807   POWER SYSTEM ANALYSIS TECHNIQUES   3 cr. (3 and 0)

E&CE 808   ELECTROMECHANICAL ENERGY CONVERSION   3 cr. (3 and 0)

E&CE 812   SAMPLED DATA SYSTEMS   3 cr. (3 and 0)

E&CE 815   RANDOM DATA MEASUREMENTS AND ANALYSIS   3 cr. (3 and 0)

E&CE 816   LINEAR INTEGRATED CIRCUITS   3 cr. (3 and 0)

E&CE 817   POWER SYSTEM TRANSIENT ANALYSIS   3 cr. (3 and 0)

E&CE 819   DETECTION AND ESTIMATION THEORY   3 cr. (3 and 0)

E&CE 820   THEORY OF COMMUNICATIONS I   3 cr. (3 and 0)

E&CE 821   THEORY OF COMMUNICATIONS II   3 cr. (3 and 0)

E&CE 822   INFORMATION THEORY   3 cr. (3 and 0)

E&CE 823   INTEGRATED CIRCUIT TECHNOLOGY   3 cr. (3 and 0)

E&CE 824   APPLICATIONS OF INTEGRATED CIRCUITS   3 cr. (3 and 0)

E&CE 825   SOLID-STATE ELECTRONICS   3 cr. (3 and 0)

E&CE 826   LARGE-SCALE INTEGRATION   3 cr. (3 and 0)

E&CE 827   INSTRUMENTATION AND MEASUREMENTS   3 cr. (3 and 0)

E&CE 830   ELECTROMAGNETICS I   3 cr. (3 and 0)

E&CE 831   ELECTROMAGNETICS II   3 cr. (3 and 0)

E&CE 832   ANTENNA THEORY   3 cr. (3 and 0)

E&CE 834   MICROWAVE ELECTRONICS   3 cr. (3 and 0)

E&CE 836   OPTICAL ELECTROMAGNETICS AND QUANTUM
ELECTRONICS   3 cr. (3 and 0)

E&CE 844   DIGITAL SIGNAL PROCESSING   3 cr. (3 and 0)

E&CE 850   COMPUTATION AND SIMULATION   3 cr. (3 and 0)

E&CE 851   THEORY AND DESIGN OF DIGITAL-ANALOG MACHINES
3 cr. (3 and 0)

E&CE 852   DIGITAL COMPUTERS AND INFORMATION PROCESSING
3 cr. (3 and 0)

E&CE 853   COMPUTER DATA DISPLAYS   3 cr. (3 and 0)

E&CE 854   ADVANCED SIMULATION STUDIES   3 cr. (3 and 0)

E&CE 855   ARTIFICIAL INTELLIGENCE   3 cr. (3 and 0)

E&CE 856   PATTERN RECOGNITION   3 cr. (3 and 0)

E&CE 857   CODING THEORY   3 cr. (3 and 0)

E&CE 858   AUTOMATA THEORY   3 cr. (3 and 0)

E&CE 864   ADVANCED PHYSICAL SYSTEMS   3 cr. (3 and 0)

E&CE 870   BIOSYSTEMS ANALYSIS   3 cr. (3 and 0)

E&CE 890   SELECTED TOPICS IN ELECTRICAL ENGINEERING   3 cr.
(3 and 0)

E&CE 891   RESEARCH.   Credit to be arranged.

E&CE 991   DOCTORAL RESEARCH.   Credit to be arranged.

Engineering

ENGR 110   ENGINEERING PROBLEMS WORKSHOP I   1 cr. (0 and 2)
A workshop devoted to the analysis and solution of engineering-oriented problems. Representative problems taken from the different fields of engineering will be used to illustrate such analytical and problem-solving techniques as estimation and approximation, numerical aids to computation, and solutions by graphical methods.

ENGR 120   ENGINEERING PROBLEMS WORKSHOP II   1 cr. (0 and 2)
A continuation of Engr 110, although Engr 110 is not a prerequisite.

ENGR 180   ENGINEERING CONCEPTS   3 cr. (2 and 2)
An introduction to the profession of engineering. An analysis of role and responsibilities of the engineer in contemporary society. The engineering

process, from problem formulation to the evolution of creative design, is demonstrated through comprehensive project studies. The course provides the student with insight into the relationship between science and engineering through discussions of typical problems frequently encountered in engineering systems. The course emphasizes the utility and significance of computing devices in present-day engineering practice. An introduction to computer programming and a discussion of computer system architecture are among the topics covered.

ENGR 220 TECHNOLOGY IN THE MODERN WORLD 3 cr. (3 and 0)

The modern world is influenced by the interplay of economic, social, political, and technical forces. This course is designed to give the nontechnical student a better appreciation of the effect of technical forces on the world in which he lives. Topics will include systems analysis, energy sources and systems, automation, the computer, and the interaction of technology and the social system. *Prerequisite:* Sophomore, Junior or Senior standing in liberal arts, science, industrial management, or permission of instructor.

ENGR 491 SEMINAR 1-3 cr. (1-3 and 0)

A study of the dynamic role of engineering in relationship to man and his environment. Topics not covered in formal courses will be presented to keep students abreast of today's rapidly changing technology. *Prerequisite:* Permission of instructor.

Engineering Graphics

Professor: E. Laitala, *Head*
Associate Professors: B. E. Dunkle, L. H. Jameson, C. M. McHugh
Assistant Professors: C. W. Carter, C. D. Meeks

EG 101 FREEHAND SKETCHING 1 cr. (0 and 3)

Principles of technical sketching, including the development of skills in technical lettering and freehand orthographic and pictorial drawing.

EG 103 ENGINEERING COMMUNICATIONS 3 cr. (1 and 6)

The role of engineering communication in engineering and management. Graphic communication includes lettering, sketching, orthographic projection, auxiliary projection, sections and conventional practices, dimensioning, working drawings. Architectural drawing, charts and graphs, presentation techniques. Manufacturing philosophy; interrelation between product design and production processes. For Industrial Management majors.

EG 104 ENGINEERING COMMUNICATION AND DESIGN 2 cr. (0 and 6)

The role of engineering communication from the manager's point of view. Working drawings relating product design and production processes. Architectural drawing nomography, charts and graphs, presentation techniques. *Prerequisite:* EG 109 or consent of instructor.

EG 105 ENGINEERING GRAPHICS 2 cr. (0 and 6)

A course in graphical communication. Freehand sketching, orthographic and auxiliary projection, sectional views, and conventional practices, dimensioning, reading drawings.

EG 109   ENGINEERING GRAPHICAL COMMUNICATION   2 cr.
  (0 and 6)
Graphical methods of communicating ideas and information in engineering.
Development of the student's ability to visualize three dimensional forms and
spatial relationships through the study of creative freehand sketching and basic
fundamentals of engineering representation. Use of drafting aids, introduction
to computer graphics, curve plotting, reproduction methods.

EG 110   ENGINEERING COMMUNICATION FOR ENGINEERING
  TECHNOLOGY   2 cr. (0 and 6)
A continuation of EG 109. Emphasis is placed on engineering drawing as
a means of expressing a design. Standard practices and procedures. Dimen-
sioning for interchangeability, numerical control, and quantity production.
Component design. Developments and intersections. *Prerequisite:* EG 109.

EG 115   ENGINEERING GRAPHICS FOR INDUSTRIAL EDUCATION
  2 cr. (0 and 6)
A comprehensive study of engineering graphics fundamentals. The course
includes lettering, use of instruments, technical sketching, multiviewing draw-
ing, auxiliary projection, descriptive geometry, sectional views, dimensioning,
fasteners, detail and assembly drawings.

EG 116   GRAPHICAL TECHNOLOGY FOR INDUSTRIAL EDUCATION
  2 cr. (0 and 6)
Continuation of EG 115 with emphasis on depth in graphical communica-
tion. Working drawings to include detail and assembly drawings. Inter-
sections and developments. Specifications, standards. Architectural drawings.
Production illustration, pedagogy of graphics, pragmatic and creative design.
Prerequisite: EG 115.

EG 301   ADVANCED ENGINEERING GRAPHICS   3 cr. (1 and 6)
Application of the fundamental principles of engineering graphics to the
solution of three dimensional spatial problems in the design of various engi-
neering systems. Creative functional design, introduction to graphical kine-
matics and computer-aided design. *Prerequisite:* EG 109 or 116.

EG 302   GRAPHICAL COMPUTATION   3 cr. (2 and 3)
Graphic layouts of empirical equations. The application of graphical solu-
tion of equations, nomography, and the graphical calculus to the solution of
problems in engineering and science. Graphical solution of differential equa-
tions. *Prerequisite:* EG 109, Math 106 or equivalent.

Engineering Management

Professors: C. C. Davis, F. R. Himsworth, E. A. LaRoche, B. J. Todd, C. H.
  Whitehurst, Jr.
Associate Professors: F. R. Gray, G. D. Riggs, C. O. Shuler, C. R. Smith,
  J. M. Wannamaker
Assistant Professors: D. L. Davison, J. A. Turner, Jr.

EMGT 910   SEMINAR IN PRODUCTION MANAGEMENT   2 cr.
  (2 and 0)

EMGT 911   SEMINAR IN DECISION THEORY   2 cr. (2 and 0)

EMGT 912   SEMINAR IN FINANCE   3 cr. (3 and 0)

EMGT 913   SYSTEMS ANALYSIS   3 cr. (3 and 0)

EMGT 991   DOCTORAL RESEARCH.   Credit to be arranged.

Engineering Mechanics

Professors: N. R. Bauld, Jr., R. W. Moorman, *Head*

Associate Professors: W. E. Castro, R. E. Elling, J. G. Goree, A. G. Law, R. F. Nowack, M. K. Richardson, P. B. Zielinski

Assistant Professors: E. H. Law, C. R. Mitchell

EM 200   STATICS (SCALAR)   3 cr. (3 and 0)

Forces and force systems and their external effect on bodies; principally the condition of equilibrium for two-dimensional structures. Both analytical and graphical techniques are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Math 108.

EM 201, H201   ENGINEERING MECHANICS (STATICS)   3 cr. (3 and 0)

Forces and force systems and their external effect on bodies; principally the condition of equilibrium. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. Admission to HONORS section by invitation. *Prerequisite:* Phys 122, concurrent registration in Math 206.

EM 202, H202   ENGINEERING MECHANICS (DYNAMICS)   3 cr. (3 and 0)

A continuation of EM 201. The principal topics are kinematics and kinetics of particles and rigid bodies of finite size. Techniques of vector mathematics are employed. Admission to HONORS section by invitation. *Prerequisite:* EM 201, Math 206.

EM 211   PARTICLE MECHANICS: STATICS AND DYNAMICS   3 cr. (3 and 0)

Force and force systems and their effect on particles; the conditions of equilibrium and the kinematics and kinetics of particle motion. The techniques of vector mathematics are employed, and the rigor of physical analysis is emphasized. *Prerequisite:* Phys 122, Math 206.

EM 304, H304   MECHANICS OF MATERIALS   3 cr. (3 and 0)

The relationships between external loads on solid bodies or members and the resulting internal effects and dimension changes, including the derivation of rational formulas for stresses and deformations and the identification and use of important mechanical properties of engineering materials. Admission to HONORS section by invitation. *Prerequisite:* EM 201, Math 206.

EM 305   MECHANICS OF MATERIALS LABORATORY   1 cr. (0 and 3)

Theoretical relationships considered in EM 304 are verified. Students observe the behavior under load and the failure of engineering materials; identify and evaluate mechanical properties of materials important to design and manufacturing processes; and are acquainted with various testing methods, testing machines, and instruments. *Prerequisite:* Must be accompanied or preceded by EM 304.

EM 320, H320   FLUID MECHANICS   3 cr. (3 and 0)

The behavior of fluids at rest or in motion, including the study of fluid properties. Emphasis is placed upon a rational, analytical approach from which are developed basic principles of broad applicability to all fields of engineering. Admission to HONORS section by invitation. *Prerequisite:* EM 202 or 211.

EM 322 FLUID MECHANICS LABORATORY 1 cr. (0 and 3)

The principles developed in EM 320 are verified and demonstrated. Familiarization with orderly techniques in organizing and reporting results of experimental investigations and with the use of instruments and equipment is afforded. *Prerequisite:* Must be accompanied or preceded by EM 320.

EM 421, 621 HYDROLOGY AND HYDRAULICS 2 cr. (2 and 0)

Elements of surface water and ground water hydrology are introduced and applied to engineering problems. Special topics of open channel hydraulics and water distribution systems are developed from the fundamentals of fluid mechanics. *Prerequisite:* EM 320.

EM 425, 625 ADVANCED MECHANICS OF MATERIALS 3 cr. (3 and 0)

A continuation of EM 304. This course includes traditional topics in strength of materials, such as shear center, unsymmetrical bending, torsion of noncircular sections, curved members, and elastic stability. Additionally, there are introduced topics from theory of elasticity as related to simple bending and torsion problems. *Prerequisite:* EM 304.

EM 450, 650 MECHANICAL VIBRATIONS 3 cr. (3 and 0)

Mathematical analysis of physical problems in the vibration of mechanical systems. Topics include: linear free vibrations, forced vibrations and damping in single degree of freedom systems, transient response, multidegree of freedom systems with lumped parameters, Lagrange's equations. *Prerequisite:* EM 202, 304, Math 208.

EM 470, 670 EXPERIMENTAL STRESS ANALYSIS I 3 cr. (2 and 3)

Experimental analysis of static and dynamic stress fields. Emphasis is on the techniques required to obtain data and the theoretical analysis required for proper interpretation. Methods and instrumentation associated with strain gages (including transducer applications), Moiré grids, brittle coatings, birefringent coatings, and photoelasticity are studied. *Prerequisite:* EM 304 and permission of instructor.

EM 802 EXPERIMENTAL STRESS ANALYSIS II 3 cr. (2 and 3)

EM 821 CONTINUUM MECHANICS 3 cr. (3 and 0)

EM 823 DIMENSIONAL ANALYSIS AND DYNAMIC SIMILARITY 3 cr. (3 and 0)

EM 827 TOPICS IN ANALYTICAL MECHANICS 3 cr. (3 and 0)

EM 829 ENERGY METHODS AND VARIATIONAL PRINCIPLES 3 cr. (3 and 0)

EM 831 THEORY OF ELASTICITY I 3 cr. (3 and 0)

EM 832 THEORY OF ELASTICITY II 3 cr. (3 and 0)

EM 834 THEORY OF ELASTIC STABILITY 3 cr. (3 and 0)

EM 845 INTERMEDIATE DYNAMICS 3 cr. (3 and 0)

EM 881 SPECIAL PROBLEMS 3 cr. (3 and 0)

EM 889 SEMINAR 0-1 cr. (1 and 0)

EM 890 SEMINAR 0-1 cr. (1 and 0)

EM 891   RESEARCH.   Credit to be arranged.

EM 932   THEORY OF PLASTICITY   3 cr. (3 and 0)

EM 980   SPECIAL TOPICS IN MECHANICS   3 cr. (3 and 0)

EM 981   SPECIAL TOPICS IN MECHANICS   3 cr. (3 and 0)

EM 982   SPECIAL TOPICS IN MECHANICS   3 cr. (3 and 0)

EM 983   SPECIAL TOPICS IN MECHANICS   3 cr. (3 and 0)

EM 991   DOCTORAL RESEARCH.   Credit to be arranged.

Engineering Technology

Professor: E. Laitala, *Program Director*
Associate Professors: A. F. Hammond, R. L. Perry

ET 241   KINEMATICS OF MACHINES   3 cr. (2 and 3)
    A study of displacements, velocities, and accelerations encountered in the design of machines using the graphical approach to the solution of problems. The use of these principles applied to the study of cams, gears, and miscellaneous mechanisms. *Prerequisite:* EG 110.

ET 301   MECHANICS I   3 cr. (3 and 0)
    A study of statics including force systems and friction, dynamics of particles and rigid bodies; and kinetics including forces, mass and acceleration, work and energy, impulse and momentum. *Prerequisite:* ET 351, Phys 208.

ET 302   MECHANICS II   3 cr. (3 and 0)
    Mechanical properties of solids and fluids. Stress analysis in solids; beams, columns and cylinders. Hydrostatic systems. Energy and flow characteristics of fluid dynamic systems. *Prerequisite:* ET 301.

ET 311   ELECTRICAL CIRCUITS I   3 cr. (3 and 0)
    A study of direct and alternating current circuits. Circuit theorems are introduced in the direct current coverage and are reinforced during the study of alternating currents. Emphasis is placed on steady-state conditions and power relationships in circuits with sinusoidal excitations. *Prerequisite:* Phys 208, concurrent registration in Math 206.

ET 312   ELECTRICAL CIRCUITS II   3 cr. (3 and 0)
    Continuation of Electrical Circuits I. A thorough coverage of polyphase circuits is included. *Prerequisite:* ET 311.

ET 321   HEAT POWER I   3 cr. (3 and 0)
    First and second laws of thermodynamics, thermodynamic properties, gas mixtures and thermodynamic processes. *Prerequisite:* Phys 208, concurrent registration in Math 206.

ET 322   HEAT POWER II   3 cr. (3 and 0)
    Internal combustion engines, gas turbines, air compressors, flow in nozzles, refrigeration and steam power plant cycles, and heat transfer. *Prerequisite:* ET 321.

ET 331   HEAT POWER LABORATORY   1 cr. (0 and 3)
    The course is intended to illustrate theory covered in heat power and in air-conditioning; to develop experimental technique; to interpret data and

results; and to develop basic skills in technical report writing. *Prerequisite:* ET 321 and registration in ET 322.

ET 351   PROBLEMS IN TECHNOLOGY   4 cr. (3 and 3)

The application of basic college mathematics, including differential and integral calculus, to problems found in a broad range of categories corresponding to the Engineering Technology curriculum requirements. Major categories covered include electrical, mechanical, heat power, and processes considerations. *Prerequisite:* Math 106, Phys 208.

ET 411   ELECTRICAL MACHINERY   3 cr. (3 and 0)

Coverage includes the theory of operation and application of D-C and A-C machines and transformers. External characteristics are depicted from the machine equivalent circuit. *Prerequisite:* ET 312.

ET 412   ELEMENTS OF ELECTRONICS   2 cr. (2 and 0)

Theory and operation of electronic circuits and control with emphasis on equipment for industrial application. *Prerequisite:* ET 311.

ET 421   HEATING AND AIR-CONDITIONING   3 cr. (3 and 0)

Psychrometric properties and processes; heating and cooling load calculations; selection and layout of major equipment for heating systems and air-conditioning systems, refrigeration and automatic controls. *Prerequisite:* ET 322.

ET 431   ELECTRICAL LABORATORY   1 cr. (0 and 3)

A laboratory course designed to complement instruction in ET 311, 312, 411. *Prerequisite:* ET 311, 312, and concurrent registration in ET 411.

ET 441   MACHINE AND COMPONENT DESIGN   3 cr. (2 and 3)

Basic instruction in the design and analysis of machine and machine components with emphasis on realistic and functional application. Kinematic and dynamic characteristics of the mechanical system together with wear, fatigue, structural soundness, safety, etc., will be a major consideration of the analysis. *Prerequisite:* ET 241, 302.

English

Professors: R. J. Calhoun, H. M. Cox, C. B. Green, Harriet R. Holman, M. A. Owings, *Head*

Associate Professors: C. O. Caskey, A. J. Fear, C. Gum, L. L. Henry, A. H. Holt, J. L. Idol, Jr., C. M. McGee, Jr., J. J. McLaughlin, J. H. Mandel, Corinne H. Sawyer, M. S. Steadman, Jr., M. O. Usrey, C. H. Watson, E. P. Willey, J. P. Winter

Assistant Professors: R. E. Barfield, Jr., R. F. Barton, J. D. Blanche,* H. B. Bryant, R. L. Cross, T. E. Douglass, D. N. Griffin, H. B. Hannah, R. W. Hill, R. P. Recktenwald, A. L. Recoulley, III, R. O. Rogers, V. A. Rudowski, J. B. Simms, B. N. Skardon, R. A. Underwood, C. H. Woodell

Instructors: H. R. Bettich, W. V. Bost, Joan T. Cross, S. K. Eisiminger, Virginia L. Ganim,* R. B. Heaton, Jr., G. W. Koon, R. F. Lunsford, C. L. Montgomery, Jr., F. W. Pearce, Jr., G. Poster, III, Janice L. Sargent

ENGL 011   ENGLISH   5 cr. (5 and 0)

Writing centered around sentence structure and the single paragraph. Prose readings to accompany classwork.

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* On leave.

ENGL 013   ENGLISH   5 cr. (5 and 0)
Extensive writing of compositions longer than a paragraph. Prose, non-fiction readings to accompany classwork.

ENGL 101, H101   ENGLISH COMPOSITION   3 cr. (3 and 0)
Training in correct and effective expression, in brief expository essays; review of the fundamentals of grammar and punctuation; instruction in common expository methods. Admission to HONORS section by invitation.

ENGL 102, H102   ENGLISH COMPOSITION   3 cr. (3 and 0)
Continued emphasis on correct and effective expression; an introduction to nonfiction prose, fiction, drama, and poetry; training in the organization and writing of the research report. Admission to HONORS section by invitation. *Prerequisite:* Engl 101.

ENGL 105   FUNDAMENTALS OF ORAL COMMUNICATION   3 cr. (3 and 0)
Introduction to the problems of oral communication in the following areas: oral reading, listening, discussion, speaking, with emphasis on individual needs; oral exercises.

ENGL 111   ENGLISH FOR FOREIGN STUDENTS   3 cr. (3 and 2)
A special course for students learning English as a second language. Intensive study and drill in American English pronunciation and listening comprehension. Required of all foreign students who do not make a satisfactory grade on screening examinations in oral English.

ENGL 203, H203   A SURVEY OF ENGLISH LITERATURE   3 cr. (3 and 0)
Chief British authors and works from Beowulf to the Romantic period. Proficiency in composition must be demonstrated. Admission to HONORS section by invitation. *Prerequisite:* Engl 101, 102.

ENGL 204, H204   A SURVEY OF ENGLISH LITERATURE   3 cr. (3 and 0)
Chief British authors and works from Romantic period to the present. Proficiency in composition must be demonstrated. Admission to HONORS section by invitation. *Prerequisite:* Engl 101, 102.

ENGL 205   AMERICAN LITERATURE I   3 cr. (3 and 0)
A survey of American literature to the Civil War, with emphasis on major writers. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 101, 102.

ENGL 206   AMERICAN LITERATURE II   3 cr. (3 and 0)
A survey of American literature from the Civil War to the present, with emphasis on major writers. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 101, 102.

ENGL 207   A SURVEY OF WORLD LITERATURE I   3 cr. (3 and 0)
Translations from the Hellenic, Hebraic, and Oriental Worlds, through the Renaissance, with emphasis on major authors. Proficiency in composition must be demonstrated. *Prerequisite:* Engl 101, 102.

ENGL 208   A SURVEY OF WORLD LITERATURE II   3 cr. (3 and 0)
on major writers. Proficiency in composition must be demonstrated. *Pre-* Translations from the Neo-Classical and Modern Worlds, with emphasis *requisite:* Engl 101, 102.

ENGL 215 INTRODUCTION TO DRAMA 3 cr. (3 and 0)

Introduction to drama as a literary form through readings of representative plays from Aeschylus to Ibsen. *Prerequisite:* Engl 101, 102.

ENGL 217 VOCABULARY BUILDING 3 cr. (3 and 0)

Development of a useful discriminating vocabulary for writing, speaking, and reading. Student notebooks and proficiency quizzes. *Prerequisite:* Engl 101, 102.

ENGL 221 THE CLASSICS IN TRANSLATION 3 cr. (3 and 0)

An examination of the whole of the *The Iliad, The Odyssey, Hesiod's Theogony, The Aeneid, The Metamorphoses,* Apuleius's *The Golden Asse,* and selections from Herodotus and Tacitus. *Prerequisite:* Engl 101, 102.

ENGL 222 MYTHOLOGY 3 cr. (3 and 0)

Great myths of the world, with applications to literature.

ENGL 231 INTRODUCTION TO JOURNALISM 3 cr. (3 and 0)

Instruction and practice in writing for mass media; editorial responsibilities. *Prerequisite:* Engl 102.

ENGL 232 INTRODUCTION TO BROADCASTING 3 cr. (3 and 0)

The history and scope of radio and television broadcasting in America.

ENGL 240 BLACK AMERICAN LITERATURE 3 cr. (3 and 0)

Black American literature from its beginning to the present. A critical examination of essays, short stories, novels, drama, and poetry produced by the Black American. *Prerequisite:* Engl 101, 102.

ENGL 300 JOURNALISM WORKSHOP 1 cr. (1 and 0)

Responsibilities and duties of students editing uncensored publications; criticism of student publications. Open only to members of publication staffs. *Prerequisite:* Engl 102.

ENGL 301 PUBLIC SPEAKING 3 cr. (3 and 0)

Practical training in public speaking; attention to diction, voice, and platform presence; an introduction to parliamentary procedure; practice in preparing and delivering short speeches. *Prerequisite:* Sophomore standing.

ENGL 302 PERSUASION 3 cr. (3 and 0)

The theories and art of ethical oral persuasion. The composition and delivery of speeches of a persuasive nature to convince, to stimulate, and to actuate. *Prerequisite:* Engl 105 or 301.

ENGL 303 VOICE AND DICTION 3 cr. (3 and 0)

Practical training in speech, with emphasis on clarity, vocal variety, and tone quality.

ENGL 304 ADVANCED COMPOSITION 3 cr. (3 and 0)

Supervised writing for students of advanced standing, each student undertaking projects according to his interest; some attention to reports, business letters, research methods and materials. Weekly papers and some larger exercises. Limited enrollment. *Prerequisite:* Sophomore English.

ENGL 305 ORAL INTERPRETATION OF LITERATURE 3 cr. (3 and 0)

Analysis and oral interpretation of selected poetry and prose; training in development of effective tone production. *Prerequisite:* Engl 101, 102.

ENGL 306   FORENSIC LABORATORY   1 cr. (0 and 3)
Organized preparation for participation in college speech activities. Inter-collegiate, campus, and community programs.

ENGL 307   ARGUMENTATION AND DEBATE   3 cr. (3 and 0)
The basic principles of argumentation with emphasis on developing prac-tical skills in argumentative speech. The role of the advocate in contemporary society and an analysis of selected significant debates in U.S. history. *Pre-requisite:* Permission of instructor.

ENGL 308   PRINCIPLES OF ACTING   3 cr. (3 and 0)
Acting for the stage, basic techniques of characterization, audition pro-cedures, exercises in emotional recall and pantomime, experience in supervised performance. *Prerequisite:* Engl 101, 102.

ENGL 309   STAGE DIRECTION   3 cr. (3 and 0)
A laboratory class designed to prepare students to direct plays and super-vise other theatre activities for educational institutions or civic organizations. *Prerequisite:* Engl 308 or 310.

ENGL 310   INTRODUCTION TO THE THEATRE   3 cr. (3 and 0)
The history of play production from the Greeks to modern times. The role of lighting, costuming, set design and other elements in play production. *Prerequisite:* Junior standing.

ENGL 311   THEATRE LABORATORY   1 cr. (0 and 3)
Participation in theatre production including stage management, direction, costume, makeup, lighting, sound, scenery, and business management. No formal class meetings. One credit. May be repeated for a total of three credits. *Prerequisite:* Sophomore standing and permission of instructor.

ENGL 331   CREATIVE WRITING   3 cr. (3 and 0)
The technique of nonexpository writing—narration, description, dramatiza-tion. *Prerequisite:* Sophomore standing or higher and permission of instructor.

ENGL 332   CREATIVE WRITING   3 cr. (3 and 0)
A continuation of Engl 331. *Prerequisite:* Engl 331 or permission of in-structor.

ENGL 333   THE STRUCTURE OF FICTION   3 cr. (3 and 0)
A study of the short story, the novella, and the novel from the writer's point of view. *Prerequisite:* Permission of instructor.

ENGL 334   THE STRUCTURE OF POETRY   3 cr. (3 and 0)
A creative and critical study of various forms of short poetry: the lyric, short narrative, elegy, verse essay. *Prerequisite:* Permission of instructor.

ENGL 339   SCIENCE FICTION   3 cr. (3 and 0)
Readings in science fiction from the seventeenth century to the present, with special emphasis on writers since Verne and Wells. *Prerequisite:* Sopho-more English.

ENGL 351   CHILDREN'S LITERATURE   3 cr. (3 and 0)
Wide reading in prose and verse suitable for children in elementary grades. *Prerequisite:* Sophomore English.

ENGL 352   ADOLESCENT LITERATURE   3 cr. (3 and 0)
Wide reading in prose and verse suitable for children in secondary schools. *Prerequisite:* Sophomore English.

ENGL 362   SPEECH IN THE ELEMENTARY CLASSROOM   3 cr.
(3 and 0)

The development of oral communication skills in children and the use of speech improvement activities to motivate spontaneous, accurate self-expression. *Prerequisite:* Junior standing.

ENGL 363   SPEECH FOR TEACHERS   3 cr. (3 and 0)

A performance course in the communication needs of the professional educator: listening, group discussion, speech and drama activities, conferences, using the media, and micro-teaching. *Prerequisite: Engl 301, 305, or 308.*

ENGL 402, 602   THE ENGLISH LANGUAGE   3 cr. (3 and 0)

Studies in English usage and the historical development of the language. *Prerequisite:* Junior standing.

ENGL 403, 603   COMPOSITION FOR TEACHERS   3 cr. (3 and 0)

Practical training in teaching composition: finding workable topics, organizing and developing observations and ideas, evaluating themes, and creative writing. *Prerequisite:* Junior standing.

ENGL 404, 604   THE STRUCTURE OF MODERN ENGLISH   3 cr.
(3 and 0)

Structural linguistic analysis; principles of phonology, morphology, and syntax as related to traditional, structural, and transformational grammars. Recommended for English teachers. *Prerequisite:* Junior standing.

ENGL 405, 605   SHAKESPEARE   3 cr. (3 and 0)

An introduction to Shakespeare's plays through a study of the tragedies *Hamlet, Othello, King Lear, Macbeth, Anthony* and *Cleopatra,* and of the two tragic plays *Romeo and Juliet* and *Julius Caesar. Prerequisite:* Junior standing.

ENGL 406, 606   SHAKESPEARE   3 cr. (3 and 0)

A selective study of Shakespeare's comedies and histories. *Prerequisite:* Junior standing.

ENGL 409, 609   CHAUCER   3 cr. (3 and 0)

Chaucer as an artist; the "Prologue" for historical and linguistic orientation; "The Canterbury Tales," "House of Fame," "Parliament of Fowls," and "Troilus and Criseyde" as art forms. *Prerequisite:* Junior standing.

ENGL 410, 610   MIDDLE ENGLISH LITERATURE   3 cr. (3 and 0)

Selected works written in English between 1100 and 1500, exclusive of Chaucer. *Prerequisite:* Junior standing.

ENGL 413, 613   CLASSICAL DRAMA   3 cr. (3 and 0)

Selected readings in the dramatic literature of classical Greece and Rome. *Prerequisite:* Junior standing.

ENGL 416, 616   MODERN DRAMA   3 cr. (3 and 0)

Principles and progress of drama from Ibsen to the present; analysis of representative plays; critical reports; discussion of trends in contemporary drama. *Prerequisite:* Junior standing.

ENGL 422, 622   A SURVEY OF AMERICAN LITERATURE   3 cr.
(3 and 0)

The Colonial Period to the Civil War, with emphasis on major authors. *Prerequisite:* Junior standing.

ENGL 423, 623   A SURVEY OF AMERICAN LITERATURE   3 cr.
(3 and 0)

From the Civil War to the early twentieth century, with emphasis on major authors. *Prerequisite:* Junior standing.

ENGL 424, 624   A SURVEY OF AMERICAN LITERATURE   3 cr.
(3 and 0)

Twentieth century, with emphasis on major authors. *Prerequisite:* Junior standing.

ENGL 425, 625   THE ROMANTIC REVIVAL   3 cr. (3 and 0)

The eighteenth century forerunners of Romanticism; Wordsworth, Coleridge, Byron, Shelley, Keats. *Prerequisite:* Junior standing.

ENGL 427, 627   VICTORIAN POETRY   3 cr. (3 and 0)

Extensive readings from the poets of the Victorian Age. *Prerequisite:* Junior standing.

ENGL 429, 629   NINETEENTH CENTURY PROSE   3 cr. (3 and 0)

Readings in the fiction of the nineteenth century after Jane Austen and in the essays of the Romantic and Victorian periods. *Prerequisite:* Junior standing.

ENGL 431, 631   THE RESTORATION AND EIGHTEENTH CENTURY
3 cr. (3 and 0)

Readings in Dryden, Swift, Pope, and Dr. Johnson. *Prerequisite:* Junior standing.

ENGL 435, 635   SOUTHERN LITERATURE   3 cr. (3 and 0)

The intellectual and literary achievement of the South from 1607 to the present, with emphasis upon the writers of the nineteenth century. *Prerequisite: Junior* standing.

ENGL 436, 636   MILTON AND HIS AGE   3 cr. (3 and 0)

The development of Milton's thought and art in relation to his times and to the writings of his contemporaries. *Prerequisite:* Junior standing.

ENGL 437, 637   THE EIGHTEENTH CENTURY ENGLISH NOVEL
3 cr. (3 and 0)

A critical and historical study of the English novel from Defoe to Jane Austen. *Prerequisite:* Junior standing.

ENGL 438, 638   TWENTIETH CENTURY POETRY   3 cr. (3 and 0)

The modern tradition in English and American poetry from Yeats to the present; relevant critical essays. *Prerequisite:* Junior standing.

ENGL 439, 639   TWENTIETH CENTURY FICTION   3 cr. (3 and 0)

American and British novelists and short story writers of the twentieth century. *Prerequisite:* Junior standing.

ENGL 440, 640   APPLIED LITERARY CRITICISM   3 cr. (3 and 0)

Major critical approaches to literature, in theory and practice, from Aristotle to the present. *Prerequisite:* Junior standing.

ENGL 441, 641   CONTINENTAL FICTION IN TRANSLATION   3 cr.
(3 and 0)

Master European fiction writers of the twentieth century, considered in terms of both ideas and literary technique. *Prerequisite:* Junior standing.

ENGL 443, 643   SEVENTEENTH CENTURY POETRY AND PROSE
3 cr. (3 and 0)

A survey of British authors of the seventeenth century other than Shakespeare and Milton. *Prerequisite:* Junior standing.

ENGL 445, 645   RENAISSANCE NONDRAMATIC LITERATURE   3 cr.
(3 and 0)

Tudor and Elizabethan poetry, prose fiction, translations, essays, and criticism. *Prerequisite:* Junior standing.

ENGL 446, 646   TUDOR-STUART DRAMA   3 cr. (3 and 0)

Selected readings in non-Shakespearean dramatic literature of the sixteenth and seventeenth centuries. *Prerequisite:* Junior standing.

ENGL 447, 647   THE AMERICAN NOVEL   3 cr. (3 and 0)

A survey of the most significant forms and themes of the American novel from its beginnings to 1900. *Prerequisite:* Junior standing.

ENGL 461, 661   STUDIES IN ENGLISH LITERATURE TO 1700   3 cr.
(3 and 0)

Selected readings in English literature from the beginnings to 1700, with emphasis on social and intellectual backgrounds. *Prerequisite:* Junior standing.

ENGL 462, 662   STUDIES IN ENGLISH LITERATURE SINCE 1700
3 cr. (3 and 0)

Selected readings in English literature from 1700 to the present, with emphasis on social and intellectual backgrounds. *Prerequisite:* Junior standing.

ENGL H470   SENIOR DIVISION HONORS ENGLISH   3 cr. (3 and 0)

An intensive study of a period, topic, genre, or figure. Papers, reports, reading list, examination. *Prerequisite:* Sophomore English and approval of the Honors Council. May be repeated by arrangement with the department.

ENGL 481   DIRECTED READING   1-3 cr. (1-3 and 0)

Class and tutorial work for students with special interests or projects in American, British, or European literature outside the scope of existing courses. May be repeated by arrangement with the department. *Prerequisite:* Junior standing, or Engl H203, H204, and invitation of the department.

ENGL 740   BLACK AMERICAN LITERATURE FOR TEACHERS   3 cr.
(3 and 0)

ENGL 751   CHILDREN'S LITERATURE FOR TEACHERS   3 cr.
(3 and 0)

ENGL 761   ENGLISH LITERATURE FOR TEACHERS I   3 cr. (3 and 0)

ENGL 762   ENGLISH LITERATURE FOR TEACHERS II   3 cr. (3 and 0)

ENGL 801   THE TEACHING OF ENGLISH   3 cr. (3 and 0)

ENGL 802   STUDIES IN MIDDLE ENGLISH LITERATURE   3 cr.
(3 and 0)

ENGL 803   STUDIES IN RENAISSANCE ENGLISH LITERATURE   3 cr.
(3 and 0)

ENGL 804   STUDIES IN NEOCLASSIC AND ROMANTIC LITERATURE
3 cr. (3 and 0)

ENGL 805   STUDIES IN VICTORIAN AND MODERN ENGLISH LITERATURE   3 cr. (3 and 0)

ENGL 810   STUDIES IN COLONIAL AND REVOLUTIONARY AMERICAN LITERATURE   3 cr. (3 and 0)

ENGL 811   STUDIES IN ROMANTIC AND REALISTIC AMERICAN LITERATURE   3 cr. (3 and 0)

ENGL 812   STUDIES IN MODERN AMERICAN LITERATURE   3 cr. (3 and 0)

ENGL 820   STUDIES IN THEORETICAL AND APPLIED LITERARY CRITICISM   3 cr. (3 and 0)

ENGL 830   STUDIES IN LINGUISTICS   3 cr. (3 and 0)

ENGL 840   STUDIES IN WORLD LITERATURE   3 cr. (3 and 0)

ENGL 881   DIRECTED READING   3 cr. (3 and 0)

ENGL 890   INTRODUCTION TO RESEARCH   1 cr. (1 and 0)

ENGL 891   RESEARCH.   Credit to be arranged.

Entomology

Professors: T. R. Adkins, Jr., R. C. Fox, S. B. Hays, *Head;* E. W. King
Associate Professor: T. E. Skelton
Assistant Professors: G. R. Carner, R. Noblet, R. Gayle Pittman, B. M. Shepard

ENT 200   INSECTS   2 cr. (2 and 0)
An introduction to insects; their various relationships with man, other animals and plants. The general nature of this course makes it beneficial to all students regardless of specialty.

ENT 301   GENERAL ENTOMOLOGY   3 cr. (2 and 3)
A general introduction to entomology with emphasis on anatomy, metamorphosis, and description of the most common insect species. Methods of control are introduced and current control practices are explained for some of the most important species.

ENT 307   FOREST ENTOMOLOGY   3 cr. (2 and 3) F
Insects of economic importance to forests, forest products and shade trees, and their role in the practice of good forest management as well as their significance in the natural environment.

ENT 308   APICULTURE   3 cr. (2 and 3)
A detailed study of the honey bee and its economic importance in pollination and honey production. Attention will be given to bee behavior, colony management, equipment, honey plant identification, and honey production and processing. *Prerequisite:* Zool 101, 103, and permission of instructor.

ENT 401, 601   FIELD CROP AND STORED PRODUCT INSECTS   3 cr. (2 and 3)
Common insect pests of the following are studied: cotton, corn, small grains, legume field crops, tobacco, stored grain and seed. Primary emphasis

is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

ENT 402, 602   FRUIT, NUT, AND VEGETABLE INSECTS   3 cr.
(2 and 3)

Common insect pests of the following are studied: peaches, apples, grapes, pecans, sweet corn, cole crops, cucurbits, potatoes, sweet potatoes, peas and beans. Primary emphasis is placed on life histories, identification of destructive stages, recognition of damage, and current control measures.

ENT 405, H405, 605   INSECT MORPHOLOGY   4 cr. (3 and 3) F

A study of insect structure in relation to function and of the variation of form in insects. Admission to HONORS section by invitation. *Prerequisite:* Ent 301.

ENT 410, 610   INSECT TAXONOMY   3 cr. (1 and 6)

The identification of the principal families of the major orders of adult insects. Laboratory work consists of intensive practice of such identification; lecture material deals with necessary theoretical discussion of taxonomic features observed in the laboratory. *Prerequisite:* Zool 101, 103, Ent 301; Ent 405 desirable.

ENT 455, 655   MEDICAL AND VETERINARY ENTOMOLOGY   3 cr.
(2 and 3) S

Insects and their arthropod relatives which are of considerable economic importance in their effect on man and animals.

ENT 458, 658   PEST CONTROL   3 cr. (2 and 3)

A detailed study of insect pests of structures, the household, lawn and ornamental plants. Identification of the pest, its damage, control methods and safety in handling insecticides will be emphasized.

ENT 461   SEMINAR   1 cr. (1 and 0) F

Students review the principal journals pertaining to insects and related animals; also review the lives and activities of prominent pioneer entomologists. *Prerequisite:* Zool 101, 103, Ent 301.

ENT 462   SEMINAR   1 cr. (1 and 0) S

Continuation of Ent 461.

ENT 468, 668   INTRODUCTION TO RESEARCH   2 cr. (1 and 3) S

Principles, developments and changes in research methods related to certain fields of biological and agricultural research. The students obtain practice in experimental techniques, scientific writing and the use and maintenance of various research instruments and equipment.

ENT 470, 670   INSECT PHYSIOLOGY   3 cr. (2 and 3)

An introduction to the physiological systems of insects including structure as related to function. Emphasis will be on digestion, nutrition, reproduction, respiration, excretion, and nervous and hormonal systems as they affect growth and development in insects.

ENT 480, 680   INSECT PATHOLOGY   3 cr. (2 and 3)

The study of insect diseases including those caused by viruses, rickettsiae, bacteria, fungi, protozoa, and nematodes will be covered in this course. The effects of diseases on insect populations and the use of pathogens in insect control will also be considered in detail.

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

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

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

ENT 840   INSECT ECOLOGY   3 cr. (2 and 3)

ENT 856   MEDICAL ENTOMOLOGY   3 cr. (2 and 3)

ENT 860   INSECT PEST MANAGEMENT   3 cr. (3 and 0)

ENT 861   INSECT TOXICOLOGY   3 cr. (2 and 3)

ENT 863   SPECIAL PROBLEMS IN ENTOMOLOGY   3-6 cr.

ENT 870   ADVANCED INSECT PHYSIOLOGY   3 cr. (2 and 3)

ENT 891   RESEARCH.   Credit to be arranged.

ENT 991   DOCTORAL RESEARCH.   Credit to be arranged.

Environmental Science

Professors: R. F. Borgman, A. W. Snell, W. P. Williams, Jr.
Associate Professors: A. R. Abernathy, C. L. Barth
Assistant Professor: M. G. Johnson

EN SC 431   PUBLIC HEALTH ADMINISTRATION   3 cr. (3 and 0)

A course designed to prepare one for a career in the environmental sciences, with positions in public health and pollution control. Topics included are public health organizations and regulations, public relations, psychology of public health administration, and the use of the communications media in educating the public on health problems.

EN SC 432   INSPECTION METHODS IN WATER AND SOLID WASTE   3 cr. (2 and 3)

Methods of disposal of liquid and solid wastes will be emphasized in regard to environmental quality control. Treatment plant methods will be discussed. Inspection techniques for adequate treatment is a basic approach.

EN SC 471, 671   MAN AND HIS ENVIRONMENT   2 cr. (2 and 0)

The interaction of man with his environment will be surveyed. Health factors such as urbanization, population growth, pathogens, disease vectors, ionizing radiation, sewage disposal, and noise control will be considered. The effects of environmental contacts with air, water, food, and solid and liquid wastes will be emphasized. *Prerequisite:* Permission of instructor.

EN SC 472, 672   ENVIRONMENTAL PLANNING AND CONTROL   2 cr. (2 and 0)

Application of planning and control to effective environmental quality improvement. Topics such as water supply and treatment, wastewater treatment and disposal, solid waste disposal, air pollution abatement, and land use and zoning will be considered from the standpoint of control. Not intended for graduate students in engineering. *Prerequisite:* Permission of instructor.

EN SC 893   ENVIRONMENTAL HEALTH SEMINAR I   1 cr. (1 and 0)

Environmental Systems Engineering

Professors: J. F. Andrews, *Head;* J. H. Austin, L. G. Rich
Associate Professors: A. R. Abernathy, B. C. Dysart, III, T. M. Keinath
Assistant Professor: E. S. Iracki
Adjunct Professors: D. W. Duttweiler, W. M. Sanders, III

ESE 401, 601 ENVIRONMENTAL ENGINEERING 3 cr. (3 and 0)
   An introduction to the field of environmental engineering. Topics to be covered include public health aspects of the environment, water supply and treatment, water pollution control, air pollution control, solid wastes collection and disposal, noise abatement, and radiological health. *Prerequisite:* Junior standing in engineering or permission of instructor.

ESE 402, 602 WATER AND WASTE TREATMENT SYSTEMS 3 cr. (3 and 0)
   A study of the fundamental principles, rational design considerations, and operational procedures of the unit operations and processes employed in water and waste treatment. Both physiochemical and biological treatment techniques will be discussed. An introduction to the integration of unit operations and processes into water and waste treatment systems. *Prerequisite:* EM 320, E&CE 330, or permission of instructor.

ESE 403, 603 WATER AND WASTE TRANSPORT SYSTEMS 3 cr. (3 and 0)
   Analysis, design, and operation of continuous, man-made transport systems for water and wastewater. Introduction to continuous, natural transport systems for water and air and discrete, man-made transport systems for solid wastes. Application of systems engineering techniques such as network theory, transient analysis, mathematical modeling, simulation, and optimization will be stressed. *Prerequisite:* EM 320, E&CE 330, or permission of instructor.

ESE 410 RADIOASSAY TECHNIQUES FOR ENVIRONMENTAL MONITORING 6 cr. (5 and 30)
   The student will be in residence at the Savannah River Laboratory working with the professional staff. Theoretical and practical aspects of radioassay techniques will be covered, including alpha and beta spectrometry; environmental monitoring (sampling and analysis); air filtration systems and monitoring, personnel monitoring (bioassay and whole body counting); and environmental analysis and planning.

ESE 443, 643 ENVIRONMENTAL ENGINEERING CHEMISTRY I 2 cr. (2 and 0)
   A study of those fundamental principles of physical and analytical chemistry that find application in the treatment of waters and wastewaters. Chemical thermodynamics, chemical kinetics, acid-base equilibria, solubility equilibria, complex equilibria, and electrochemistry, are several topics that are examined.

ESE 444, 644 ENVIRONMENTAL ENGINEERING CHEMISTRY LABORATORY I 2 cr. (0 and 6)
   Demonstration of the principles discussed in ESE 443 and laboratory exercises in those analytical methods used in water quality control. Typical wet-chemical analytical techniques demonstrated are residue analysis, turbidity, color, alkalinity, acidity, pH, hardness, iron, manganese, dissolved oxygen, and biochemical oxygen demand. Moreover, several modern instrumental and electroanalytical techniques that are commonly incorporated in environmental water quality monitors are discussed and demonstrated in detail.

ESE 701   SPECIAL PROBLEMS   1-4 cr. (1-4 and 0)

ESE 832   UNIT PROCESSES LABORATORY   1 cr. (0 and 3)

ESE 833   UNIT OPERATIONS LABORATORY   1 cr. (0 and 3)

ESE 842   SANITARY ENGINEERING PROCESSES   3 cr. (3 and 0)

ESE 843   UNIT OPERATIONS OF SANITARY ENGINEERING   3 cr. (3 and 0)

ESE 846   POLLUTION OF THE AQUATIC ENVIRONMENT   3 cr. (3 and 0)

ESE 847   POLLUTION OF THE AQUATIC ENVIRONMENT LABORATORY   1 cr. (0 and 3)

ESE 848   ENVIRONMENTAL ENGINEERING CHEMISTRY II   2 cr. (2 and 0)

ESE 849   ENVIRONMENTAL ENGINEERING CHEMISTRY LABORATORY II   2 cr. (1 and 3)

ESE 852   WATER AND WASTEWATER TREATMENT SYSTEM   3 cr. (2 and 3)

ESE 861   ENVIRONMENTAL SYSTEMS ENGINEERING SEMINAR   0-1 cr. (1 and 0)

ESE 862   ENVIRONMENTAL QUALITY CASE STUDY   1 cr. (0 and 3)

ESE 881   SPECIAL PROBLEMS   1-4 cr.

ESE 883   SELECTED TOPICS IN ENVIRONMENTAL ENGINEERING   3 cr. (3 and 0)

ESE 884   SELECTED TOPICS IN ENVIRONMENTAL ENGINEERING   3 cr. (3 and 0)

ESE 891   RESEARCH.   Credit to be arranged.

ESE 991   DOCTORAL RESEARCH.   Credit to be arranged.

Experimental Statistics

Professor: W. P. Byrd
Associate Professors: W. E. Johnston, J. S. Lytle
Assistant Professor: J. R. Holman
Instructor: W. A. Thomas

EX ST 301   INTRODUCTORY STATISTICS   3 cr. (2 and 2) F, S, SS
   Basic concepts and methods of statistical inference; organization and presentation of data, elementary probability, measures of central tendency and variation, tests of significance, sampling simple linear regression and correlation. The role of statistics in interpreting research, and the general application of the methods are stressed.

EX ST 462, 662   STATISTICS APPLIED TO ECONOMICS   3 cr. (3 and 0) S
   A continuation of Ex St 301 with emphasis on statistical methods used in the collection, analysis, presentation and interpretation of economic data.

Special attention is given to time series analysis, the construction of index numbers and the designing of samples for surveys in the social science fields. *Prerequisite:* Ex St 301.

EX ST 801   STATISTICAL METHODS   4 cr. (3 and 3)

EX ST 803   REGRESSION AND LEAST SQUARES ANALYSIS   3 cr. (3 and 0)

EX ST 804   SAMPLING   3 cr. (3 and 0)

EX ST 805   DESIGN AND ANALYSIS OF EXPERIMENTS   3 cr. (3 and 0)

Fluid Mechanics

The courses listed are offered by the faculties of the departments of Chemical Engineering, Engineering Mechanics, and Mechanical Engineering for students majoring in those departments who desire an area of concentration in fluid mechanics. This integrated sequence provides the opportunity for in-depth penetration of this study area as well as breadth of application to such diverse fields of technology as: propulsion systems, water distribution systems, chemical systems, biological systems, and air and water pollution.

The 800-series courses will be offered on *fixed schedule,* odd number offered in fall and even number in spring. The 900 series are offered as needed.

FM 801   FOUNDATION OF FLUID MECHANICS   3 cr. (3 and 0)

FM 811   EXPERIMENTAL FLUID MECHANICS   3 cr. (2 and 3)

FM 812   THEORY OF INCOMPRESSIBLE IDEAL FLOW   3 cr. (3 and 0)

FM 814   TURBULENT BOUNDARY LAYER   3 cr. (3 and 0)

FM 815   NUMERICAL METHODS IN FLUID MECHANICS   3 cr. (3 and 0)

FM 816   FLOW IN OPEN CHANNELS   3 cr. (3 and 0)

FM 817   NON-NEWTONIAN FLOW   3 cr. (3 and 0)

FM 841   SEMINAR   1 cr. (1 and 0)

FM 901   APPLIED HYDRODYNAMICS   3 cr. (3 and 0)

FM 921   TWO-PHASE FLOW   3 cr. (3 and 0)

FM 931   FREE SURFACE FLOW   3 cr. (3 and 0)

FM 951   BIO-FLUID MECHANICS   3 cr. (3 and 0)

Food Science

Professors: J. H. Mitchell, Jr., W. P. Williams, Jr., *Head*
Assistant Professors: J. C. Acton, J. J. Jen, M. G. Johnson

FD SC 212   MAN'S FOOD RESOURCES   2 cr. (2 and 0)

Food material resources with reference to quality preservation, processing, and nutritional requirements. The role of science and technology in the modern food industry is emphasized. The need for food standards and grades is explained, and the functions of regulatory agencies are discussed.

FD SC 305   DAIRY AND FOOD ENGINEERING   3 cr. (2 and 3)

A study of the basic engineering principles and their application to the dairy and food processing operations. The relationship between engineering principles and fundamentals of food processing is emphasized for the dairy and food technologist. Topics include material and energy balance, electricity and power, steam generation, refrigeration, transfer of heat, flow and mechanics of fluids, evaporation and distillation, strength of materials and kinetics of biological reactions.

FD SC 321   FOOD PROCESSING   2 cr. (2 and 0)

Principles of food handling and processing by refrigerated storage, freezing, canning, fermentation, sugar concentration, and food additives. *Prerequisite:* Organic chemistry and physics or biochemistry.

FD SC 322   FOOD PROCESSING   2 cr. (2 and 0)

Importance of chemical composition and physical characteristics of food materials related to their processing. Unit processes, ingredient functions and new product development concepts. *Prerequisite:* Physics and organic chemistry or biochemistry.

FD SC 323   FOOD PROCESSING LABORATORY   2 cr. (1 and 3)

Laboratory exercises dealing with equipment and processes used in food manufacture.

FD SC 324   FOOD PROCESSING LABORATORY   2 cr. (1 and 3)

A continuation of Fd Sc 323.

FD SC 401, 601   FOOD CHEMISTRY I   4 cr. (3 and 3)

The basic composition, structure, and properties of food and the chemistry of changes occurring during processing utilization. *Prerequisite:* Bioch 210 or permission of instructor.

FD SC 402, 602   FOOD CHEMISTRY II   4 cr. (3 and 3)

Application of theory and procedures for quantitative and qualitative analysis of raw materials, food ingredients and food products. Methods for protein, moisture, lipid, carbohydrate, ash, vitamins, fiber, rancidity, microbial, rheological, color and filth analyses of foods and tests for functional properties of ingredients and food modification during processing will be discussed. *Prerequisite:* Bioch 210 or permission of instructor.

FD SC 415, 615   HUMAN NUTRITION   2 cr. (2 and 0)

Characteristics and functions of basic food nutrients and how they are affected by food processing, preservation and storage methods. Pathways for the conversion of nutrients into living tissue will be examined. *Prerequisite:* Bioch 210, 423, or permission of instructor.

FD SC 417   SEMINAR   1 cr. (1 and 0)

Literature research and oral presentation of current food science topics.

FD SC 418   SEMINAR   1 cr. (1 and 0)

Literature research and oral presentation of current food science topics.

FD SC 420   SPECIAL TOPICS IN FOOD SCIENCE   1-3 cr. (1-3 and 0)

A comprehensive study of special topics in Food Science not covered in other courses. Special emphasis will be placed on independent investigations of contemporary developments.

FD SC 422, 622   QUALITY ASSURANCE AND SENSORY EVALUATION
2 cr. (2 and 0)

Principles of food quality assurance programs with emphasis on the elements of sensory evaluation testing, sampling, inspections, federal and trade standards/grades, records and EVOP procedures.

FD SC 424, 624   QUALITY ASSURANCE AND SENSORY EVALUATION
LABORATORY   1 cr. (0 and 3)

A continuation of Fd Sc 422. The mechanics of quality assurance laboratory methods with emphasis on sensory evaluation panel testing, scoring, kinesthetic properties, and grade-quality measurements.

Forestry

Professors: R. M. Allen, *Head;* B. M. Cool, J. R. Warner

Associate Professors: N. B. Goebel, C. L. Lane, R. E. Schoenike, W. A. Shain, D. H. Van Lear, T. E. Wooten

Assistant Professors: G. D. Kessler, S. A. Marbut, L. D. Reamer, G. E. Sabin

Visiting Assistant Professor: J. R. Saucier

FOR 101   INTRODUCTION TO FORESTRY   1 cr. (1 and 0) F

An informative sketch of forestry, forests, and forestry tasks of the nation; education and career opportunities for foresters.

FOR 102   INTRODUCTION TO FORESTRY   1 cr. (1 and 0) S

A continuation of For 101.

FOR 205   DENDROLOGY   4 cr. (3 and 3) F

Classification and identification of the principal forest trees of the United States, their geographical distribution, ecological requirements, and economic importance. Field identification of native trees, shrubs, woody vines, and of commonly planted exotics in the Piedmont and surrounding areas. *Prerequisite:* Bot 101.

FOR 206   SILVICS   4 cr. (3 and 3) S

A study of the nature of forests and forest trees, how they grow, reproduce, and their relationships to the physical and biological environment. *Prerequisite:* Agron 202, Bot 101, For 205, or permission of instructor.

FOR 251   FOREST PLANTS   2 cr. (Summer Camp)

Identification of principal native forestry understory plants by vegetative and floral characteristics; their site requirements and forest-type associations with emphasis on successional patterns; and their value for man and wildlife. The preparation of a field herbarium is required of all students. *Prerequisite:* Bot 101, For 205, or permission of instructor.

FOR 252   FOREST ENGINEERING   2 cr. (Summer Camp) SS

Field and drafting practice in mapping, traversing boundaries, and road location; use of surveying equipment and techniques. *Prerequisite:* EG 105, CE 201.

FOR 253   FOREST MENSURATION   4 cr. (Summer Camp)

Practical application of field techniques including timber cruising, measuring tree heights and volumes, constructing volume tables and boundary line surveys. *Prerequisite:* CE 201, EG 105, For 205.

FOR 254   FOREST PRODUCTS   1 cr. (Summer Camp)

A tour of the forest products industry of South Carolina with an emphasis on those products and processes of some distinction or special interest.

FOR 302, 602   FOREST MENSURATION   3 cr. (2 and 3) S

A practical application of statistical and mensurational techniques in forest management. *Prerequisite:* Ex St 301, For 253.

FOR 304, 604   FOREST ECONOMICS   3 cr. (3 and 0) S

Economic problems and principles involved in the utilization of forest land and timber and in the distribution of forest products; cost analysis of integrated forest operations. *Prerequisite:* Econ 201.

FOR 305   ELEMENTS OF FORESTRY   2 cr. (2 and 0) F, S

A compendium of forestry subjects providing a broad view of the forest environment as it relates to ecology, management and utilization of forests, especially those of South Carolina. *Prerequisite:* Bot 101 or permission of instructor. Not open to forestry majors.

FOR 306, 606   WOOD AND WOOD FIBER IDENTIFICATION   2 cr. (1 and 3) S

Macroscopic and microscopic identification, properties, and uses of selected economically significant timbers. *Prerequisite:* Bot 101, Ch 102, or permission of instructor.

FOR 307   ELEMENTS OF FORESTRY LABORATORY   1 cr. (0 and 3) F, S

Field and laboratory exercises in the fundamentals of forest land management considered in For 305. *Prerequisite:* Registration in For 305.

FOR 308, 608   AERIAL PHOTOGRAPHS IN FORESTRY   3 cr. (2 and 3) F

An introduction to photographic measurements, aerial photo-interpretations, mapping, and timber estimating. *Prerequisite:* CE 201, Forestry Summer Camp, or permission of instructor.

FOR 310, 610   SILVICULTURE   4 cr. (3 and 3) S

Theory and practice of establishing, maintaining, and harvesting forest stands in accordance with ecological and economic principles. *Prerequisite:* For 206 and Forestry Summer Camp.

FOR 315   FOREST ECOLOGY   2 cr. (2 and 0) S

A study of the forest ecosystem stressing the interrelationships between the living and nonliving components of the forest environment. Energy flow, nutrient and hydrologic cycles, meteorological and soil factors will also be considered. Not open to forestry majors.

FOR 401, 601   LOGGING AND MILLING   3 cr. (2 and 3) S

Logging and milling methods and costs with major emphasis on survey of methods and equipment. *Prerequisite:* Senior standing or permission of instructor.

FOR 403, 603   FOREST SOILS SEMINAR   1 cr. (1 and 0) S

A study of forest soil characteristics with respect to site evaluation, forest fertilization, planting problems, watershed management, tree-soil-microorganism interactions, and trafficability. *Prerequisite:* Junior standing or permission of instructor.

FOR 409, 609   MULTIPLE-USE FORESTRY   3 cr. (3 and 0) F

A study of the demands placed on forests for a variety of products and uses, and how these can and must be reconciled in planning the management of each forest. *Prerequisite:* Senior standing or permission of instructor.

FOR 411, 611   HARVESTING FOREST PRODUCTS   3 cr. (2 and 3) S

An application of engineering and cost analysis techniques to the evaluation of the forest transport system and various harvesting situations. *Prerequisite:* For 401 or permission of instructor.

FOR 412, 612   FOREST PROTECTION   2 cr. (2 and 0) S

Prevention and suppression of forest fires; their effect upon the environment and people; factors affecting fire behavior; and use of fire in resource management. *Prerequisite:* Senior standing or permission of instructor.

FOR 414, 614   MANAGEMENT PLANS   1 cr. (0 and 3) S

Analysis of factors entering into forest working plans of several forestry organizations; preparation of a preliminary management plan of a sample area. *Prerequisite:* For 417.

FOR 416, 616   FOREST POLICY AND ADMINISTRATION   2 cr. (2 and 0) S

Development of public and private forest policy in the United States; administrative and executive tasks in forestry; principles of organization, personnel management, budgeting, and decision making. *Prerequisite:* For 304 or permission of instructor.

FOR 417, 617   FOREST MANAGEMENT AND REGULATION   4 cr. (3 and 3) F

Correlation of production factors and yields of forests; regulation of cuts and growing stock in sustained yield management. *Prerequisite:* Forestry Summer Camp, For 304, 310.

FOR 418, 618   FOREST VALUATION   3 cr. (3 and 0) S

Capital investments in forestry and the returns derivable from them; valuation of land, timber, and other resources associated with forestry; appraisal of damage and stumpage values. *Prerequisite:* For 304.

FOR 419   SENIOR PROBLEMS   3 cr. (1-3 and 0)

Problems chosen with faculty approval in selected areas of forestry. *Prerequisite:* Senior standing.

FOR 420, 620   FOREST PRODUCTS   2 cr. (2 and 0) F

Primary forest products other than lumber; i.e., poles and piles, railroad ties, veneers and plywoods, wood furniture, shingles, containers, secondary wood products; chemically derived products from wood including pulp and paper, distillation products, wood hydrolysis; miscellaneous and minor forest products. *Prerequisite:* For 205, Phys 207, Forestry Summer Camp; Senior standing or permission of instructor.

FOR 421, 621   WOOD PROPERTIES I   3 cr. (2 and 3) F

The formation of wood in forest trees, gross and minute characteristics of wood; defects in wood; variability in wood. *Prerequisite:* Bot 101, For 306, or permission of instructor.

FOR 422, 622   WOOD PROPERTIES II   3 cr. (2 and 3) S

Wood in relation to moisture, heat, sound, light, and electricity; mechanical properties of wood; standard testing procedures for wood. *Prerequisite:* For 306 or permission of instructor.

FOR 423, 623   LECTURES IN FORESTRY   2-4 cr. (2-4 and 0-3)

Lectures in various fields of forestry delivered by the holders of the Belle W. Baruch Visiting Professorship in Forestry.

FOR 424, 624   FOREST GENETICS AND TREE BREEDING   3 cr. (3 and 0) S

History of genetics and breeding in forestry and its relation to silviculture; natural variation, hybridization and inheritance in forest trees; tree breeding objectives and methods. *Prerequisite:* Gen 302 or equivalent, or permission of instructor.

FOR 425   WOOD CHEMISTRY   3 cr. (2 and 3) F

The chemistry of the major components of wood; distribution of the cell-wall components in wood; chemical processing of wood and cellulose-derived products. *Prerequisite:* Ch 102.

FOR 426   A SURVEY OF FOREST POLICY   2 cr. (2 and 0) S

Development of public and private forest policy in the United States; administrative and executive tasks in forestry; principles of organization, personnel management, and budget. *Prerequisite:* Senior standing. Not open to Forestry majors.

FOR 427   WOOD PROCESSING I   3 cr. (2 and 3) F

Wood seasoning principles and practices; seasoning defects; wood preservation principles and practices; fire-retardant treatments. *Prerequisite:* For 421, 422.

FOR 428   WOOD PROCESSING II   3 cr. (2 and 3) S

Machining and preparation of wood for processing; wood adhesives; wood finishes. *Prerequisite:* For 423.

FOR 429   WOOD DESIGN   3 cr. (2 and 3) F

The technical mechanical properties of wood; load analysis and design criteria; design of structural elements in wood. *Prerequisite:* For 423, 424.

FOR 801   DATA PROCESSING IN FORESTRY PROBLEMS   3 cr. (2 and 3)

FOR 802   ADVANCED MENSURATION   3 cr. (2 and 3)

FOR 803   PHOTO-INTERPRETATION   3 cr. (2 and 3)

FOR 804   ADVANCED FOREST ECONOMICS   3 cr. (2 and 3)

FOR 805   COST STUDIES IN HARVESTING AND PROCESSING   3 cr. (2 and 3)

FOR 807   SPECIAL PROBLEMS IN FORESTRY.   Credit to be arranged.

FOR 891   RESEARCH.   Credit to be arranged.

French

Professor: H. E. Stewart, *Head*

Associate Professor: J. A. Dean

Assistant Professors: D. Y. Brannock, Jr., R. R. McGregor, Jr., Jo A. McNatt,° J. B. Macy

Instructors: D. J. Calvez, Marguerite A. Kirsch, Gladys A. Strader, E. L. Wall, R. Willingham

Visiting Instructor: M. Hugo

FR 101, H101   ELEMENTARY FRENCH   4 cr. (3 and 1)

A course for beginners in which, through conversation, composition, and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory. Admission to HONORS section by invitation.

FR 102, H102   ELEMENTARY FRENCH   4 cr. (3 and 1)

A continuation of Fr 101; three hours a week of classroom instruction and one hour a week in the language laboratory. Admission to HONORS section by invitation.

FR 151   FRENCH FOR GRADUATE STUDENTS   3 cr. (3 and 0)

An intensive program for graduate students preparing to take the reading examination in French. Some previous study of the language is helpful but not essential.

FR 152   FRENCH READINGS FOR GRADUATE STUDENTS   3 cr. (3 and 0)

A continuation of Fr 151 with increasing emphasis upon reading comprehension and vocabulary development in the student's area of interest. *Prerequisite:* Fr 151, one year of college French, or departmental permission.

FR 201, H201   INTERMEDIATE FRENCH   3 cr. (3 and 0)

Attention to grammar, with conversation, composition and dictation continued from Fr 102, and the beginning of more serious reading of French prose in short stories or novels. Admission to HONORS section by invitation.

FR 202, H202   INTERMEDIATE FRENCH   3 cr. (3 and 0)

While attention is paid to writing and speaking French, more stress is laid on the rapid reading of more difficult French prose than in the earlier courses. Admission to HONORS section by invitation. *Prerequisite:* Fr 201.

FR 303   SURVEY OF FRENCH LITERATURE I   3 cr. (3 and 0)

Literary movements and authors from the beginnings to the eighteenth century. Required of French majors. *Prerequisite:* Fr 201, 202.

FR 304   SURVEY OF FRENCH LITERATURE II   3 cr. (3 and 0)

Literary movements and authors of the nineteenth and twentieth centuries. Required of French majors. *Prerequisite:* Fr 201, 202.

FR 305   CONVERSATIONAL FRENCH   3 cr. (3 and 0)

Practice in the spoken language, with stress on vocabulary building, pronunciation, intonation, and comprehension; written work to increase accuracy.

° On leave.

Assignments in the language laboratory. Required of French majors. *Prerequisite:* Fr 201.

FR 306   ADVANCED CONVERSATION WITH COMPOSITION   3 cr. (3 and 0)

A continuation of Fr 305, with additional emphasis on written composition. *Prerequisite:* Fr 305, or permission of the Department Head.

FR 307   FRENCH CIVILIZATION   3 cr. (3 and 0)

A study of the significant aspects of the culture of France from its origins to the present. *Prerequisite:* Fr 202 or approval of department.

FR 308   CONTEMPORARY FRENCH CULTURE   3 cr. (3 and 0)

A study of contemporary ideas, opinions and events through magazines, newspapers, scholarly journals of individual interest and essays of national and international import. Class discussions; oral and written reports. *Prerequisite:* Fr 202 or approval of department.

FR 309   INTRODUCTION TO FRENCH PHONETICS   3 cr. (3 and 0)

A study of the fundamental principles of the pronunciation of French through the use of the International Phonetic Alphabet and recordings. *Prerequisite:* Fr 201 or equivalent.

FR 403   TWENTIETH CENTURY PROSE   3 cr. (3 and 0)

The outstanding authors of the first half of the twentieth century: Proust, Gide, Mauriac, Saint-Exupéry, Sartre, Camus, and others. Reading of selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 404   TWENTIETH CENTURY DRAMA   3 cr. (3 and 0)

The French theater since 1900, with emphasis on the period after 1930. Readings, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 405   NINETEENTH CENTURY FRENCH ROMANTICISM   3 cr. (3 and 0)

The Romantic movement as expressed in the works of Chateaubriand, Hugo, Merimée, Vigny, Stendhal, Sand, and others. Readings, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 406   NINETEENTH CENTURY FRENCH REALISM   3 cr. (3 and 0)

Realism as expressed in the works of Balzac, Flaubert, Daudet, Maupassant, Zola, and others. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 407   EIGHTEENTH CENTURY FRENCH LITERATURE   3 cr. (3 and 0)

The principal literary figures of the eighteenth century, with particular emphasis on Voltaire and Rousseau. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 408   SEVENTEENTH CENTURY FRENCH DRAMA   3 cr. (3 and 0)

The French classical drama, with emphasis on Corneille, Racine, and Molière. Selected works, discussions, and reports. *Prerequisite:* Fr 303 or 304.

FR 409   ADVANCED GRAMMAR AND COMPOSITION   3 cr. (3 and 0)

An intensive study of syntax and stylistics through composition and translations. *Prerequisite:* Senior standing or permission.

FR 498   INDEPENDENT STUDY   1-3 cr. (1-3 and 0)
Independent in-depth study of selected topics in French literature. May be repeated for a maximum of six credits. *Prerequisite:* Permission of the Head of the Department of Languages.

Genetics

Professor: C. M. Jones
Associate Professors: W. D. Graham, Jr., J. D. Maxwell
Assistant Professor: E. F. McClain

GEN 301   GENETICS   3 cr. (3 and 0) F
An introduction to the basic principles of genetics and the relationship of these principles to man. To include deleterious genes, chromosome abnormalities, and mutations as these affect the human race; sex-linked, sex-influenced and sex-limited traits; and genetic predictions and population genetics in relation to society. Will not substitute for Gen 302.

GEN 302, H302, 602   GENETICS   4 cr. (3 and 3) F, S, SS
A general coverage of the basic principles of genetics. Examples illustrating the fundamentals of heredity and variation are given for plants and animals, including man. Admission to HONORS section by invitation. *Prerequisite:* Bot 101, 103, Zool 101, 103, or consent of instructor.

GEN 451, 651   GENETICS   3 cr. (3 and 0) S
Methods and concepts in classical and modern genetics. Topics will include advanced studies of linkage; variations in chromosome number and structure; natural and induced mutations; extranuclear inheritance; experimental evolution; population, biochemical and medical genetics. Principles will be illustrated by examples from plants, animals (including man), and microorganisms. *Prerequisite:* Gen 302.

GEN 801   CYTOGENETICS   3 cr. (2 and 3)

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

Geography

GEOG 201   INTRODUCTION TO GEOGRAPHY   3 cr. (3 and 0)
An introduction to the study of geography, including maps, the physical elements of the natural environment and their distribution, and world cultural patterns.

GEOG 301   ECONOMIC GEOGRAPHY   3 cr. (3 and 0)
The geographic conditions fundamental to the world's resources—agricultural, mineral, commercial and industrial, and the conditions which affect the utilization, marketing, consumption and strategic significance of these resources.

GEOG 302   POLITICAL GEOGRAPHY   3 cr. (3 and 0)
The geographic basis for and the geographic problems of the modern state; the relevance of geographical patterns to international affairs. *Prerequisite:* Junior standing or permission of instructor.

Geology

Associate Professors: P. K. Birkhead, V. S. Griffin, Jr., G. M. Haselton, R. D. Hatcher, Jr., D. S. Snipes

GEOL 101   PHYSICAL GEOLOGY   4 cr. (3 and 3)

A study of the minerals and rock which compose the earth's crust, their origins and transformations. Emphasis is placed upon geological processes, both internal and external, by which changes are produced on or in the earth. Laboratory instruction is provided in the interpretation of geologic processes through study of topographic maps. Field trips provide direct observation of processes and results.

GEOL 102   HISTORICAL GEOLOGY   4 cr. (3 and 3)

Evolution, both organic and inorganic, is traced from the beginning of the record up through time to the present. Laboratory instruction and field trips provide practice in the identification and study of plants and animals which have left their record as fossils in the rocks of the earth's crust. Emphasis is placed upon geologic structures and the interpretation of geologic maps. *Prerequisite:* Geol 101.

GEOL 219   GEOLOGY FOR FORESTERS   3 cr. (3 and 0)

A study of materials of the earth's crust, processes of their origin and change; landforms, processes of their formation and destruction. Demonstration of materials is fully incorporated into lectures. Limited to students majoring in forestry or permission of instructor.

GEOL 306, 606   MINERALOGY   3 cr. (2 and 3)

The student gains a working knowledge of crystallography and a comprehensive knowledge of determinative mineralogy. Identification of the minerals is based on their physical and chemical properties. *Prerequisite:* Geol 101 or 406.

GEOL 309, 609   PETROLOGY   3 cr. (2 and 3)

The genesis, evolution, and classification of rocks through lectures, laboratory exercises, and field trips. The occurrences, chemical relationships, and distribution of rock types are emphasized. *Prerequisite:* Geol 306.

GEOL 310, 610   OPTICAL MINERALOGY   3 cr. (1 and 4)

The purpose of this course is to enable the student to identify minerals under the microscope on the basis of their optical properties. *Prerequisite:* Geol 306.

GEOL 313, 613   STRATIGRAPHY AND SEDIMENTATION   3 cr. (3 and 0)

The process by which sediments are eroded, transported, and deposited (sedimentation), with major emphasis on relationships of the area and time distribution of stratified rocks and their historical significances (stratigraphy). *Prerequisite:* Geol 101 or 406.

GEOL 400, 600   ENVIRONMENTAL GEOLOGY   3 cr. (3 and 0)

A discussion-oriented introductory course requiring no previous geologic background involving the study of the relationships of man to his physical surroundings and the problems that result from upsetting the established equilibria of geologic systems. Introduction to geologic materials, systems and processes. Environmental impact of highways, cities, dams and other earthworks; mining techniques and various types of waste products on streams,

the oceans, groundwater and other geologic systems. Man's role as a geologic agent, environmental conservation and management. Use of geologic maps and other geologic tools in resource and land-use planning.

GEOL 402, 602　STRUCTURAL GEOLOGY　3 cr. (2 and 2)

The diverse geological structures of the earth, their description, origin, and field recognition. Practical problems in interpreting geologic structures are utilized, in addition to theoretical considerations of the mechanics and causes of tectonism. *Prerequisite:* Geol 101 or 406.

GEOL 403, 603　INVERTEBRATE PALEONTOLOGY　3 cr. (2 and 3)

A study of life of past geologic ages, as shown by fossilized remains of ancient animals, with emphasis on the invertebrates. *Prerequisite:* Geol 101 or permission of instructor.

GEOL 404, 604　ECONOMIC GEOLOGY　3 cr. (3 and 0)

This course concerns the description and classification of ore deposits and commercial nonmetallic mineral deposits. The origin of mineral deposits and their occurrence is emphasized. Problem studies and field trips to nearby mines and quarries. *Prerequisite:* Geol 306.

GEOL 405, 605　GEOMORPHOLOGY　4 cr. (3 and 3)

A study of the surface features of the earth—their form, nature, origin, development, and the change they are undergoing. *Prerequisite:* Geol 101, 102, 406 or permission of instructor.

GEOL 406　ENGINEERING GEOLOGY　3 cr. (2 and 3)

This course is similar to Geol 101 except that progress is faster and emphasis is on the relationship of geology to engineering.

GEOL 407, 607　QUATERNARY GEOLOGY　3 cr. (2 and 2)

Early concepts about glaciation. Types and distribution of glaciers today and during their maximum extent. Glacial erosion, transportation and ice-sculptured terrain features. Study of quaternary sediments and their chronology. Drainage changes, sea level fluctuations and crustal deformation. Detailed study of specific areas as time permits. Field trips.

GEOL 408, 608　GEOHYDROLOGY　3 cr. (3 and 0)

Study of the hydrologic cycle, aquifer characteristics, theory of groundwater movement, mechanics of well flow, experimental methods, and subsurface mapping. *Prerequisite:* Geol 101, 102, 406.

GEOL 411, 611　RESEARCH PROBLEMS　3 cr. (0 and 9)

A field, laboratory, or library study of an approved topic in geology. The topic would be one not normally covered in formal course offering, but may be an extension of a course. *Prerequisite:* Senior standing in geology or approval of the department head.

GEOL 412　RESEARCH PROBLEMS　3 cr. (0 and 9)

A continuation of Geol 411.

GEOL 700　EARTH SCIENCE I　3 cr. (2 and 3)

GEOL 750　EARTH SCIENCE II　3 cr. (2 and 3)

German

Associate Professor: Patricia W. Wannamaker
Assistant Professor: Judith M. Melton
Instructors: E. P. Arnold, H. L. Laws, Jr.

GER 101, H101 ELEMENTARY GERMAN 4 cr. (3 and 1)

A course for beginners in which, through conversation, composition and dictation, the fundamentals of the language are taught and a foundation is provided for further study and the eventual ability to read and speak the language. Three hours a week of classroom instruction and one hour a week in the language laboratory. Admission to HONORS section by invitation.

GER 102, H102 ELEMENTARY GERMAN 4 cr. (3 and 1)

A continuation of Ger 101; three hours a week of classroom instruction and one hour a week in the language laboratory. Admission to HONORS section by invitation.

GER 151 GERMAN FOR GRADUATE STUDENTS 3 cr. (3 and 0)

An intensive program for graduate students preparing to take the reading examination in German.

GER 152 GERMAN READINGS FOR GRADUATE STUDENTS 3 cr. (3 and 0)

A continuation of Ger 151 with increasing emphasis upon reading comprehension and vocabulary development in the student's area of interest. *Prerequisite:* Ger 151, one year of college German, or departmental permission.

GER 201, H201 INTERMEDIATE GERMAN 3 cr. (3 and 0)

A short review of grammar, with conversation, composition and dictation continued from Ger 102, and the beginning of more serious reading of German prose in short stories or novels. Admission to HONORS section by invitation.

GER 202, H202 INTERMEDIATE GERMAN 3 cr. (3 and 0)

While attention is paid to writing and speaking German, more stress is laid on the rapid reading of more difficult German prose than in the earlier courses. Admission to HONORS section by invitation. *Prerequisite:* Ger 201.

GER 251 SCIENTIFIC GERMAN 3 cr. (3 and 0)

An alternate course to Ger 202; readings in general science and some review of grammar and syntax. *Prerequisite:* Ger 201.

GER 303 SURVEY OF GERMAN LITERATURE I 3 cr. (3 and 0)

Chief authors and works from the Hildebrandslied through the Aufklärung. Required of German majors. *Prerequisite:* Ger 201, 202.

GER 304 SURVEY OF GERMAN LITERATURE II 3 cr. (3 and 0)

Literary movements and works from Heine through Brecht. Required of German majors. *Prerequisite:* Ger 201, 202.

GER 305 CONVERSATIONAL GERMAN 3 cr. (3 and 0)

Practice in the spoken language, with emphasis on vocabulary, pronunciation, and comprehension; written exercises for accuracy; assignments in the language laboratory. Required of German majors. *Prerequisite:* Ger 201.

GER 306   ADVANCED CONVERSATION WITH COMPOSITION   3 cr.
(3 and 0)

Continuation of Ger 305 with additional emphasis on written composition. *Prerequisite:* Ger 305.

GER 307   CONTEMPORARY GERMAN CULTURE I   3 cr. (3 and 0)

A study of significant aspects of the contemporary culture of Germany through readings in current German periodicals on a wide variety of subjects: art, music, literature, economics, travel and human interest topics. *Prerequisite:* Ger 202, or 251, or approval of department.

GER 308   CONTEMPORARY GERMAN CULTURE II   3 cr. (3 and 0)

A continuation of Ger 307. *Prerequisite:* Ger 202, or 251, or approval of department.

GER 403   NINETEENTH CENTURY GERMAN LITERATURE   3 cr.
(3 and 0)

Selected works of Heine, Hebbel, Grillparzer, Keller, Meyer, Hauptmann, Schnitzler, and Hofmannsthal. Readings, discussions, and reports. *Prerequisite:* Ger 303 or 304.

GER 404   TWENTIETH CENTURY GERMAN LITERATURE   3 cr.
(3 and 0)

Selected works from authors of the twentieth century. *Prerequisite:* Ger 303 or 304.

GER 405   THE AGE OF GOETHE   3 cr. (3 and 0)

The development of German literature during Goethe's lifetime, 1749-1832; Aufklärung, Sturm und Drang, Klassiq, Romantik. *Prerequisite:* Ger 303 or 304.

GER 406   FAUST   3 cr. (3 and 0)

An intensive reading of Goethe's masterpiece accompanied by extensive critical research. *Prerequisite:* Ger 303 or 304.

GER 498   INDEPENDENT STUDY   1-3 cr. (1-3 and 0)

Independent in-depth study of selected topics in German literature. May be repeated for a maximum of six credits. *Prerequisite:* Permission of the Head of the Department of Languages.

History

Professors: C. W. Bolen, R. S. Lambert, *Head;* E. M. Lander, Jr.

Associate Professors: Patricia K. Hill, J. V. Reel, Jr.

Assistant Professors: H. D. Adams, J. L. Arbena, J. W. Barnhill, Ruby S. Davis, C. A. Grubb, J. Y. LeBourgeois, R. P. Leemhuis, Rameth R. Owens, J. E. Sargent, R. L. Saunders, Jr., W. F. Steirer, Jr.

Instructors: Bettina K. Beer,* J. R. Beer, A. D. McClare, R. W. Olson, W. L. Pippin, Jr., D. S. Trask, T. M. Verich

HIST 101, H101   AMERICAN HISTORY   3 cr. (3 and 0)

The political, economic and social development of the American people from the period of discovery to the end of Reconstruction. Admission to HONORS section by invitation.

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* On leave.

HIST 102, H102 AMERICAN HISTORY 3 cr. (3 and 0)

The political, economic and social development of the American people from the end of Reconstruction to the present. Admission to HONORS section by invitation.

HIST 171 WESTERN CIVILIZATION 3 cr. (3 and 0)

The political, economic, and social movements of Western Civilization from ancient times to A.D. 900.

HIST 172, H172 WESTERN CIVILIZATION 3 cr. (3 and 0)

The political, economic and social movements of Western Civilization from A.D. 900 to 1715. Admission to HONORS section by invitation.

HIST 173, H173 WESTERN CIVILIZATION 3 cr. (3 and 0)

The political, economic, and social movements of Western Civilization from 1715 to the present. Admission to HONORS section by invitation.

HIST 306 AMERICAN ECONOMIC DEVELOPMENT 3 cr. (3 and 0)

The economic development of the United States from Colonial to recent times, emphasizing the institutional development of agriculture, banking, business and labor, and government regulation and policy. *Prerequisite:* Hist 101, 102.

HIST 307 RECENT UNITED STATES DIPLOMATIC HISTORY 3 cr. (3 and 0)

The history of American foreign policy from the late nineteenth century to the present, showing the rise of America's world interests and gradual involvement in global affairs. Emphasis is placed on the role of public opinion in foreign policy. *Prerequisite:* Hist 101, 102.

HIST 313 HISTORY OF SOUTH CAROLINA 3 cr. (3 and 0)

The political, economic and social development of South Carolina from 1670 up to the present. *Prerequisite:* Junior standing.

HIST 314 HISTORY OF THE SOUTH 3 cr. (3 and 0)

Origins and development of political, economic, and cultural institutions of the South from the Colonial period to the present; and the role of the South in the nation's development.

HIST 315 BLACK HISTORY IN AMERICA 3 cr. (3 and 0)

This course is an effort to define and understand the relationship of Black Americans with White Americans within American society after 1619. *Prerequisite:* Permission of instructor.

HIST 331 PRE-MODERN HISTORY OF EAST ASIA. 3 cr. (3 and 0)

A survey of the history of China and Japan from earliest times to the arrival of Europeans in the sixteenth century.

HIST 332 MODERNIZATION OF EAST ASIA 3 cr. (3 and 0)

A survey of the history of China and Japan from the sixteenth century to the present, with emphasis on the impact of Western culture.

HIST 340 INDIGENOUS AND COLONIAL LATIN AMERICA 3 cr. (3 and 0)

An introduction to the geography of the region; structure and accomplishments of pre-Columbian societies; Iberian background to overseas expansion; conquest and settlement of the New World; political, economic, and social

patterns in the Colonial era leading to the Wars of Independence. *Prerequisite:* Junior standing or permission of instructor.

HIST 341   MEXICO, CENTRAL AMERICA, AND THE CARIBBEAN
SINCE 1800   3 cr. (3 and 0)

An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

HIST 342   SOUTH AMERICA SINCE 1800   3 cr. (3 and 0)

An introduction to the geography of the region; origins and progress of the Independence movements; political, economic and social developments after 1825; current domestic and international problems. *Prerequisite:* 6 hours of history or permission of instructor.

HIST 361   HISTORY OF ENGLAND TO 1603   3 cr. (3 and 0)

The history of England to 1603. *Prerequisite:* Junior standing.

HIST 363   HISTORY OF ENGLAND SINCE 1603   3 cr. (3 and 0)

A continuation of History 361. *Prerequisite:* Junior standing.

HIST 371   ANCIENT CIVILIZATION   3 cr. (3 and 0)

A survey of the history of the Near East, Greece, and Rome to A.D. 476. *Prerequisite:* Hist 171, 172.

HIST 385   HISTORY OF RUSSIA TO 1905   3 cr. (3 and 0)

A survey of Russian history from earliest times to 1905, emphasizing Kievan and Appanage Russia, the rise of the Moscow state, and Imperial Russia. *Prerequisite:* Junior standing.

HIST 386   HISTORY OF RUSSIA SINCE 1905   3 cr. (3 and 0)

Continuation of Hist 385. *Prerequisite:* Junior standing.

HIST 410, 610   HISTORY OF COLONIAL AMERICA   3 cr. (3 and 0)

The development of American institutions and customs in the period before 1776. Considerable emphasis is placed on the imperial relations between Great Britain and her colonies and upon the movement towards, and the philosophy of, the American revolution. *Prerequisite:* Hist 101, 102.

HIST 411, 611   UNITED STATES, 1783-1850   3 cr. (3 and 0)

The formation and growing pains of the new nation through the Federal and Middle periods of its history, with emphasis on economic and political development, the westward movement, and the conflicting forces of nationalism and sectionalism. *Prerequisite:* Hist 101, 102.

HIST 412, 612   UNITED STATES, 1850-1900   3 cr. (3 and 0)

A course dealing with the background causes of developments during, and broad problems after, the Civil War in American history. *Prerequisite:* Hist 101, 102.

HIST 413, 613   UNITED STATES HISTORY, 1890-1933   3 cr. (3 and 0)

Emphasis will be placed on the Populist and Progressive movements, the rise of imperialism, American participation in World War I, the Republican era of the 1920's, and the coming of the Great Depression. *Prerequisite:* Hist 101, 102.

HIST 414, 614   THE UNITED STATES SINCE 1933   3 cr. (3 and 0)
Particular emphasis will be given to the Great Depression, World War II, the Cold War, and domestic developments in the 1950's and 1960's. *Prerequisite:* Hist 101, 102.

HIST 431   CULTURAL INFLUENCE OF CHINA ON EUROPE   3 cr. (3 and 0)
A study of Chinese contacts with and contributions to Western civilization from the Greeks to the nineteenth century.

HIST 441   COMPARATIVE HISTORY OF THE AMERICAS   3 cr. (3 and 0)
An examination of the concept of a unique Western Hemisphere identity through a comparative analysis of common and divergent historical institutions and experiences. Selected topics to be considered will be drawn from the following: conquest and colonization, slavery and race relations, frontiers, land patterns, industrialization and urbanization, and twentieth century reform movements. *Prerequisite:* Hist 101, 102, and one of the following: Hist 340, 341, 342.

HIST 473, 673   MEDIEVAL HISTORY   3 cr. (3 and 0)
A survey of the period from the eclipse of Rome to the advent of the Renaissance, emphasizing human migrations, feudalism, rise of towns, and cultural life. *Prerequisite:* Hist 172 or permission.

HIST 475, 675   THE RENAISSANCE   3 cr. (3 and 0)
An examination of the transitional period of European civilization (ca. 1300-1500) with emphasis on institutional, cultural, and intellectual developments. *Prerequisite:* Hist 172 or permission.

HIST 476, 676   EARLY MODERN EUROPE   3 cr. (3 and 0)
The evolution of Modern Europe (ca. 1500-1660), as affected by the Reformation, wars of religion, and growth of nation-states. The study will include intellectual advances and the beginnings of European expansion overseas. *Prerequisite:* Hist 172 or permission.

HIST 477   ABSOLUTISM AND THE AGE OF REASON   3 cr. (3 and 0)
A study of the quest for order and the consolidation of the European state system between 1660 and 1789 with emphasis on the idea of absolutism, the question of French hegemony, and the synthesis of the eighteenth century Enlightenment. *Prerequisite:* Hist 172 or permission.

HIST 479, 679   EUROPE, 1789-1850   3 cr. (3 and 0)
A history of Europe from the outbreak of the French Revolutions through the Revolutions of 1848, with emphasis on the conflict between the forces of change and those of conservatism within the states and in Europe in general. (Formerly Hist 356.) *Prerequisite:* Hist 173 or permission.

HIST 480, 680   EUROPE, 1850-1914   3 cr. (3 and 0)
A history of Europe from the mid-nineteenth century to the outbreak of the First World War, with emphasis on the social, economic and political development of the European states and the forces of nationalism, imperialism, and liberalism. *Prerequisite:* Hist 173 or permission.

HIST 481   NINETEENTH CENTURY EUROPEAN DIPLOMACY, 1815-1914   3 cr. (3 and 0)
A study of nineteenth century European diplomacy from the Congress of Vienna to the outbreak of the First World War, with emphasis on the func-

tioning of the Concert System, the effects of nationalism, industrialism, popular democracy and imperialism on the character of diplomacy and the relations of the Great Powers. *Prerequisite:* Hist 172, 173.

HIST 482, 682   INTERNATIONAL RELATIONS SINCE 1914   3 cr. (3 and 0)

The great powers and world politics since 1914. *Prerequisite:* Hist 173 or permission.

HIST 483   EUROPE IN THE TWENTIETH CENTURY   3 cr. (3 and 0)

A study of the political, economic, and social institutions of the European peoples from 1914 to the present. Attention will be given to the world wars and to the collapse of the European state-system.

HIST 484   EUROPEAN INTELLECTUAL HISTORY SINCE 1789   3 cr. (3 and 0)

A survey, based upon representative works, of the major intellectual currents in Europe from the Enlightenment to the present. *Prerequisite:* Hist 173 or permission.

HIST 499   STUDIES IN HISTORY   3 cr. (3 and 0)

An attempt to integrate the student's knowledge and understanding of the field of history by lectures, discussions, and readings on the broad themes of history and their relevance to particular periods and geographical areas. Required of all history majors. *Prerequisite:* Hist 101, 102, 172, 173, and permission of the history adviser.

HIST 715   HISTORY OF THE BLACK AMERICAN   3 cr. (3 and 0)

HIST 719   UNITED STATES HISTORY SINCE 1900   3 cr. (3 and 0)

HIST 732   MODERNIZATION OF EAST ASIA   3 cr. (3 and 0)

HIST 741   COMPARATIVE HISTORY OF THE AMERICAS   3 cr. (3 and 0)

HIST 811   INTRODUCTION TO HISTORICAL RESEARCH   3 cr. (3 and 0)

HIST 813   MEDIEVAL HISTORIOGRAPHY   3 cr. (3 and 0)

HIST 814   MODERN EUROPEAN HISTORIOGRAPHY   3 cr. (3 and 0)

HIST 821   STUDIES IN EIGHTEENTH CENTURY UNITED STATES HISTORY   3 cr. (3 and 0)

HIST 822   STUDIES IN NINETEENTH CENTURY UNITED STATES HISTORY   3 cr. (3 and 0)

HIST 823   STUDIES IN TWENTIETH CENTURY UNITED STATES HISTORY   3 cr. (3 and 0)

HIST 824   SEMINAR IN THE AMERICAN SOUTH   3 cr. (3 and 0)

HIST 861   SEMINAR IN MEDIEVAL ENGLAND   3 cr. (3 and 0)

HIST 862   SEMINAR IN MEDIEVAL ENGLAND TO 1485   3 cr. (3 and 0)

HIST 863   SEMINAR IN TUDOR ENGLAND   3 cr. (3 and 0)

HIST 864   SEMINAR IN STUART ENGLAND   3 cr. (3 and 0)

HIST 865   SEMINAR IN MODERN ENGLAND SINCE 1715   3 cr.
(3 and 0)

HIST 866   SEMINAR IN MODERN ENGLAND SINCE 1715   3 cr.
(3 and 0)

HIST 891   RESEARCH.   Credit to be arranged.

Horticulture

Professors: W. L. Ogle, T. L. Senn, *Head;* E. T. Sims, Jr., L. O. Van Blari-
com

Associate Professors: J. R. Haun, W. S. Jordan, H. J. Sefick, B. J. Skelton,
G. E. Stembridge, F. W. Thode

Assistant Professors: J. P. Fulmer, C. R. Johnson, F. B. Ledeboer

HORT 201   GENERAL HORTICULTURE   3 cr. (2 and 2) F, S
A working knowledge of the fundamental plant processes is developed,
showing the influence of light, temperature, water and nutrients upon vegeta-
tive growth and reproduction of horticultural plants. Production practices,
harvesting, storage and marketing of the principal fruit, vegetable and orna-
mental crops are discussed with demonstrations and practice in greenhouse
and orchard. *Prerequisite:* Bot 101, Ch 101.

HORT 301   HORTICULTURE AND MAN   2 cr. (2 and 0)
Study of various areas of horticulture as they affect the daily affairs of man.
Topics include the horticultural industry, factors influencing plant growth,
establishment and maintenance of home grounds, house plants, care of perish-
able horticultural products, and flower arranging.

HORT 302   PRINCIPLES OF VEGETABLE PRODUCTION   3 cr.
(2 and 3) F
The general principles of vegetable growing and handling. Phases receiving
special emphasis are economic importance, producing areas, management
practices, plant forcing, cultural practices, irrigation, quality factors, harvest-
ing, grading, packing, storage, market inspection, transportation, refrigeration,
exhibition and seed production. *Prerequisite:* Hort 201.

HORT 303   PLANT MATERIALS I   3 cr. (2 and 3) F
Woody, ornamental plants and their aesthetic and functional uses in land-
scape developments. The study covers habit of growth, ultimate size, texture
effect, period of bloom, color, and cultural requirements.

HORT 304   PLANT MATERIALS II   3 cr. (2 and 3) S
Herbaceous, ornamental plants which are commonly used as garden flowers.
This study covers habit of growth, size, period of bloom, color and cultural
requirements.

HORT 305   PLANT PROPAGATION   3 cr. (2 and 3) F
Methods of propagation; time, manner and material for making cuttings;
temperature and media for rooting cuttings or ornamental trees, shrubs and
flowering plants; propagating structures, soils and fertilizers. Practical in-
struction given in field and greenhouse. *Prerequisite:* Hort 201.

HORT 308   LANDSCAPE DESIGN   3 cr. (2 and 3) S
Landscape planning of residential and public properties in order to achieve
best use and most enjoyment from a given piece of ground. *Prerequisite:*
Hort 303.

HORT 310, 610   FLORICULTURE   3 cr. (2 and 3) S

Greenhouse production of commercial flower crops; soils; fertilizers; greenhouse diseases and insects; flower crops to be grown on benches and as pot plants; marketing and costs of production. *Prerequisite:* Hort 201.

HORT 352, 652   COMMERCIAL POMOLOGY   3 cr. (2 and 3) F

Fruit bud formation, rest period and water relations of fruit plants, soils, fruit setting; orchard soil management and responses of various fruits to fertilizers; principles of pruning, effect of climatic differences, freezing of tissues and means of avoiding injury; harvesting, transportation and storage. *Prerequisite:* Hort 201.

HORT 405, 605   NUT TREE CULTURE   2 cr. (2 and 0) F, '74 and alternate years.

The production, harvesting and marketing of the principal nut crops with emphasis on the pecan. *Prerequisite:* Hort 201.

HORT 406, 606   NURSERY TECHNOLOGY   3 cr. (2 and 3) S

Principles and techniques in handling nursery crops. *Prerequisite:* Hort 303, 305.

HORT 407, 607   LANDSCAPE DESIGN   3 cr. (2 and 3) F

The first half of this course is a study of trees, shrubs, vines and ground covers used in landscape planting. Attention is given to cultural requirements, growth habits, period of bloom, texture, and fall color. The second half of the course is devoted in landscape planning for small residential properties.

HORT 408, 608   FLORAL DESIGN AND RETAIL MARKETING   2 cr. (1 and 3) F

Studies of the retail flower business with relations to financing, floor plan, equipment, personnel, supplies, salesmanship, advertising, and other important areas. Floral designing for the retail trade will include table arrangements, funeral and wedding designs, as well as corsage and wreath construction.

HORT 409   SEMINAR   1 cr. (1 and 0) F

Recent research work on various phases of horticulture, methods of conducting investigations, and preparation of report of investigations.

HORT 410   SEMINAR   1 cr. (1 and 0) S

A continuation of Hort 409.

HORT 412, 612   TURF MANAGEMENT   3 cr. (2 and 3) F

Studies of warm and cool season turf grasses in relation to regional adaptation, soils, fertilization, general maintenance practices, diseases and insects. Identification of grass and weed species and specific management program for home lawns, golf courses, parks and roadsides. *Prerequisite:* Junior standing.

HORT 451, 651   SMALL FRUIT CULTURE   3 cr. (2 and 3) S

Varieties, soils, sites, culture, fertilizers, harvesting and preparation for marketing of grapes, strawberries, dewberries, blackberries, raspberries, and other small fruits. *Prerequisite:* Hort 201.

HORT 456, 656   VEGETABLE CROPS   3 cr. (3 and 0) S, '75 and alternate years.

The principles and practices employed in the commercial growing and marketing of vegetable crops. Emphasis is placed on temperature requirements, plant characteristics, varieties, soils, fertilizers, weed control, harvesting and preparation for market.

HORT 460, 660   PROBLEMS IN LANDSCAPE DESIGN   5 cr. (3 and 6) F

Landscape planning for larger residential properties, schools, industrial plants, real estate developments; detailed finished plans, costs; further study of materials used; original problems; field study. *Prerequisite:* Hort 308 or 407.

HORT 464, 664   POST HARVEST HORTICULTURE   3 cr. (2 and 2) F

The handling of fruits, vegetables, and ornamental crops after harvesting. Subjects include spoilage problems, hydrocooling, common and cold storage of crops, packaging and processing procedures.

HORT 468, 668   INTRODUCTION TO RESEARCH   2 cr. (1 and 3) S

Principles, developments and changes in research methods related to certain fields of agricultural research. The students obtain practice in experimental techniques, scientific writing and the use and maintenance of various research instruments and equipment. *Prerequisite:* Senior standing.

HORT 470, 670   HORTICULTURAL THERAPY   3 cr. (3 and 0)

The use of horticultural appeal and methods for improvement of physical and mental well-being will be emphasized. Aesthetic and physical activities that can be adapted to suit almost any person are presented. A number of activities are suggested for use in a horticultural therapy program. Horticultural therapy is of value to patients in any type of therapeutic situation and projects will be developed to fit each patient's needs and abilities.

HORT 801   PROBLEMS IN SMALL FRUIT PRODUCTION   3 cr. (3 and 0)

HORT 802   RESEARCH SYSTEMS IN HORTICULTURE   3 cr. (2 and 3)

HORT 803   EXPERIMENTAL OLERICULTURE   3 cr. (3 and 0)

HORT 804   SCIENTIFIC ADVANCES IN ORNAMENTAL HORTICULTURE   3 cr. (3 and 0)

HORT 805   PHYSIOCHEMICAL PROCEDURES FOR DETERMINING QUALITY IN HORTICULTURAL CROPS   3 cr. (2 and 3)

HORT 806   POSTHARVEST PHYSIOLOGY AND HANDLING OF HORTICULTURE CROPS   3 cr. (3 and 0)

HORT 807   POMOLOGY   3 cr. (3 and 0)

HORT 808   SPECIAL INVESTIGATIONS IN HORTICULTURE   2 cr. (2 and 0)

HORT 809   SEMINAR I   1 cr. (1 and 0)

HORT 810   SEMINAR II   1 cr. (1 and 0)

HORT 811   QUANTITATIVE EXPOSITION OF PLANT DEVELOPMENT   2 cr. (1 and 3)

HORT 891   RESEARCH.   Credit to be arranged.

HORT 991   DOCTORAL RESEARCH.   Credit to be arranged.

Hospital and Health Services Administration

Professor: F. A. Burtner
Associate Professor: C. O. Shuler
Visiting Professor: R. E. Toomey

H ADM 308   HOSPITAL AND HEALTH SERVICES ADMINISTRATION
3 cr. (3 and 0)

An introduction to the organization and operation of modern American hospitals, separate clinics and public health services. Included will be legal status, organizational peculiarities, and specific legislation affecting such agencies. *Prerequisite:* Junior standing.

H ADM 410, 610   HOSPITAL INTERNSHIP   3 cr. (0 and 9)

The student will spend nine hours per week on a specified program of observing, practicing and experiencing the duties of hospital administrators in selected local hospitals. The course will be specifically outlined along with the amount of time the student will spend in each phase or department of the hospital. Student progress will be constantly monitored by University faculty and hospital staff. *Prerequisite:* H Adm 308.

H ADM 800   THE FUNCTION AND ORGANIZATION OF HOSPITALS
AND HEALTH SERVICES ADMINISTRATION   3 cr. (3 and 0)

Humanities

Associate Professor: J. J. McLaughlin

HUM 201   INTRODUCTION TO THE HUMANITIES   3 cr. (3 and 0)

A general introduction to humanistic studies, stressing the interrelatedness of various humanistic disciplines. Such fields as art, architecture, music, literature, philosophy, and drama will be considered as they interact with, support, and develop each other in various cultural settings.

HUM 202   INTRODUCTION TO THE HUMANITIES   3 cr. (3 and 0)

A continuation of Hum 201. *Prerequisite:* Sophomore standing or permission of instructor.

HUM 203   CRITICAL JUDGMENT OF THE CINEMA   3 cr. (3 and 0)

The historical development of the aims and techniques of the cinema; the theory of cinematography, its artistic values, and its critical standards. *Prerequisite:* Sophomore standing.

Industrial Education

Professors: E. E. Maurer, A. F. Newton, *Head*
Associate Professors: J. P. Crouch, H. E. Morgan, Jr.
Assistant Professors: F. A. Bosdell, P. C. Caley, D. H. Pate, W. E. West

IN ED 101   INTRODUCTION TO INDUSTRIAL EDUCATION   2 cr.
(1 and 2)

An introduction to the field of industrial education in terms of the underlying philosophies, the aims and goals, and the specific objectives of each of the Industrial Education options. Course activities include research and field experiences in industrial education.

IN ED 102   WOODWORKING I   2 cr. (1 and 3)

A study of wood, its properties and the requisite skills necessary for understanding the use of wood in our technological way of life.

IN ED 103   WOODWORKING II   2 cr. (1 and 3)

A continuation of In Ed 102 in the study of wood, its properties, skills in machine and tool use with wood, project design, project costs and finishing processes necessary for teachers of industrial subjects. (Formerly In Ed 202.) *Prerequisite:* In Ed 102.

IN ED 105   MACHINING PRACTICES   3 cr. (1 and 6)

Basic practical shop experiences on the lathe, drill press, milling machine and shaper. Benchwork, measuring tools, theory and demonstrations related to a survey of fundamental machining practices. (Formerly In Ed 305.) *Prerequisite:* In Ed 101.

IN ED 203   BASIC METAL PROCESSES   3 cr. (1 and 6)

Material separating, forming and combining practices in the metals industries, through the study of basic casting, welding and sheet metal techniques. *Prerequisite:* In Ed 101.

IN ED 204   GRAPHIC ARTS   3 cr. (1 and 6)

Major emphasis is placed on the basic principles underlying the graphic arts. Major areas of study include general photography, graphic layout and design, process photography, offset lithography, screen processing printing, and bindery. Modern industrial applications are stressed throughout.

IN ED 205   POWER TECHNOLOGY   3 cr. (2 and 2)

A study of power in terms of energy sources, and the generation, transmission and utilization of power. Emphasis is placed on the development of insights and understandings of the scientific and operational principles involved in the production, transmission, and utilization of power. *Prerequisite:* In Ed 101.

IN ED 208   ELECTRICITY   3 cr. (2 and 3)

Theory and application of D.C. and A.C. fundamentals, including instrumentation, power sources, circuit analysis, motors, construction wiring, and electronic principles and components. (Formerly In Ed 303.)

IN ED 220   RECREATIONAL AND AVOCATIONAL CRAFTS   3 cr. (2 and 3)

Provides exploratory experiences in the performance of a variety of arts and crafts activities, and encourages the development of an understanding of the purpose of arts and crafts in the comprehensive recreational program.

IN ED 302   DWELLING MATERIALS AND CONSTRUCTION METHODS   2 cr. (1 and 2)

This course is designed as an introduction to the commonly used building materials and the methods of combining them in present day construction. *Prerequisite:* In Ed 102.

IN ED 304   PHOTOGRAPHIC TECHNIQUES   3 cr. (1 and 6)

Emphasis is placed on application of black and white and color photogences are provided to assure confidence in the use of photographic techniques. The tools and materials of image preparation are also used in conjunction raphy as activities for vocation and avocation. Sufficient laboratory experi-

with several graphic reproduction processes to enrich the effectiveness of visual presentations. Problems encountered in action, portrait, still life, and character study photography are considered.

IN ED 310   METHODS OF TRADE TEACHING   3 cr. (3 and 0)

This course is designed to give basic instruction to beginning teachers in tradework. Psychological factors of learning; individual differences; methods of teaching subjects; the special methods used in teaching skills; grading of students and keeping of proper records and reports. (Offered in Summer Sessions only.)

IN ED 312   METAL PROCESSES IN THE GENERAL SHOP   3 cr. (3 and 0)

Major emphasis is placed on planning and development of projects in wrought iron, sheet metal, art metal, metal spinning, welding, heat treating and other aspects of metal work that fit into a general shop program. (Offered in Summer Sessions only.)

IN ED 313   ARTS AND CRAFTS   3 cr. (2 and 3)

Emphasis on knowledge and skills in the industrial crafts by lecture, discussion and laboratory experiences. Stress is placed on several crafts basic to industrial production and popularity. Laboratory experience is required in at least four craft areas with an additional experience in one minor craft.

IN ED 315   CONSTRUCTION PRACTICES   3 cr. (3 and 0)

This course is a study of industrial practices commonly employed in the construction industry. Included will be the use of brick, tile, concrete, metal, wood, and other construction materials. (Offered in Summer Sessions only.)

IN ED 316   PLASTICS AND PLASTIC PROCESSES IN THE GENERAL SHOP   3 cr. (3 and 0)

The industrial, commercial and personal uses of plastics are discussed and demonstrated. In addition, the kinds of plastics, their properties, and special uses are studied. (Offered in Summer Sessions only.)

IN ED 318   INDUSTRIAL TECHNOLOGY TECHNIQUES   3 cr. (3 and 0)

Major emphasis is placed on casting, stamping and forming processes, forging and extrusion processes, machining processes, metal spraying or metallurgy, blast cutting, heating and case hardening, assembly processes, bending, finishing processes, inspection gaging. (Offered in Summer Sessions only.)

IN ED 320   MACHINE WOODWORKING   2 cr. (1 and 3)

Basic characteristics of woodcutting, shaping, and finishing operations by use of machinery and auxiliary tools. Includes project work. *Prerequisite:* Junior standing.

IN ED 325   INDUSTRIAL ORGANIZATIONS AND PEOPLE   3 cr. (3 and 0)

A study of the relationships of personnel to the kinds of tasks they are asked to perform in industrial situations and the ways such situations affect workers. Emphasis is placed on assessment of personnel, organization of industry, working conditions and safety.

IN ED 333   DESIGN   3 cr. (2 and 2)

The study of the principles of form and design elements in two or three dimensions as related to products in the several industrial arts areas. Lectures

and laboratory projects stress creativity in the use of materials in reaching design solutions and in developing a personal design philosophy. Limited market and engineering research is conducted along with the study of significant figures in the field. *Prerequisite:* Basic courses in laboratory methods.

IN ED 350 INDUSTRIAL COOPERATIVE EXPERIENCE 6 cr.

A full-time work experience program in industry for industrial vocational-technical education degree candidates. The student, under the cooperative supervision of the University instructor and an industrial supervisor, is placed in industry to receive planned experiences in the technical specialty which he is preparing to teach. The University instructor will coordinate placement, supervision, and evaluation of the student. The course is offered during the summer only and students are required to register with the instructor one semester prior to the summer in which he plans to enroll. *Prerequisite:* Junior standing in the Industrial Vocational-Technical Education program and approval of instructor.

IN ED 372 ARTS AND CRAFTS FOR THE ELEMENTARY CHILD
3 cr. (2 and 3)

Provides the elementary teacher with an opportunity to develop skills and knowledge in the use of a variety of media suitable for integrating the study of industry and industrial technology into the usual classroom procedures.

IN ED 402 DIRECTED TEACHING 6 cr. (0 and 18)

Supervised observation and teaching in cooperation with selected public schools in which opportunities are provided for securing experience in teaching industrial subjects. *Prerequisite:* In Ed 416, 425, and grade-point ratio required for graduation.

IN ED 405, 605 COURSE ORGANIZATION AND EVALUATION 3 cr.
(3 and 0)

Problems, techniques and procedures in the preparation, selection and organization of subject matter for instructional purposes. Methods, techniques and preparation of materials used in the evaluation of student achievement in industrial education subjects.

IN ED 408, 608 TRAINING PROGRAMS IN INDUSTRY 3 cr. (3 and 0)

Basic concepts of supervision, administration, and management of training programs. Emphasis on determining training requirements, planning, directing, and evaluating training programs.

IN ED 410, 610 SPECIAL INSTITUTE COURSE: TOPICS IN
INDUSTRIAL EDUCATION 3 cr. (3 and 0)

Subject areas organized according to institute needs. Content of the course will be planned cooperatively by the University and the school system or agency requesting the course. *Prerequisite:* Teacher or Graduate standing.

IN ED 414, 614 ELECTRONICS FOR TEACHERS 3 cr. (1 and 6)

Principles of electronics as applied in communications and automatic controls involving vacuum tubes, transistors, integrated circuits, and other electronic devices and materials for the preparation of teachers of industrial arts and vocational-technical electricity and electronics. *Prerequisite:* In Ed 208 or equivalent.

IN ED 416 MANAGEMENT AND OPERATION OF INDUSTRIAL EDUCATION LABORATORIES   3 cr. (2 and 2)

Management and operation of unit and multiple-activity laboratories, including laboratory design, selection and procurement of tools and equipment, budgeting management, and coordination of activities in laboratory courses.

IN ED 421 VOCATIONAL COOPERATIVE PROGRAMS   2 cr. (2 and 0)

A study of the developments, objectives and principles of industrial co-operative training programs. Emphasis is on the organization, promotion, and management of programs in this area of vocational education.

IN ED 422, 622 HISTORY AND PHILOSOPHY OF INDUSTRIAL AND VOCATIONAL EDUCATION   3 cr. (3 and 0)

A study of industrial and vocational education programs with the intent of developing a sound individual philosophy of industrial and vocational education. General topics covered: history; local, state, and federal legislation; types of vocational-technical programs; professional organizations; manpower utilization, vocational guidance, and training; industry, labor, and school relationships.

IN ED 425, 625 TEACHING INDUSTRIAL SUBJECTS   3 cr. (3 and 0)

Effective methods and techniques of teaching industrial subjects. Emphasis is given to class organization, preparation of lesson outlines, and audio-visual aids. *Prerequisite:* Ed 335.

IN ED 432, 632 ADVANCED WOODWORKING   2 cr. (1 and 3)

An advanced consideration of machine methods and developments, materials, quality factors, and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 102.

IN ED 435, 635 ADVANCED WELDING   2 cr. (1 and 3)

An advanced consideration of studies originated in In Ed 203, new theories and developments in welding technology. Inspection trips, written and oral reports. *Prerequisite:* In Ed 203.

IN ED 436, 636 ADVANCED MATERIAL FORMING   2 cr. (1 and 3)

Advanced consideration of studies initiated in In Ed 203, development and evaluation of instructional materials and problems. Inspection trips and reports. *Prerequisite:* In Ed 203.

IN ED 438, 638 ADVANCED MACHINING   2 cr. (0 and 6)

Advanced experiences in the set-up, operation and maintenance of machine tools and equipment. Project and product design. Study and reports of recent machining technological developments.

IN ED 440, 640 ADVANCED TECHNIQUES OF THE GRAPHIC ARTS   3 cr. (1 and 6)

Students selecting to pursue the area of graphic arts will gain experience in the development of advanced techniques of layout and design; photographic copy preparation; cold type composition; line, halftone, duotone, and special effects photography, and advanced platemaking and pressmanship. *Prerequisite:* In Ed 204.

IN ED 441 COMPREHENSIVE LABORATORY FIELD EXPERIENCE   2 cr. (1 and 3)

Field experiences in comprehensive laboratories including management and planning of multiple-activity programs.

IN ED 442 COMPETENCY TESTING IN VOCATIONAL SUBJECTS
3 cr. (3 and 0)

This course is especially designed for trade teachers who have assisted in making trade tests for S. C. Certification program. Teachers who expect to assist in making trade tests are also urged to enroll in this course. The course is devoted to revising present trade tests and developing tests in new fields. (Offered in Summer Sessions only.)

IN ED 444, 644 GRAPHIC ARTS PRODUCTION CONTROL 3 cr.
(2 and 3)

A study of commercial and industrial printing control. Emphasis is placed upon consideration for decision making in the areas of process and equipment selection, capital investment, and plant layout. Other topics include production flow, cost analysis, personnel supervision and training, and recent developments as they affect production. *Prerequisite:* In Ed 204, 440, or permission of instructor.

IN ED 450 INDUSTRIAL COOPERATIVE EXPERIENCE 6 cr.

Continuation of In Ed 350. Summer only. *Prerequisite:* Senior standing, In Ed 350, and approval of instructor.

IN ED 451 SPECIAL PROJECTS 3 cr. (3 and 0)

The student is assigned a project in accordance with his needs and capabilities. Projects are either experimental, theoretical or developmental and cover subjects not thoroughly covered in other courses.

IN ED 452, 652 ADVANCED PROJECTS 1-6 cr.

The student gains depth in content by completing a project under the supervision of an instructor in one of the following subject areas: (a) Arts and Crafts, (b) Drawing and Design, (c) Electricity and Electronics, (d) Graphic Arts, (e) Metalworking, (f) Occupational Education, (g) Power, and (h) Woodworking.

IN ED 496, 696 PUBLIC RELATIONS 3 cr. (3 and 0)

This course emphasizes the techniques and methods of effective public and industrial relations which contribute to understanding and cooperation of labor, business, professional, educational, and industrial groups.

IN ED 815 SEMINAR IN INDUSTRIAL EDUCATION 1 cr. (1 and 0)

IN ED 820 RECENT PROCESS DEVELOPMENTS 3 cr. (3 and 0)

IN ED 840 SCHOOL SHOP DESIGN 3 cr. (3 and 0)

IN ED 845 CURRICULUM PLANNING AND DEVELOPMENT IN INDUSTRIAL EDUCATION 3 cr. (3 and 0)

IN ED 860 CURRICULUM MATERIALS DEVELOPMENT IN INDUSTRIAL EDUCATION 3 cr. (3 and 0)

IN ED 861 ADMINISTRATION AND SUPERVISION OF VOCATIONAL EDUCATION 3 cr. (3 and 0)

IN ED 865 AMERICAN INDUSTRIES 3 cr. (3 and 0)

IN ED 891 RESEARCH. Credit to be arranged.

IN ED 895 SPECIAL PROBLEMS I 3 cr. (3 and 0)

IN ED 896 SPECIAL PROBLEMS II 3 cr. (3 and 0)

Industrial Engineering

Professor: E. Laitala, *Head*
Associate Professor: J. H. Couch

IE 301   PROCESS PLANNING I   3 cr. (2 and 3)

Study of methods of conversion of raw materials into finished products. Emphasis is from the viewpoint of management and control of manufacturing operations. Includes basic terminology, interpretation and use of engineering plans, impact of production volume. This course will examine various manufacturing processes including material removal, casting, joining and forming of materials, and associated measurement techniques. *Prerequisite:* EG 103 or 109, Phys 122.

IE 303   JOB EVALUATION AND WAGE INCENTIVES   3 cr. (3 and 0)

Job description, specification, and classification. Systems employed for establishing relative ranks of jobs. Basic wage and salary determination. Wage incentive methods. *Prerequisite:* IE 307, 410, or consent of instructor.

IE 304   METHODS AND STANDARDS   3 cr. (2 and 3)

Fundamentals relating to work methods design and analysis. Includes study of techniques necessary for determining efficient work methods. Work measurement as a basis for control of costs and scheduling. *Prerequisite:* Junior standing.

IE 306   PROCESS PLANNING II   3 cr. (2 and 3)

Study of recent process developments and impact on planning and control of manufacturing operations. Numerical control of machines, computer-aided design, zero defects program, and others. Special laboratory investigations, and value engineering project. *Prerequisite:* IE 301.

IE 307   SURVEY OF ENGINEERING   3 cr. (3 and 0)

An examination of engineering in terms of fundamentals employed, criteria governing engineering decisions, basic functions and plans created. The kinds of interactions and interdependencies between engineering and nonengineering functions are identified as a basis for optimum organization design. Open to students planning employment in industry including both engineering and nonengineerings majors. *Prerequisite:* Phys 208, or 221, and Junior standing.

IE 403   PROCESS PLANNING III   3 cr. (3 and 0)

Continuation of IE 306; study of latest process developments. *Prerequisite:* IE 306.

IE 405   PLANT LAYOUT AND MATERIAL HANDLING   3 cr. (2 and 3)

Fundamentals underlying the planning of factory layout for new products and increases in production volume. Layout by product and process. Scale model, template, and other planning techniques. Materials handling analysis and equipment decisions. *Prerequisite:* IE 301, IM 408, or consent of instructor.

IE 407   INDUSTRIAL APPLICATION OF STATISTICS   3 cr. (2 and 3)

Application of statistical principles of analysis and control to production processes, studies of process capabilities, quality control, work sampling, reliability analysis, and machine interference. *Prerequisite:* Math 208, 301.

IE 408 PLANT DESIGN 2 cr. (1 and 3)

Integration of unit operations into a total production system. Study of analytical procedures for determining layout of production and other facilities, line balance, manner in which operations shall be linked or material moved between them. Creation and analysis of alternative designs. *Prerequisite:* IE 304 and Senior standing.

IE 410 ENGINEERING AND ORGANIZATION 3 cr. (3 and 0)

The nature of industrial enterprise in terms of purpose, organization structure, governing criteria, responsibilities and relationships of various functional groups. Project engineering and organization. Analysis and coordination of engineering functions as foundation for engineering management.

IE 412 SEMINAR 1 cr. (1 and 0)

Library research and oral reports covering recent technological developments in the field of industrial engineering. Consideration of professional responsibilities and postgraduation plans. A major term paper is required. *Prerequisite:* Senior standing in Industrial Engineering.

IE 413 SEMINAR 1 cr. (1 and 0)

Continuation of IE 412 *Prerequisite:* IE 412.

Industrial Management

Professors: C. C. Davis, F. R. Himsworth, E. A. LaRoche, B. J. Todd, C. H. Whitehurst, Jr., *Head*

Associate Professors: Susan H. Brown, F. R. Gray, J. L. Richardson, G. D. Riggs, C. O. Shuler, C. R. Smith, J. M. Wannamaker

Assistant Professors: D. L. Davison, S. C. Dudley, C. L. Dyer, E. L. Powers, J. A. Turner, Jr., T. H. Wilson, R. F. Zant

Instructors: Bettye B. Johnson, H. Pierce, Shirley F. Pierce

Visiting Professors: R. L. Brown, R. E. Toomey

Visiting Assistant Professor: H. G. Robbins, Jr.

Part-time Visiting Lecturer: S T Peden

IM 201 INTRODUCTION TO INDUSTRIAL MANAGEMENT 3 cr. (3 and 0)

An introductory survey of management's role as a fourth factor of economic production.

IM 299 COMPUTER PROGRAMMING I 1 cr. (0 and 3)

An elementary programming course primarily designed to familiarize the student with the various capabilities of electronic computers. A demonstrated ability to write basic programs applicable to management areas is required. *Prerequisite:* Comp Sc 205 or permission of instructor.

IM 304 QUALITY CONTROL 3 cr. (3 and 0)

Basic control techniques in the field of industrial production, inspection and experimentation. Various sampling, control and inspection problems are studied with special reference to practical applications. Underlying theory, assumptions and limitations are presented. *Prerequisite:* Math 203 or 301.

IM 306 CORPORATION FINANCE 3 cr. (3 and 0)

The organization and operation of corporations with emphasis on the nature and influences of the various sources of funds. *Prerequisite:* Junior standing or permission of instructor.

IM 307   PERSONNEL MANAGEMENT   3 cr. (3 and 0)

An introductory course dealing with the principles and policies governing present day employee-employer relationships. Attention directed to methods of electing, training, placing, and promoting of employees to develop sound personnel techniques. *Prerequisite:* Junior standing.

IM 308   PRINCIPLES OF MARKETING   3 cr. (3 and 0)

The introductory course for undergraduate students in marketing. A study of the principles and concepts involved in the planning, pricing, promotion, and distribution of goods and services.

IM 312   COMMERCIAL LAW   3 cr. (3 and 0)

An introduction to business law with primary attention given to contracts, agency, negotiable instruments and sales. *Prerequisite:* Junior standing.

IM 313   COMMERCIAL LAW   3 cr. (3 and 0)

Continuation of IM 312 with emphasis on business organization, personal and real property, estates and bankruptcy and security services.

IM 322   LEGAL ENVIRONMENT OF BUSINESS   3 cr. (3 and 0)

A comprehensive study of the development of governmental regulation of business including both state and national regulations. Attention is given to the constitutional source and limitation of power in both governments; specific areas in which the governments have acted (production, labor, combinations, prices, etc.) and the regulations that have been imposed in these areas; and the scope of the administrative process.

IM 401, 601   QUANTITATIVE MARKETING ANALYSIS   3 cr. (3 and 0)

An application of quantitative techniques in the investigation and solution of marketing problems. Attention is given to decision theory, game theory, Markov chain models, sales forecasting models, sample survey design, mathematical programming, simulation models, and marketing information systems. *Prerequisite:* IM 308.

IM 402, 602   OPERATIONS PLANNING AND CONTROL   3 cr. (3 and 0)

The application of modern statistical and mathematical techniques to the planning and control of industrial operations. Emphasis will be placed on applications in forecasting, inventory, production scheduling and control, equipment selection and replacement, maintenance and materials handling. Included in the course of instruction is a management simulation (management game) which will give the student practice in managerial decision-making under simulated competitive industry conditions. *Prerequisite:* IM 304 and Senior standing.

IM 403   SPECIAL PROBLEMS   1-3 cr. (1-3 and 0)

Each student will plan and develop a research project related to the field of management or defense studies. *Prerequisite:* Senior standing in Industrial Management or Administrative Management.

IM 404, 604   MANAGERIAL ECONOMICS   3 cr. (3 and 0)

The objective of this course is to bridge the gap between theory and managerial practices. Its stress is on the use of tools of economic analysis in classifying problems, in organizing and evaluating information, and in comparing alternative courses of action. *Prerequisite:* Mgt Sc 310 or 311, or permission of instructor.

IM 405, 605   ECONOMICS OF TRANSPORTATION   3 cr. (3 and 0)

History and structure of transportation systems of the United States; the nature of transportation costs and rates. Transportation systems as factors in industrial location. Government policy towards transportation. *Prerequisite:* Senior standing and permission of instructor.

IM 406, 606   THEORY OF INDUSTRIAL LOCATION   3 cr. (3 and 0)

A theoretical study of the general factors which determine plant location in a capitalist society. Particular attention is paid to surveying current literature. A comparison of location theory and actual location patterns is stressed. *Prerequisite:* Senior standing and permission of instructor.

IM 407   DIRECTED RESEARCH   1 cr. (1 and 0)

Each student will plan and develop a research project related to the field of management. *Prerequisite:* Senior standing in Industrial Management.

IM 408, 608   WORK SIMPLIFICATION AND STANDARDIZATION
3 cr. (3 and 0)

Principles and practices of motion and time as it is applied to industry. Emphasis is given to its application and its influence on methods, material handling, plant layout, and time study procedures.

IM 410   MARKETING RESEARCH I   1 cr. (1 and 0)

Directed independent research and analysis of contemporary topics in marketing. *Prerequisite:* IM 308.

IM 411   MARKETING RESEARCH II   2 cr. (2 and 0)

Directed independent research and analysis of contemporary topics in marketing. *Prerequisite:* IM 308.

IM 412, 612   MARKETING MANAGEMENT   3 cr. (3 and 0)

The terminal course for undergraduate students in marketing. An application of marketing principles in the investigation and solution of marketing problems. Managerial decision areas include products development, pricing, advertising, personal selling, and channels of distribution. *Prerequisite:* IM 308.

IM 413   MARKETING COMMUNICATIONS   3 cr. (3 and 0)

An analysis of mass and interpersonal communications in marketing. Attention is given to communications theory, advertising, sales promotion, and personal selling. *Prerequisite:* IM 308.

IM 415, 615   MANAGERIAL DECISION MAKING   3 cr. (3 and 0)

Management problems and methods involved in the operation of manufacturing institutions, including location, equipment investment, organization structure, and budgets. Attention is given primarily to the above areas by the use of the case method. Emphasis on oral and written communication. *Prerequisite:* Permission of instructor.

IM 416   MANAGEMENT OF HUMAN RESOURCES   3 cr. (3 and 0)

A course designed to orient the student toward recent developments in enlightened uses of human resources with emphasis on procurement, training, development, rewarding and retention of such resources. *Prerequisite:* Permission of instructor.

IM 417, 617   MANUFACTURING LOGISTICS   3 cr. (3 and 0)

A study of more advanced manufacturing and production techniques including predetermined motion time data systems, micromotion study analysis, work

sampling or ratio delay studies, zero defects, materials handling techniques, machine interference, time study formula construction, machinery and equipment replacement calculations, economic lot size determination, development and use of standard data, cost reduction programs, operator training methods, charting of time study data, problems of machinery and equipment layout, and developing of complex time standards. *Prerequisite:* IM 408 or permission of instructor.

IM 418, 618   MANAGEMENT INFORMATION SYSTEMS   3 cr.
(3 and 0)
A study of the design and use of communication processes in which data are recorded, transmitted and revised as an aid in management decision making in operations planning and controlling.

IM 420, 620   MANAGEMENT OF DEFENSE EXPENDITURES   3 cr.
(3 and 0)
Examines the various components and budget classifications of the Department of Defense. Responsibility for the management of these expenditures and methods employed are treated extensively. *Prerequisite:* Econ 419 or permission of instructor.

IM 421   CONSUMER BEHAVIOR   3 cr. (3 and 0)
An examination of selected behavioral science concepts and their application to the understanding of consumer decision making. Text and cases. *Prerequisite:* IM 308.

IM 499   COMPUTER PROGRAMMING II   1 cr. (0 and 3)
Each student will complete a research project relating to the accomplishment of some management function in which a computer program is now— or is expected to be—of cardinal importance. Students selecting the Defense Studies area concentration may complete the course requirement in that field. *Prerequisite:* IM 299 or equivalent.

Latin

Assistant Professor: R. R. McGregor, Jr.

LAT 101   ELEMENTARY LATIN   3 cr. (3 and 0)
A course for beginners designed principally to teach the reading of the language.

LAT 102   ELEMENTARY LATIN   3 cr. (3 and 0)
A continuation of Lat 101 with the introduction of supplementary readings from Classical and Medieval authors.

LAT 201   INTERMEDIATE LATIN   3 cr. (3 and 0)
A review of the fundamental principles of grammar in conjunction with readings from the Classical period. *Prerequisite:* Lat 102 or equivalent.

LAT 202   INTERMEDIATE LATIN   3 cr. (3 and 0)
A continuation of Lat 201 with the introduction of writings from the late Latin and Medieval periods. *Prerequisite:* Lat 201 or equivalent.

Management

MGT 800   MANAGEMENT SIMULATION   1 cr. (0 and 3)

MGT 801   QUANTITATIVE ECONOMIC ANALYSIS   3 cr. (3 and 0)

MGT 802   FINANCE   3 cr. (3 and 0)

MGT 803   OPERATIONS MANAGEMENT   3 cr. (3 and 0)

MGT 804   MANAGERIAL POLICY   3 cr. (3 and 0)

MGT 805   QUALITY CONTROL   3 cr. (3 and 0)

MGT 810   MANAGEMENT AND THE LAW   3 cr. (3 and 0)

MGT 811   ADVANCED MARKETING ANALYSIS   3 cr. (3 and 0)

MGT 816   MANAGEMENT OF HUMAN RESOURCES   3 cr. (3 and 0)

MGT 891   RESEARCH.   Credit to be arranged.

Management Science

Professors: F. R. Himsworth, E. A. LaRoche, B. J. Todd, C. H. Whitehurst, Jr.
Associate Professor: G. D. Riggs
Assistant Professors: C. L. Dyer, T. H. Wilson, R. F. Zant

MGT SC 310   INTRODUCTION TO MANAGEMENT SCIENCE   3 cr.
(3 and 0)

An introduction to quantitative methods of the management scientist with applications to economic and industrial problems. The course is designed to introduce the student to the use of mathematics, statistics, and accounting as tools in managerial decision making. *Prerequisite:* Math 203, Econ 202.

MGT SC 311, 611   INTRODUCTION TO ECONOMETRICS   3 cr.
(3 and 0)

An introduction to economic measurement. Emphasis is placed upon the mathematical formulation of economic theory, the application of calculus to economic theory, and the application of statistics with particular emphasis on the use of regression analysis in economics. Elementary econometric models are introduced. *Prerequisite:* Math 301, Econ 314.

MGT SC 413, 613   MANAGEMENT SCIENCE I   3 cr. (3 and 0)

The role and uses of management science techniques in decision making in business and industry; the problems of internal operation of a business enterprise in static and dynamic settings under conditions of certainty, risk and uncertainty. Deterministic models will be emphasized, and topics include classical optimization, marginal analysis, programming, the transportation problem, allocation and assignment, the game theory. Attention will also be given to input-output, network analysis, and decision theory. *Prerequisite:* Consent of instructor.

MGT SC 414, 614   STATISTICAL ANALYSIS   3 cr. (3 and 0)

This course is designed to provide the student with sufficient understanding of modern statistical methods to make judicious application of statistics in management decision making. Emphasis is placed on the proper design, analysis and interpretation of planned experiences in internal operations. Topics

include single factor through fractional factorial experiments, response surface methodology and evolutionary operations. *Prerequisite:* Math 301 or equivalent.

MGT SC 806   REGIONAL SCIENCE METHODS   3 cr. (3 and 0)

MGT SC 807   ECONOMETRIC METHODS I   3 cr. (3 and 0)

MGT SC 808   ECONOMETRIC METHODS II   3 cr. (3 and 0)

MGT SC 812   MANAGEMENT SCIENCE II   3 cr. (3 and 0)

Materials Engineering

Professor: S. F. Hulbert
Associate Professors: F. W. Cooke, J. S. Wolf
Assistant Professors: J. J. Klawitter, A. M. Weinstein
Visiting Professor: S. Lyng
Visiting Assistant Professor: R. B. Leonard

MATE 301   INTRODUCTION TO METALLURGICAL ENGINEERING
3 cr. (3 and 0)

An introduction to the structure and properties of engineering materials. Topics included are bonding in solids, mechanical behavior, equilibrium and nonequilibrium behavior of mixtures and alloys, material-environment interaction, selection of materials for engineering uses, and analysis of material failures. Emphasis is placed on metals and polymers. *Prerequisite:* Junior standing in engineering or the physical sciences, Ch 102, Phys 221.

MATE 302   MATERIALS ENGINEERING LABORATORY   2 cr. (1 and 3)

Laboratory practice in the determination and analysis of the properties of engineering materials. Topics included are specimen selection and preparation, microscopy, photography, temperature measurement, thermal analysis, and mechanical testing. *Prerequisite:* MatE 301 or CrE 310.

MATE 307   INTRODUCTION TO POLYMER ENGINEERING   3 cr.
(3 and 0)

An introduction to the materials engineering of organic polymers. Principles and practice of synthesis of macromolecules; polymerization through addition and condensation; copolymerization; block and graft polymerization. Characterization of polymers in solution; molecular weight averages and polymolecularity. Structure and properties of polymers in the condensed state; crystalline-amorphous system; theory of rubber elasticity, mechanical, thermal, optical, and electrical behavior. *Prerequisite:* Freshman chemistry.

MATE 312   MATERIALS ENGINEERING THERMODYNAMICS   3 cr.
(3 and 0)

An introduction to the thermodynamics of materials with special emphasis on metallic systems. Topics included are atomic and crystalline properties of metals, solid solutions and intermetallic compounds, the thermodynamic laws and their relation to solution theory and phase equilibria, and applications of the above to the phase equilibria in unary, binary, and ternary metallic systems with special regard to microstructural evolution. *Prerequisite:* MatE 301 or CrE 310.

MATE 405, 605   PHYSICAL METALLURGY I   3 cr. (3 and 0)

A comprehensive treatment of electron theory, lattice defects, diffusion, solutions and phase equilibria, phase transformations, creep and fracture ap-

plied to metals and simple alloys, with emphasis on structure-property relationships. *Prerequisite:* MatE 301 or CrE 310.

MATE 406, 606 PHYSICAL METALLURGY II 3 cr. (3 and 0)
A continuation of MatE 405. *Prerequisite:* MatE 405.

MATE 408, 608 PRINCIPLES OF POLYMER SCIENCE I 3 cr. (3 and 0)
An introduction to the materials science of organic polymers. The structures for many types of polymers are surveyed and correlated with macroscopically observable characteristics. The general properties of pure and coexisting polymer phases are defined, and thermally dependent phase transitions are discussed. Further considerations are devoted to swelling phenomena, degradation and stabilization mechanisms, surface modification methods, and to properties of composite structures. *Prerequisite:* MatE 301 or 307, CrE 310, or an equivalent course.

MATE 409, 609 PRINCIPLES OF POLYMER SCIENCE II 3 cr. (3 and 0)
A continuation of the introductory course in polymer science. Polymerization methods are surveyed, and the polymerization kinetics of one type of system is dealt with in detail. Quantitative treatments are presented for various experimental procedures that involve dilute polymer solutions. Further considerations are concerned with important testing techniques, and with the unique behavior of some polyelectrolyte systems. *Prerequisite:* MatE 408 or an equivalent course.

MATE 411 MATERIALS ENGINEERING KINETICS 3 cr. (3 and 0)
An introduction to the important rate processes in solid materials. Topics included are homogeneous and heterogeneous phase transitions, solidification and other nucleation processes, recrystallization and grain growth, and sintering reactions. Emphasis is placed upon the effects of these phenomena on the properties of engineering materials. *Prerequisite:* A course in thermodynamics.

MATE 421, 621 MECHANICAL METALLURGY 3 cr. (3 and 0)
A comprehensive treatment of the concepts of the atomic and microstructural processes which govern the mechanical behavior of metals, alloys, metal oxides, and composite structures. The theories of plastic deformation, creep, and fatigue are applied to metalworking processes and the selection of materials for loadbearing applications. *Prerequisite:* MatE 301 or CrE 310.

MATE 450, 650 SPECIAL TOPICS IN MATERIALS ENGINEERING 1-4 cr. (0-4 and 12-0)
A comprehensive study of a topic of current interest in the field of materials engineering. May be taken for credit more than one time. *Prerequisite:* Permission of instructor.

MATE 451, 651 CORROSION OF MATERIALS 3 cr. (2 and 3)
An introduction to the aqueous and gaseous corrosion of metals and alloys. Topics included are ion migration in solid and liquid phases, Pourbaix diagrams, theory and application of corrosion rate measurements, and special corrosion process as they apply to metal degradation and failure. *Prerequisite:* A course in thermodynamics.

MATE 800 SEMINAR IN MATERIALS RESEARCH 1 cr. (1 and 0)

MATE 802 RESEARCH TECHNIQUES IN PHYSICAL METALLURGY 3 cr. (2 and 3)

MATE 805 PHYSICAL METALLURGY I 3 cr. (3 and 0)

MATE 806 PHYSICAL METALLURGY II 3 cr. (3 and 0)

MATE 807 PHYSICAL PROPERTIES OF POLYMERS 3 cr. (3 and 0)

MATE 808 MECHANICAL PROPERTIES OF POLYMERS 3 cr. (3 and 0)

MATE 810 DIFFUSION IN SOLIDS 3 cr. (3 and 0)

MATE 811 KINETICS OF HETEROGENEOUS REACTIONS 3 cr. (3 and 0)

MATE 812 METALLURGICAL THERMODYNAMICS 3 cr. (3 and 0)

MATE 814 SURFACE CHEMISTRY OF MATERIALS 3 cr. (3 and 0)

MATE 815 APPLICATION OF HETEROGENEOUS EQUILIBRIA 3 cr. (3 and 0)

MATE 820 DEFORMATION MECHANISMS IN SOLIDS 3 cr. (3 and 0)

MATE 821 STRENGTH MECHANISMS IN SOLIDS 3 cr. (3 and 0)

MATE 831 QUANTUM THEORY OF METALS I 3 cr. (3 and 0)

MATE 835 X-RAY METALLOGRAPHY 3 cr. (2 and 3)

MATE 841 SINTERING AND RELATED PHENOMENA 3 cr. (3 and 0)

MATE 850 SPECIAL TOPICS IN MATERIALS ENGINEERING 3 cr. (3 and 0)

MATE 851 OXIDATION OF METALS AND ALLOYS 3 cr. (3 and 0)

MATE 891 RESEARCH. Credit to be arranged.

MATE 991 DOCTORAL RESEARCH. Credit to be arranged.

Mathematics

Professors: C. V. Aucoin, J. V. Brawley, F. M. Cholewinski, R. E. Haymond, A. T. Hind, Jr., J. W. Kenelly, *Head;* A. F. Sobczyk, K. T. Wallenius

Associate Professors: K. Alam, M. C. Bell, W. R. Boland, A. K. Bose, A. S. Cover, J. L. Flatt, J. D. Fulton, J. C. Harden, Jr., W. R. Hare, Jr., P. T. Holmes, C. E. Kirkwood, Jr, J. W. LaGrone, Renu C. Laskar, D. R. LaTorre, J. K. Luedeman, S. M. Lukawecki, M. C. Palmer, E. Park, T. G. Proctor,° J. A. Reneke,° L. A. Rife, W. H. Ruckle, C. B. Russell, K. Seo, J. R. Sullivan

Assistant Professors: C. W. Ahlers, Claire R. Aucoin, R. Constantine, Jr., Sue K. Dunkle, R. E. Fennell, C. F. Fennemore, W. H. Ford, J. H. Nicholson, J. C. Peck, B. J. Prochaska°

Instructors: Eugenie V. Bartmess, P. G. Buckhiester, Louise G. Fulmer, Jeuel G. LaTorre, D. R. Russell, R. S. Schouest

MATH 011 MATHEMATICS 5 cr. (5 and 2)

Basic algebraic methods. A general review and development of fundamental mathematical concepts. Basic numerical processes and techniques of algebra. Designed to prepare students for college courses.

° On leave.

MATH 012 MATHEMATICS 5 cr. (5 and 2)

Basic geometric concepts. A general review and development of elementary geometric and spacial concepts. Mensuration formulas and elementary properties of spacial figures. Designed to prepare students for college courses.

MATH 100 PREPARATORY MATHEMATICS 2 cr. (5 and 0)

Required of all freshmen who fail to make a satisfactory grade on the Mathematics Test, Level I (Standard). Topics to be covered: mathematical methods, number systems, polynomials, algebraic fractions, exponents and radicals, equations, inequalities, algebraic functions, exponential and logarithmic functions, trigonometric functions, and analytic geometry. The even-numbered sections will emphasize topics that prepare the student for Math 101 and 102 series. The odd-numbered sections will emphasize topics that prepare students for Math 106.

MATH 101 MATHEMATICAL ANALYSIS I 3 cr. (3 and 0)

Topics include: probability spaces, conditional probabilities and discrete random variables. *Prerequisite:* A satisfactory score on the Mathematics Test, Level I (Standard), or consent of instructor.

MATH 102 MATHEMATICAL ANALYSIS II 3 cr. (3 and 0)

Topics include: intuitive calculus (differentiation and integration), continuous random variables, and probability densities. *Prerequisite:* Math 101 or consent of instructor. Not open to those receiving credit for Math 106.

MATH 103 COLLEGE ALGEBRA 2 cr. (3 and 0)

Algebraic processes, functions, equations, inequalities, mathematical induction, theory of equations, determinants, and logarithms.

MATH 104 TRIGONOMETRY 2 cr. (3 and 0)

Trigonometric functions, equations, identities, and solution of triangles. Logarithms and complex numbers.

MATH 106, H106 CALCULUS OF ONE VARIABLE 4 cr. (4 and 0)

Topics include: analytic geometry, introduction to derivatives, computation and application of derivatives, integrals, exponential and logarithm functions. Admission to HONORS section by invitation. *Prerequisite:* Math 100, or a satisfactory score on the Mathematics Test, Level I (Standard), or consent of instructor.

MATH 108, H108 CALCULUS AND LINEAR ALGEBRA 4 cr. (4 and 0)

Topics included are infinite series, limits, differentiation and techniques of integration. Admission to HONORS section by invitation. *Prerequisite:* Math 106.

MATH 115 CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS I 3 cr. (3 and 0)

Logic, sets, and the properties of the counting numbers, numeration systems. *Prerequisite:* Open only to elementary school majors or permission of instructor.

MATH 116 CONTEMPORARY MATHEMATICS FOR ELEMENTARY SCHOOL TEACHERS II 3 cr. (3 and 0)

A continuation of Math 115. Subtraction, properties of the integers, elementary number theory, rational number system, real number system. *Prerequisite:* Math 115; open only to elementary school majors or consent of instructor.

MATH 203   ELEMENTARY STATISTICAL INFERENCE   3 cr. (3 and 0)
A survey course in fundamental statistical principles with applications to social sciences and other fields. The development of the course will assume knowledge of finite probability. Major topics include: empirical frequency distributions, computation of descriptive statistics, basic statistical inference including estimation and testing of hypotheses, regression and correlation analysis, and contingency tables. *Prerequisite:* Math 102, or a 3-credit course in finite probability, or consent of instructor.

MATH 206, H206   CALCULUS OF SEVERAL VARIABLES   4 cr. (4 and 0)
Topics include: real valued functions of several variables, multiple integration, differential calculus of functions of several variables, matrices, vector field theory. Admission to HONORS section by invitation. *Prerequisite:* Math 108.

MATH 207   MULTIPLE DIMENSION CALCULUS   3 cr. (3 and 0)
Principal topics include differential and integral calculus for functions of several variables, extreme values of functions, Lagrangian multipliers, differential equations and difference equations. Examples from the managerial and social sciences. *Prerequisite:* Math 108.

MATH 208, H208   ENGINEERING MATHEMATICS I   4 cr. (5 and 0)
This course presents an introduction to the study of differential equations and their application to physical problems. The topics include exact solutions, series solutions, numerical solutions, solutions by means of Laplace transforms, and solutions of systems of differential equations. Admission to HONORS section by invitation. *Prerequisite:* Math 206.

MATH 215   ALGEBRA FOR ELEMENTARY SCHOOL TEACHERS   3 cr. (3 and 0)
Linear equations and linear inequalities in one variable, functions and graphs, systems of linear equations and linear inequalities, quadratic equations, complex number system. Finite number systems, algebraic structures. *Prerequisite:* Math 116; open only to elementary school majors or consent of instructor.

MATH 216   GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS   3 cr. (3 and 0)
An informal treatment of the basic concepts of geometry. *Prerequisite:* Math 116; open only to elementary school majors or consent of instructor.

MATH 231   MATHEMATICS OF LIFE INSURANCE   3 cr. (3 and 0)
An introduction to the basic mathematics of finance and of life insurance. Topics include: compound interest, annuities certain, mortality tables, life annuities, net premiums, net level reserves, modified reserves, nonforfeiture values and dividends.

MATH 295   FOUNDATION OF ANALYSIS   3 cr. (3 and 0)
An introduction to the language and use of symbolic logic and the properties of the real number system with applications to the calculus. *Prerequisite:* Math 108.

MATH 301, H301, 601   STATISTICAL THEORY AND METHODS I   3 cr. (3 and 0)
Principal topics include: elementary probability theory, discrete and continuous random variables, expected values, normal distribution, chi-square

distribution, t-distribution, F-distribution, test of hypothesis, point and interval estimation, curve fitting. Admission to HONORS section by invitation. *Prerequisite:* Math 206.

MATH 308 COLLEGE GEOMETRY 3 cr. (3 and 0)
Theorems and concepts more advanced than those of high school geometry. A treatment of the various properties of the triangle, including the notable points, lines, and circles associated with it. *Prerequisite:* Math 106.

MATH 309, H309 ENGINEERING MATHEMATICS II 3 cr. (3 and 0)
A continuation of Math 208. An introduction to Fourier Series, numerical methods, partial differential equations and certain special functions is given. Admission to HONORS section by invitation. *Prerequisite:* Math 208.

MATH 402, H402, 602 THEORY OF PROBABILITY 3 cr. (3 and 0)
Principal topics include: combinatorial theory, probability axioms, random variables, expected values; special discrete and continuous distributions, jointly distributed random variables, correlation, conditional expectation, law of large numbers, central limit theorem. Admission to HONORS section by invitation. *Prerequisite:* Math 301 or consent of instructor.

MATH 403, H403, 603 STATISTICAL INFERENCE 3 cr. (3 and 0)
Principal topics include: sampling distributions, point and interval estimation, maximum likelihood estimators, method of moments, least squares estimators, tests of hypothesis, likelihood ration methods, regression and correlation analysis, introduction to analysis of variance. Admission to HONORS section by invitation. *Prerequisite:* Math 402.

MATH 404, 604 INTRODUCTION TO STOCHASTIC PROCESSES 3 cr. (3 and 0)
Principal topics include—random variables, counting processes, stationary processes, ergodic processes, spectral distribution, function, examples from scientific fields to indicate the use of stochastic processes in construction of models of physical and behavioral phenomena. *Prerequisite:* Math 402.

MATH 405, 605 STATISTICAL THEORY AND METHODS II 3 cr. (3 and 0)
Principal topics include contingency tables, goodness of fit, rank-sum tests. Kolmogorov-Smirnov tests, analysis of variance, factorial experimentation, applications to reliability and life testing, applications to quality assurance. *Prerequisite:* Math 301.

MATH 407, 607 PARTIAL DIFFERENTIAL EQUATIONS 3 cr. (3 and 0)
Partial differentiation and space geometry, origins of partial differential equations, linear and nonlinear equations of the first order, Fourier series, linear equations of the second and higher orders. *Prerequisite:* Math 208.

MATH 408, 608 TOPICS IN GEOMETRY 3 cr. (3 and 0)
An introduction to topics in special geometries which include non-Euclidean space concepts, such as projective geometry, finite geometrics, and intuitive elementary topology. A brief introduction to vector geometry. *Prerequisite:* Math 206.

MATH 409, 609 STATISTICAL THEORY AND METHODS III 3 cr. (3 and 0)
A continuation of Math 405 with equal emphasis on both the mathematical foundations and practical applications of advanced statistical methods. Prin-

cipal topics include: experimental designs, fractionally replicated experiments, multiple regression and response surface analysis, evolutionary operations, simultaneous inference, analysis of covariance, and time series analysis. *Prerequisite:* Math 405.

MATH 411, 611   LINEAR ALGEBRA   3 cr. (3 and 0)

An introduction to the algebra of matrices, vector spaces, polynomials and linear transformations. *Prerequisite:* Math 206.

MATH 412, H412, 612   INTRODUCTION TO MODERN ALGEBRA   3 cr. (3 and 0)

An introduction to the concepts of algebra. Topics included are the number system; elementary theory of groups; rings, integral domains, and fields; matrices over a field; determinants and matrices; groups, rings, and ideals. Admission to HONORS section by invitation. *Prerequisite:* Math 206.

MATH 413, H413, 613   MODERN ALGEBRA   3 cr. (3 and 0)

A continuation of Math 412. Admission to HONORS section by invitation.

MATH 415, H415, 615   INTRODUCTION TO TOPOLOGY   3 cr. (3 and 0)

An introduction to point set topology; Hausdorff, regular and normal spaces; metric connected and compact spaces; continuous mappings and homeomorphisms. Admission to HONORS section by invitation. *Prerequisite:* Math 295.

MATH 417, 617   MATHEMATICS PROGRAMS   3 cr. (3 and 0)

Aspects of the new programs in mathematics. Open only to in-service teachers or students in the Mathematics Teacher Training Program. *Prerequisite:* Math 308; *corequisite:* Math 408.

MATH 419, 619   APPLIED COMBINATORIAL ALGEBRA I   3 cr. (3 and 0)

This course applies theoretical concepts of sets, functions, binary relations, graphs, Boolean algebras, propositional logic, semigroups, groups, hemomorphisms, and permutation groups to computer characterization and design, words over a finite alphabet and concatenation, binary group codes, and other communication or computer problems. Computer algorithms for listing permutations, combinations, compositions, and partitions and for representation and processing of digital information are considered. *Prerequisite:* Math 206.

MATH 420, 620   APPLIED COMBINATORIAL ALGEBRA II   3 cr. (3 and 0)

This course applies graph theory, ring and field theory, cardinality of sets, and difference equations to Nim games and other perfect information games, transport networks, shortest route problems, polynomial codes, Bose-Chandhuri-Hoquenghem codes, machine computability, mathematical linguistics, classification of programming languages, and different codes. *Prerequisite:* Math 412 or 419, or consent of instructor.

MATH 422   MATHEMATICAL LOGIC   3 cr. (3 and 0)

A detailed and rigorous study of a logical system as a foundation for mathematics. An analysis of basic concepts occurring in the foundations of mathematics. *Prerequisite:* Sufficient mathematical background.

MATH 424   FOUNDATIONS OF MATHEMATICS   3 cr. (3 and 0)

Naive set theory, cardinal and ordinal numbers, and axiom of choice and equivalents. A study of the set theoretic fundamentals of abstract mathematics.

MATH 425, 625   INTERMEDIATE DIFFERENTIAL EQUATIONS   3 cr. (3 and 0)

Second order linear differential equations, regular singular points, Bessel, Legendre and hypergeometric functions, general linear equations, existence and uniqueness theorems, plane autonomous systems and phase plane concepts, Sturm-Louville systems. *Corequisite:* Advanced calculus.

MATH 428, 628   NUMERICAL LINEAR ALGEBRA   3 cr. (3 and 0)

Numerical solution of linear algebraic systems, matrix inversion, computation of eigenvalues and eigenvectors. *Prerequisite:* Comp Sc 205, Math 411.

MATH 429, 629   NUMERICAL ANALYSIS   3 cr. (3 and 0)

Solution of nonlinear equations and systems, function approximation with polynomials, numerical differentiation and quadrature, numerical solution of ordinary differential equations. *Prerequisite:* Comp Sc 205, Math 453 or 463.

MATH 430   ACTUARIAL FINITE DIFFERENCES   3 cr. (3 and 0)

A comprehensive treatment of the topics from numerical analysis and the calculus of finite differences which are used in actuarial work. Topics include finite differences, factorial polynomials, Stirling's numbers, summation, Newton's interpolation formula, operators, collocation polynomials, Lagrange's interpolation formula, divided differences, numerical integration (including Gaussian), singular integrals and the solution of nonlinear equations. *Prerequisite:* Math 106; 431 may be taken concurrently; or permission of instructor.

MATH 431   THEORY OF INTEREST   3 cr. (3 and 0)

A comprehensive treatment of the theory of interest from a continuous viewpoint. Topics include simple and compound interest, force of interest, annuities certain, amortization schedules and sinking funds, and application of the theory to bonds and other securities. *Prerequisite:* Math 106; 430 may be taken concurrently; or permission of instructor.

MATH 432   ACTUARIAL SCIENCE SEMINAR   1 cr. (1 and 0)

A problem-solving seminar designed to prepare the student for Society of Actuaries Examination 2 (Probability and Statistics). *Prerequisite:* Math 403 may be taken concurrently, or permission of instructor.

MATH 435, H435, 635   COMPLEX VARIABLES   3 cr. (3 and 0)

Elementary functions. Differentiation and integration of analytic functions. Taylor and Laurent series. Contour integration and residue theory. Conformal mapping. Schwartz-Christoffel transformation. Admission to HONORS section by invitation. *Prerequisite:* Math 453 or 463.

MATH 452, H452, 652   LINEAR PROGRAMMING   3 cr. (3 and 0)

An introduction to linear programming, using elementary matrix algebra and the theory of convex polygons. Applications to managerial problems, operations research, economic behavior, the theory of games and military strategy are considered. Admission to HONORS section by invitation. *Prerequisite:* Math 206 or permission of instructor.

MATH 453, 653   ADVANCED CALCULUS I   3 cr. (3 and 0)

Limits, continuity, and differentiation of functions of one and several variables, the Riemann integral, and vector analysis. *Prerequisite:* Math 208 and Junior standing.

MATH 454, 654   ADVANCED CALCULUS II   3 cr. (3 and 0)

A continuation of Math 453. Transformations, multiple integrals, line and surface integrals, infinite sequences and series, and improper integrals.

MATH 457, 657   APPLIED MATHEMATICS I   3 cr. (3 and 0)

Determinants and matrices, review of differential equations, finite differences, Fourier series and integrals, Laplace transformations, a large selection of applications. *Prerequisite:* Math 208.

MATH 458, 658   APPLIED MATHEMATICS II   3 cr. (3 and 0)

A continuation of Math 457. Partial differential equations, Bessel functions and Legendre polynomials, analytic functions of complex variables, infinite series in a complex plane, the theory of residues, conformal mapping. *Prerequisite:* Math 457.

MATH 463, H463, 663   MATHEMATICAL ANALYSIS I   3 cr. (3 and 0)

Basic properties of the real number system, sequences and limits; continuous functions, uniform continuity and convergence. Integration, differentiation, functions of several real variables, implicit function theory. Admission to HONORS section by invitation. *Prerequisite:* Math 295.

MATH 464, H464, 664   MATHEMATICAL ANALYSIS II   3 cr. (3 and 0)

A continuation of Math 463. Admission to HONORS section by invitation.

MATH 471, 671   APPLIED STATISTICAL DECISION THEORY   3 cr. (3 and 0)

An introduction to statistical decision theory emphasizing the Bayesian approach. Behavioral axioms, characterizing the "Rational decision maker," lead to the laws of probability theory and utility theory. Topics include: axioms of subjective probability and utility, extensive and normal form analysis, likelihood principle, conjugate distributions. *Prerequisite:* Math 402.

MATH 473, 673   INTRODUCTION TO NONLINEAR OPTIMIZATION   3 cr. (3 and 0)

An introduction to the application and theory of nonlinear optimization problems. The primary topics include: classical optimization based on the calculus, approximation techniques, separable programming, quadratic programming, gradient methods, and dynamic programming. *Prerequisite:* Math 452, 453.

MATH 481, H481   SEMINAR IN MATHEMATICS   1-3 cr. (1-3 and 0)

At the discretion of the instructor, attention will be focused upon mathematical areas in which nonroutine problems can be posed with comparative ease. Emphasis will be upon independent study and student use of previously acquired mathematical skills and his own ingenuity in the examination, presentation or preparation of mathematical papers. These papers may be expository or creative in content and may deal with applications of the mathematics under investigation. Admission to HONORS section by invitation.

MATH H482   HONORS SEMINAR IN MATHEMATICS.   Credit to be arranged. (3 and 0)

A continuation of Math H481.

MATH 701 NUMBER SYSTEMS 3 cr. (3 and 0)

MATH 703 GEOMETRIC CONCEPTS 3 cr. (3 and 0)

MATH 705 ALGEBRA, PROBABILITY AND STATISTICS 3 cr. (3 and 0)

MATH 711 MODERN ALGEBRAIC CONCEPTS I 3 cr. (3 and 0)

MATH 712 MODERN ALGEBRAIC CONCEPTS II 3 cr. (3 and 0)

MATH 721 MATRIX ALGEBRA I 3 cr. (3 and 0)

MATH 722 MATRIX ALGEBRA II 3 cr. (3 and 0)

MATH 731 NON-EUCLIDEAN GEOMETRY 3 cr. (3 and 0)

MATH 732 PROJECTIVE GEOMETRY 3 cr. (3 and 0)

MATH 741 INTRODUCTION TO LINEAR PROGRAMMING WITH APPLICATIONS 3 cr. (3 and 0)

MATH 751 FUNDAMENTAL CONCEPTS OF CALCULUS I 3 cr. (3 and 0)

MATH 752 FUNDAMENTAL CONCEPTS OF CALCULUS II 3 cr. (3 and 0)

MATH 761 PROBABILITY AND STATISTICS 3 cr. (3 and 0)

MATH 771 NUMERICAL METHODS IN SECONDARY SCHOOL MATHEMATICS 3 cr. (3 and 0)

MATH 781 HISTORY OF MATHEMATICS 3 cr. (3 and 0)

MATH 783 THEORY OF NUMBERS 3 cr. (3 and 0)

MATH 791 MATHEMATICAL PROBLEMS IN THE CURRICULUM 3 cr. (3 and 0)

MATH 801 GENERAL LINEAR HYPOTHESIS I 3 cr. (3 and 0)

MATH 802 GENERAL LINEAR HYPOTHESIS II 3 cr. (3 and 0)

MATH 803 STOCHASTIC PROCESSES I 3 cr. (3 and 0)

MATH 804 STOCHASTIC PROCESSES II 3 cr. (3 and 0)

MATH 806 NONPARAMETRIC STATISTICS 3 cr. (3 and 0)

MATH 807 MATHEMATICAL STATISTICS I 3 cr. (3 and 0)

MATH 808 MATHEMATICAL STATISTICS II 3 cr. (3 and 0)

MATH 809 TIME-SERIES ANALYSIS, FORECASTING AND CONTROL 3 cr. (3 and 0)

MATH 811 NONLINEAR PROGRAMMING 3 cr. (3 and 0)

MATH 812 DYNAMIC PROGRAMMING 3 cr. (3 and 0)

MATH 813 ADVANCED LINEAR PROGRAMMING 3 cr. (3 and 0)

MATH 821 REAL ANALYSIS I 3 cr. (3 and 0)

MATH 822 REAL ANALYSIS II 3 cr. (3 and 0)

MATH 823 COMPLEX ANALYSIS I 3 cr. (3 and 0)

MATH 824   COMPLEX ANALYSIS II   3 cr. (3 and 0)

MATH 825   ORDINARY DIFFERENTIAL EQUATIONS I   3 cr. (3 and 0)

MAT 826   ORDINARY DIFFERENTIAL EQUATIONS II   3 cr. (3 and 0)

MATH 831   FOURIER SERIES   3 cr. (3 and 0)

MATH 833   OPERATIONAL MATHEMATICS   3 cr. (3 and 0)

MATH 837   CALCULUS OF VARIATIONS   3 cr. (3 and 0)

MATH 839   INTEGRAL EQUATIONS   3 cr. (3 and 0)

MATH 841   APPLIED MATHEMATICS I   3 cr. (3 and 0)

MATH 842   APPLIED MATHEMATICS II   3 cr. (3 and 0)

MATH 851   ABSTRACT ALGEBRA I   3 cr. (3 and 0)

MATH 852   ABSTRACT ALGEBRA II   3 cr. (3 and 0)

MATH 853   ADVANCED LINEAR ALGEBRA   3 cr. (3 and 0)

MATH 854   THEORY OF GRAPHS I   3 cr. (3 and 0)

MATH 855   COMBINATORIAL ANALYSIS I   3 cr. (3 and 0)

MATH 861   ADVANCED NUMERICAL ANALYSIS I   3 cr. (3 and 0)

MATH 862   ADVANCED NUMERICAL ANALYSIS II   3 cr. (3 and 0)

MATH 863   DIGITAL ANALYSIS I   3 cr. (3 and 0)

MATH 864   DIGITAL ANALYSIS II   3 cr. (3 and 0)

MATH 871   GENERAL TOPOLOGY I   3 cr. (3 and 0)

MATH 872   GENERAL TOPOLOGY II   3 cr. (3 and 0)

MATH 873   ALGEBRAIC TOPOLOGY   3 cr. (3 and 0)

MATH 875   CONVEXITY I   3 cr. (3 and 0)

MATH 876   CONVEXITY II   3 cr. (3 and 0)

MATH 881   HISTORY OF MATHEMATICS   3 cr. (3 and 0)

MATH 883   THEORY OF NUMBERS   3 cr. (3 and 0)

MATH 885   PROJECTIVE GEOMETRY   3 cr. (3 and 0)

MATH 891   RESEARCH.   Credit to be arranged.

MATH 901   PROBABILITY THEORY I   3 cr. (3 and 0)

MATH 902   PROBABILITY THEORY II   3 cr. (3 and 0)

MATH 903   ADVANCED STOCHASTIC PROCESSES   3 cr. (3 and 0)

MATH 905   DECISION THEORY I   3 cr. (3 and 0)

MATH 906   DECISION THEORY II   3 cr. (3 and 0)

MATH 907   MULTIVARIATE ANALYSIS   3 cr. (3 and 0)

MATH 920   INTRODUCTION TO HARMONIC ANALYSIS   3 cr. (3 and 0)

MATH 921 ABSTRACT HARMONIC ANALYSIS 3 cr. (3 and 0)

MATH 923 INTRODUCTION TO THE THEORY OF DISTRIBUTION 3 cr. (3 and 0)

MATH 925 TOPICS IN NONLINEAR DIFFERENTIAL EQUATIONS 3 cr. (3 and 0)

MATH 927 FUNCTIONAL ANALYSIS I 3 cr. (3 and 0)

MATH 928 FUNCTIONAL ANALYSIS II 3 cr. (3 and 0)

MATH 945 POTENTIAL THEORY 3 cr. (3 and 0)

MATH 951 GROUP THEORY 3 cr. (3 and 0)

MATH 952 RING THEORY 3 cr. (3 and 0)

MATH 954 THEORY OF GRAPHS II 3 cr. (3 and 0)

MATH 955 COMBINATIONAL ANALYSIS II 3 cr. (3 and 0)

MATH 956 FIELD THEORY 3 cr. (3 and 0)

MATH 957 SEMIGROUP THEORY 3 cr. (3 and 0)

MATH 980 SPECIAL TOPICS IN PROBABILITY 1-3 cr. (1-3 and 0)

MATH 981 SPECIAL TOPICS IN MATHEMATICAL STATISTICS 1-3 cr. (1-3 and 0)

MATH 982 SPECIAL TOPICS IN ANALYSIS 1-3 cr. (1-3 and 0)

MATH 983 SPECIAL TOPICS IN FUNCTIONAL ANALYSIS 1-3 cr. (1-3 and 0)

MATH 984 SPECIAL TOPICS IN APPLIED MATHEMATICS 1-3 cr. (1-3 and 0)

MATH 985 SPECIAL TOPICS IN ALGEBRA 1-3 cr. (1-3 and 0)

MATH 986 SPECIAL TOPICS IN CONVEXITY 1-3 cr. (1-3 and 0)

MATH 987 SPECIAL TOPICS IN NUMERICAL PROCESSES 1-3 cr. (1-3 and 0)

MATH 988 SPECIAL TOPICS IN OPERATIONS RESEARCH 1-3 cr. (1-3 and 0)

MATH 991 DOCTORAL RESEARCH. Credit to be arranged.

Mechanical Engineering

Professors: D. W. Bradbury, J .L. Edwards, T. C. Hardin, E. Harrison, A. D. Lewis, S. M. Watson, Jr., T. Yang

Associate Professors: C. A. Brandon, E. F. Coxe, A. C. Elrod, J. L. Gaddis, J. C. Hester, *Head;* W. G. Hudson, J. K. Johnson, Jr., D. W. Lyons, C. S. Rudisill

Assistant Professors: D. W. Cott, M. W. Dixon

Adjunct Professor: T. S. Hargest

ME 201　INNOVATIVE DESIGN I　2 cr. (1 and 3)

An introduction to engineering design with emphasis on creativity, synthesis, participation in a realistic experience in design to satisfy human needs, experimentation and analysis commensurate with the student's background in mathematics and science. Problems are authentic. The building of a prototype, at least of critical parts, is the consummation of the design. Nontechnical aspects of engineering such as cost, market, contracts and ethics are stressed. *Corequisite:* Phy 122 and Sophomore standing.

ME 202　INNOVATIVE DESIGN II　3 cr. (2 and 3)

A continuation of ME 201 to involve the student in the implementation of design concepts. Graphical communication, engineering materials, methods of production and design trade-offs are presented. *Prerequisite:* ME 201 and consent of instructor.

ME 301　ENGINEERING SYSTEMS ANALYSIS　3 cr. (3 and 0)

Application of undergraduate mathematics and basic engineering principles in the solution of engineering problems. Problems will be drawn from dynamics, vibrations, kinematics, heat transfer, fluid mechanics, electrical circuits, and other engineering fields. *Prerequisite:* Math 208, permission of instructor.

ME 304　HEAT TRANSFER　3 cr. (3 and 0)

Heat conduction in the steady and transient states; free and forced convection; radiation; combined modes; boiling and condensation. Analytical and numerical solutions to engineering heat transfer problems are emphasized. *Prerequisite:* Junior standing, Math 208, ME 311.

ME 311, H311　ENGINEERING THERMODYNAMICS I　3 cr. (3 and 0)

First and second laws of thermodynamics applied to engineering systems. Properties of the ideal and real gases and vapors. Processes and introduction to power and refrigeration cycles. Admission to HONORS section by invitation. *Prerequisite:* Math 208, Phys 222, Junior standing.

ME 312　ENGINEERING THERMODYNAMICS II　3 cr. (3 and 0)

Continuation of ME 311. Power and refrigeration cycles, mixtures of gases and vapors, thermodynamic relations, compressibility factors and charts, combustion, phase and chemical equilibrium. *Prerequisite:* ME 311.

ME 313　INSTRUMENTATION AND MEASUREMENTS　2 cr. (1 and 2)

Principles of measurements, accuracy of instruments, and data acquisition. Modern instruments for measuring and recording static and dynamic pressures, temperatures, fluid flow, speed, power, and torque. Technical report writing. *Prerequisite:* Enrollment in ME 311.

ME 314 ENGINEERING EXPERIMENTATION 2 cr. (1 and 2)

Theoretical, analytic and statistical aspects of basic engineering experimentation. Error analysis, dimensional analysis, experimental plans, and data analyses. Technical report writing. *Prerequisite:* ME 313, permission of instructor.

ME 316 DYNAMIC SYSTEM ANALYSIS AND CONTROL 4 cr. (3 and 3)

Principles of dynamic system response with emphasis on the determination of mathematical models from the system network representation of mechanical, electromechanical, fluid, and thermal systems. Transient and steady-state analyses make use of Laplace transforms and frequency response techniques. Automatic control theory, including system terminology, block diagram representation, and an introduction to analyses and design objectives and methods. Computers are used extensively. *Prerequisite:* ME 301 and permission of instructor.

ME 324 ENGINEERING NUMERICAL ANALYSIS 2 cr. (2 and 0)

Problem solving in such areas as heat transfer, thermodynamics, fluid and solid mechanics, and automatic controls utilizing the digital computer. Numberial techniques include Simpson's rule, Newton-Raphson, Gauss-Siedel, and Rung-Kutta.

ME 401, 601 DESIGN OF MACHINE ELEMENTS 3 cr. (3 and 0)

Principles of the analysis and synthesis of machines. The application of engineering principles and state-of-the-art of experimental knowledge to the selection of machine elements. *Prerequisite:* EM 304.

ME 402, 602 INNOVATIVE DESIGN III 2 cr. (1 and 2)

The student is given the opportunity to apply creatively his general knowledge and his knowledge of engineering in the analysis and design of one or more engineering systems, machines, or devices. Problems may be selected from two sources: A meritorious problem of the student's own choice or a problem assigned by appropriate authority. *Corequisite:* ME 401, Senior standing, and permission of instructor.

ME 403 FLUID DYNAMICS 3 cr. (3 and 0)

A study of the theory of fluids in motion. Topics include: review of concepts from thermodynamics as applied to the governing equations of fluids in motion; wave propagation in a fluid; one dimensional isentropic flow with variable area; Fanno line process; Rayleigh line process; normal and oblique shocks and expansion fans; one dimensional flow with friction and heat transfer; introduction to viscous flow theory; introduction to potential flow theory; selected applications. *Prerequisite:* EM 320, ME 311, and permission of instructor.

ME 404, 604 AUTOMATIC CONTROL 3 cr. (3 and 0)

Principles and techniques for the analysis and design of feedback control systems. Emphasis is on the classical frequency response and root locus techniques, although, describing functions, phase-plane methods, sampled-data systems, and adaptive control systems are introduced. Hydraulic, pneumatic, and electrical control systems are analyzed and designed. *Prerequisite:* ME 316, E&CE 307.

ME 405   KINEMATICS AND DYNAMICS OF MACHINERY   3 cr.
(3 and 0)

A study of the displacements, velocities, accelerations, and forces encountered in the analysis and design of machines. The application of these to the analysis and design of linkages, cams, gearing, and to miscellaneous mechanisms. *Prerequisite:* ME 401 and permission of instructor.

ME 407   APPLIED HEAT TRANSFER   3 cr. (3 and 0)

The course is primarily an applications-oriented extension of ME 304. The aim of the course is to provide a comprehensive and fundamental treatment of heat transfer processes, and also to explore selectively the state-of-the-art of experimental knowledge in the major areas of application. Major experimental results are integrated with the anlaysis to emphasize the validity of the empirical information and to provide a rational basis for design. *Prerequisite:* ME 304 and permission of instructor.

ME 408, 608   INTRODUCTION TO COMPUTER-AIDED DESIGN
3 cr. (3 and 0)

Techniques for solving engineering problems utilizing numerical techniques and the digital computer. Polynomial interpolation formulas, numerical integration, roots of nonlinear algebriac equations, simultaneous linear equations, ordinary and partial differential equations. Simpson's rule, Gauss-Jordan, Gauss-Siedel, Newton-Raphson, Runge-Kutta, Milne, Hamming, and Crank-Nicholson methods. *Prerequisite:* ME 304, 312, 324.

ME 409   MECHANICAL DESIGN   3 cr. (3 and 0)

An analytical treatment of machine elements. A rational design approach to working stresses and to the design of shafting, springs, screws, clutches, brakes, gears, bearings, and fasteners. Elementary treatment of plates, plastic bending and impact is presented. *Prerequisite:* ME 401.

ME 410   MECHANICAL PROCESSING OF MATERIALS   3 cr. (3 and 0)

Qualitative and quantitative descriptions of mechanical processing of materials is presented. The mechanical and metallurgical analysis of forging, rolling, extrusion, cutting, and finishing processes are discussed. *Prerequisite:* CrE 310 or MatE 301, ME 401.

ME 411, 611   THERMAL POWER SYSTEMS   3 cr. (3 and 0)

Analysis of reheat and regeneration with the Rankine cycle, including the application of various working fluids to specific cycle arrangements. Detailed studies of the combination process including analysis with chemical dissociation. The theoretical and actual processes associated with the gas turbine, thermal jet, thermal rocket, and the spark and compression ignition reciprocating engines are analyzed. *Prerequisite:* ME 312. *Corequisite:* ME 403.

ME 415, H415   UNDERGRADUATE RESEARCH   1-3 cr.

Individual research projects to be conducted under the direct supervision and guidance of a faculty member. Admission to HONORS section by invitation. *Prerequisite:* Permission of instructor.

ME 416   UNDERGRADUATE RESEARCH   1-3 cr.

Individual research projects to be conducted under the direct supervision and guidance of a faculty member. *Prerequisite:* Permission of instructor.

ME 417 MICROSCOPIC THERMODYNAMICS 3 cr. (3 and 0)

The development of thermodynamic concepts from microscopic observations are considered. The coverage includes the methodology of quantum-statistical mechanics; statics and kinetics of a gas; development of properties from various statistical models; and an introduction to irreversible thermodynamics. *Prerequisite:* ME 312 and permission of instructor.

ME 419 DIRECT ENERGY CONVERSION 3 cr. (3 and 0)

Treatment of direct energy conversion devices including thermoelectrics, magnetohydrodynamics, photovoltaics, thermionics, fuel cells, and electrohydrodynamics. *Prerequisite:* Senior standing and permission of instructor.

ME 422, 622 PRINCIPLES OF TURBOMACHINERY 3 cr. (3 and 0)

The guiding principles underlying all forms of turbomachinery. A unified treatment of turbomachinery to include pumps, fans, compressors and turbines. Dimensional analysis as applied to turbomachinery. Euler's equation, concepts of specific speed, thermodynamics of turbomachinery processes, the matching of the flow characteristics of duct systems with those of turbomachines, and related topics are covered. *Prerequisite:* EM 320, Senior standing. *Corequisite:* ME 403.

ME 425, 625 KINEMATICS: KINEMATIC ANALYSIS OF MACHINES
3 cr. (3 and 0)

Kinematic synthesis to produce predetermined desired motions of various elements of machines considering constraints of space, velocity, acceleration together with force transmission constraints. Equally important is the treatment of the design of mechanisms as function generators in control systems. Problems will be solved by the digital computer as well as by graphical layouts. *Prerequisite:* EM 202, ME 316, and permission of instructor.

ME 429 CRYOGENICS, REFRIGERATION AND AIR-CONDITIONING
3 cr. (3 and 0)

Mechanical vapor compression refrigeration cycles; refrigerants; thermoelectric cooling systems; cryogenics; thermodynamic properties of air; psychrometric charts; heating and cooling coils; solar radiation; heating and cooling loads; insulation systems.

ME 450, 650 VENTILATION DESIGN AND OPERATION 3 cr.
(2 and 3)

A study of the design, operation and control of industrial ventilation systems with emphasis on physiological effects on workers, their performance, safety, and health. Design of systems to meet health and safety standards. Optimization of systems.

ME 451, 651 CONTROL OF PHYSICAL STRESSES 3 cr. (3 and 0)

Fundamentals of noise and sound propagation. Physiological effects of noise and vibration. Abatement of noise. Physiological effects of high and low temperatures, abnormal pressures and light, and mitigation of stress from these causes.

ME 452, 652 SAFETY ENGINEERING 3 cr. (2 and 3)

Basic principles of industrial safety; inspections for safety compliance; design codes; design of machines and industrial equipment to meet safety standards; fire protecton and control; safety laws and regulations; protective equipment.

ME 491   SELECTED TOPICS IN MECHANICAL ENGINEERING
   3 cr. (3 and 0)

A comprehensive study of any topic in the field of mechanical engineering not covered in other courses.

ME 801   THERMAL ENVIRONMENTAL ENGINEERING   3 cr.
   (3 and 0)

ME 807   MECHANICAL SYSTEMS I   3 cr. (3 and 0)

ME 808   MECHANICAL SYSTEMS II   3 cr. (3 and 0)

ME 809   THERMAL SYSTEMS I   3 cr. (3 and 0)

ME 810   THERMAL SYSTEMS II   3 cr. (3 and 0)

ME 811   GAS DYNAMICS   3 cr. (3 and 0)

ME 813   ADVANCED GAS DYNAMICS   3 cr. (3 and 0)

ME 815   KINETIC THEORY OF GASES   3 cr. (3 and 0)

ME 816   ENERGY CONVERSION   3 cr. (3 and 0)

ME 824   PROPULSION SYSTEMS   3 cr. (3 and 0)

ME 830   HEAT TRANSFER   3 cr. (3 and 0)

ME 831   HEAT AND MASS TRANSFER   3 cr. (3 and 0)

ME 840   KINEMATICS   3 cr. (3 and 0)

ME 842   ADVANCED MECHANICAL ENGINEERING DESIGN I
   3 cr. (3 and 0)

ME 843   ADVANCED MECHANICAL ENGINEERING DESIGN II
   3 cr. (3 and 0)

ME 845   ACOUSTICS   3 cr. (3 and 0)

ME 867   CONTROL SYSTEM COMPONENTS   3 cr. (3 and 0)

ME 891   RESEARCH.   Credit to be arranged.

ME 893   SELECTED TOPICS IN MECHANICAL ENGINEERING
   1-6 cr. (1-6 and 0)

ME 894   SEMINAR   1 cr. (1 and 0)

ME 914   MAGNETOHYDRODYNAMICS   3 cr. (3 and 0)

ME 915   ENERGY CONVERSION   3 cr. (3 and 0)

ME 930· CONDUCTION HEAT TRANSFER   3 cr. (3 and 0)

ME 931   CONVECTION HEAT TRANSFER   3 cr. (3 and 0)

ME 932   RADIATION HEAT TRANSFER   3 cr. (3 and 0)

ME 940   APPLIED PLASTICITY   3 cr. (3 and 0)

ME 941   THEORY OF LUBRICATION AND WEAR   3 cr. (3 and 0)

ME 991   DOCTORAL RESEARCH.   Credit to be arranged.

Medical Technology

Anderson
Lecturers: J. W. Black, R. E. Jones, Jr., J. H. Keffer, N. L. Long
Educational Coordinator: Kaye Little

Greenville
Lecturers: F. Cantrell, E. C. Cox, E. A. Dreskin, D. G. Kilgore, Jr., B. Ludwigsen, J. H. McCarter, W. M. Waters
Educational Coordinator: Patricia Thompson

Greenwood
Lecturers: R. G. Harris, J. S. Leonard, C. H. Magruder, H. W. May, Rosa E. Proctor

MED TECH 101   AN INTRODUCTION TO MEDICAL TECHNOLOGY
1 cr. (1 and 0)
An introduction to the operation and practices in a medical laboratory. This course is designed to integrate the academic year with the clinical year. Included will be lectures on current laboratory practices, a visit to a modern medical laboratory, current training of laboratory personnel and seminars on areas of specialization.

MED TECH 401   SEROLOGY AND IMMUNOLOGY   4 cr. (21,10,49)[*]
Presents the basic principles of serology and immunology and the tests utilizing these principles to detect abnormalities helpful in the diagnosis of disease.

MED TECH 402   MICROBIOLOGY   7 cr. (59,6,470)
The principles of microbiology-bacteriology, mycology, and parasitology. Emphasis is placed on human pathogenic organisms, using both fresh and prepared organisms.

MED TECH 403   HEMATOLOGY   5 cr. (12,32,276)
Information on blood as a tissue, the theory of hematological tests, factors that affect test reliability. Knowledge of test results and knowledge of blood dyscrasias. Skill in the performance of hematological tests is emphasized and the use of automation techniques is covered.

MED TECH 404   BLOOD BANK   3 cr. (8,20,132)
History and principles of blood group systems and methods of cross matching. Testing for, and quantitative determination of, Rh antibodies with all available techniques. Selection, pretesting and bleeding of donors and processing of blood for transfusions.

MED TECH 405   CYTOLOGY   1 cr. (2,12,26)
An introduction to cytology and cytologic techniques in the diagnosis of cancer. Definition and brief history, sources of material, collection and preservation of specimens, together with practice in interpretation.

MED TECH 406   HISTOLOGY   3 cr. (20,30,190)
Histologic preparation, including actual preparation of tissue specimens derived from surgical procedures and autopsies. Routine and special training, together with experience using the cryostat.

[*] First figure represents lecture hours, second figure represents seminar hours, and the third figure represents clinical practice hours.

MED TECH 407   URINALYSIS   2 cr. (10,8,102)

The study of renal function together with principles of urine analysis, pregnancy tests and anatomy of the urinary system. Emphasis is placed on laboratory procedures and their utilization to detect abnormalities helpful in the diagnosis of disease.

MED TECH 408   CHEMISTRY   10 cr. (40,50,470)

Introduction to the chemistry of carbohydrates, nitrogen, calcium, and phosphorus compounds, acid-base balance, etc., with emphasis on the chemistry of blood and urine using both qualitative and quantitative procedures in the laboratory.

MED TECH 409   RADIOISOTOPES   1 cr. (2,0,7)

Introduction to principles of diagnostic radioisotope procedures and the use of the scintillation detector, the well counter, and the scaler.

Microbiology

Professors: H. R. Bungay, III, R. K. Guthrie
Associate Professors: Ann W. Baxter, J. H. Bond, M. J. Paynter, *Head*
Assistant Professors: O. W. Barnett, M. G. Johnson, L. L. Larcom

MICRO 100   MICROBES AND HUMAN AFFAIRS   1 cr. (1 and 0)

An explanation of the roles of microorganisms in today's world and the significance of microbes to the future of mankind.

MICRO 305, 605   GENERAL MICROBIOLOGY   4 cr. (3 and 3)

Morphology, physiology, classification, distribution, and cultivation of microorganisms and health. *Prerequisite:* Bot 101 or Zool 101, 103, Ch 101, 102 or 112.

MICRO 400, 600   PUBLIC HEALTH MICROBIOLOGY   3 cr. (3 and 0)

The epidemiology of transmissible diseases including: pathogenic characteristics of the infectious organism, modes of transmission, mechanism of infection, diagnostic aids, effective treatments, immunizing procedures and methods of preventing infection. *Prerequisite:* Micro 305.

MICRO 401, H401, 601   ADVANCED BACTERIOLOGY   4 cr. (2 and 6)

Metabolism, nutrition, growth, and death of bacteria; microbiological assays and industrial fermentation; emphasis on laboratory procedures for the identification of the more common taxonomic groups. Admission to HONORS section by invitation. *Prerequisite:* Ch 201 or 223, 227, Micro 305.

MICRO 402, H402, 602   DAIRY MICROBIOLOGY   3 cr. (2 and 3)

Morphology, physiology, and culturing of microorganisms of importance in dairy products; standard methods for the determination of numbers of bacteria, yeasts, and molds in various dairy products. Admission to HONORS section by invitation. *Prerequisite:* Micro 305.

MICRO 404, H404, 604   FOOD MICROBIOLOGY   3 cr. (2 and 3)

The microbiology of natural and processed foods. The nature of microorganisms involved in food processing, food spoilage, and food poisoning. Methods of isolating, enumerating and identifying these organisms are conducted in the laboratory. Admission to HONORS section by invitation. *Prerequisite:* Micro 305.

MICRO 410, H410, 610   SOIL MICROBIOLOGY   3 cr. (2 and 3)

The role of microorganisms in the decomposition of organic substances, transformation of nitrogen and mineral substances in the soil; interrelationships between higher plants and microorganisms; importance of microorganisms in soil fertility. Admission to HONORS section by invitation. *Prerequisite:* Micro 305.

MICRO 411, H411, 611   PATHOGENIC BACTERIOLOGY   4 cr. (3 and 3)

A study of pathogenic bacteria, their morphology, cultural requirements and classification; diagnostic tests, methods of differentiation, and the diseases caused. Admission to HONORS section by invitation. *Prerequisite:* Micro 305.

MICRO 412, H412, 612   BACTERIAL PHYSIOLOGY   4 cr. (3 and 3)

A consideration of the cytology, physiology, metabolism, and genetics of bacteria. Included will be studies of growth and death, reproduction and mutation, nutrition and metabolic pathways, regulatory mechanisms, and effects of environment. Admission to HONORS section by invitation. *Prerequisite:* Micro 305, organic chemistry.

MICRO 413, H413, 613   INDUSTRIAL MICROBIOLOGY   3 cr. (2 and 3)

Microbial aspects of large-scale processes for the production of foods, antibiotics, enzymes, fine chemicals, and beverages. Topics include strain selection, culture maintenance, biosynthetic pathways, continuous cultivation and production of single cell protein. Admission to HONORS section by invitation. *Prerequisite:* Micro 305.

MICRO 414, H414, 614   BASIC IMMUNOLOGY   3 cr. (2 and 3)

A consideration of the nature, production, and function of basic immune responses in animals. Procedures and mechanisms of antigen–antibody and other immune reactions. Admission to HONORS section by invitation. *Prerequisite:* Micro 305, organic chemistry.

MICRO 415, H415, 615   MICROBIAL GENETICS   4 cr. (3 and 3)

The cytological basis of bacterial genetics; some molecular aspects; mutation and mutagenic agents; population changes; mechanisms of genetic transfers; bacterial viruses as genetic systems; episomes and plasmids. The genetics of certain fungi and of animal and plant viruses will also be considered. Admission to HONORS section by invitation. *Prerequisite:* Ch 224, Gen 302, Micro 305.

MICRO 416, H416, 616   INTRODUCTORY VIROLOGY   3 cr. (3 and 0)

A general introduction to the field of virology, including animal, bacterial, and plant viruses. Topics will include nomenclature and classification, biochemical and biophysical characteristics, mechanisms of replication, chemotherapy, and techniques for isolation, assay and purification. Admission to HONORS section by invitation. *Prerequisite:* Micro 305.

MICRO 491   SPECIAL PROBLEMS IN MICROBIOLOGY   1-3 cr.
(0 and 3-9)

Research problems in the various areas of microbiology designed to introduce undergraduate students to the planning and execution of research experimentation, and the presentation of research findings.

MICRO 801   BACTERIAL TAXONOMY   3 cr. (2 and 3)

MICRO 802   BACTERIOLOGICAL TECHNIC   4 cr. (2 and 6)

MICRO 803   SPECIAL PROBLEMS IN MICROBIOLOGY.   Credit to be arranged.

MICRO 807   SEMINAR   1 cr. (1 and 0)

MICRO 810   SOIL MICROBIOLOGY   3 cr. (2 and 3)

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

MICRO 812   BACTERIAL METABOLISM   3 cr. (3 and 0)

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

MICRO 814   BACTERIAL METABOLISM LABORATORY   2 cr. (0 and 6)

MICRO 815   ADVANCED MICROBIAL GENETICS   3 cr. (3 and 0)

MICRO 891   RESEARCH.   Credit to be arranged.

MICRO 991   DOCTORAL RESEARCH.   Credit to be arranged.

Military Science

Professor: Col. T. B. Maertens, *Head*

Assistant Professors: Lt. Col. C. S. Simpson, Jr., Lt. Col. D. G. Williams, Maj. O. L. Ellis, Jr., Maj. J. H. Steed, Capt. G. J. Berry, Capt. P. E. Blackwell, Capt. K. W. Boatman, Capt. R. W. House, Capt. T. L. Murphy, Capt. E. L. Oliver, III

MS 101   FUNDAMENTALS (BASIC)   1 cr. (2 and 1)

A study of the evolution, organization, and mission of the Reserve Officers' Training Corps, individual weapons and markmanship and the evolution of weapons and warfare. An introduction to first aid, mass casualty treatment and discussion seminar on current events. Laboratory periods provide training in basic drill, discipline, and leadership.

MS 102   NATIONAL DEFENSE (BASIC)   1 cr. (2 and 1)

A study of the organization of the Department of Defense and its role in national security. An introduction to the history, organization, equipment and mission of the United States Army, with detailed study of small units. A look at the principles and types of war and leadership traits. Current events seminar. Leadership laboratory.

MS 201   INTRODUCTION TO OPERATIONS AND BASIC TACTICS AND MAP AND AERIAL PHOTOGRAPH READING (BASIC)   1 cr. (2 and 1)

An introduction to the organization, principles, and fundamentals of small unit tactics, emphasizing the importance of fire and maneuver. Interpretation and use of maps and aerial photographs in study and evaluation of terrain. Leadership laboratory.

MS 202   AMERICAN MILITARY HISTORY (BASIC)   1 cr. (2 and 1)

A survey of American military history from the origins of the American Army to the present, with emphasis on the factors which led to the organizational, tactical, logistical, operational, strategic, social and similar patterns found in our present-day Army. Leadership laboratory.

MS 300 MILITARY SCIENCE (ADVANCED) 6 cr.
(ROTC 3, Elective 3)

Study and application of leadership, military teaching principles, branches of the Army, small unit tactics and communications. Further training for duty as officers by application of principles of leadership in actual command during drills, parades, reviews, inspections, and ceremonies. One three-hour elective or required normal academic curriculum subject, presented by appropriate department, approved by the PMS to be of value in furthering the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective course or Advanced ROTC during either semester, but must participate in leadership laboratory training throughout the school year.

Three class hours and two laboratory hours (presented by Military Science Department) each week in one semester, and three class hours (elective presented by appropriate department) and two laboratory hours (presented by Military Science Department) each week in the other semester.

MS 400 MILITARY SCIENCE (ADVANCED) 6 cr.
(ROTC 3, Elective 3)

A study of military operations, logistics, administrative management, military law, service orientation, world change and military implication, internal defense/development, and leadership laboratory. One three-hour elective or required normal academic curriculum subject presented by appropriate department, approved by the PMS to be of value in furthering the professional qualifications of the student as a prospective commissioned officer in the United States Army. Students have the option of taking the elective or Advanced ROTC during either semester, but must participate in leadership laboratory training throughout the school year,

Three class hours and two laboratory hours (presented by Military Science Department) each week in one semester, and three class hours (elective presented by appropriate department) and two laboratory hours (presented by Military Science Department) each week in the other semester.

Music

Associate Professor: J. H. Butler, *Head*

Assistant Professors: B. F. Cook,* E. A. Freeman*

Instructors: Edith B. Card, J. K. Copenhaver, Lillian U. Harder, J. E. Jackson, E. W. Winston

MUS 151 APPLIED MUSIC 1 cr. (1 and 0)

Individual study in performance medium (voice, piano, flute, oboe, clarinet, saxophone, bassoon, cornet, trumpet, French horn, trombone, baritone, tuba, percussion). One hour-long private lesson each week, for which a minimum of four hours' practice is required. The student is guided in a continuing advance of his technical and artistic proficiency, and is required to perform an appropriate solo in a student recital each semester. May be repeated for credit with departmental approval to allow for the study of differing performance media. *Prerequisite:* Consent of instructor, based on a qualifying audition.

MUS 152 APPLIED MUSIC 1 cr. (1 and 0)

A continuation of Mus 151. *Prerequisite:* Mus 151.

MUS 205 MUSIC THEORY 3 cr. (3 and 0)

* On leave.

The terminology and notation of traditional music are reviewed, and the techniques of sight-singing and sight-reading are practiced. Harmonic practices are studied, relating to the principal diatonic triads in all inversions. *Prerequsite:* Consent of instructor, based on musical literacy.

MUS 206   MUSIC THEORY   3 cr. (3 and 0)

Continuation of Mus 205 with emphasis on secondary chord structure, modulation, and nondiatonic harmony. Advanced sight-singing and melodic dictation are practiced. *Prerequisite:* Mus 205.

MUS 210   MUSIC APPRECIATION: MUSIC IN THE WESTERN WORLD   3 cr. (3 and 0)

Designed to deepen the student's appreciation of his musical heritage through a study of the elements of the musical language and its development in Western culture.

MUS 251   APPLIED MUSIC   1 cr. (1 and 0)

A continuation of Mus 152. *Prerequisite:* Mus 152 and consent of instructor.

MUS 252   APPLIED MUSIC   1 cr. (1 and 0)

A continuation of Mus 251. *Prerequisite:* Mus 251.

MUS 305   MUSIC THEORY: ADVANCED HARMONY   3 cr. (3 and 0)

A study of harmonic usage involving chromaticism, free dissonance and atonality. Harmonic dictation is practiced. *Prerequisite:* Mus 206.

MUS 306   MUSIC THEORY: FORM AND ANALYSIS   3 cr. (3 and 0)

Principles of formal construction in music of all periods are studied by the inductive analysis of representative works. *Prerequisite:* Mus 206.

MUS 311   MUSIC APPRECIATION: AMERICAN MUSIC   3 cr. (3 and 0)

Music in America from 1620 to the present. Indigenous and borrowed influences will be examined.

MUS 315   MUSIC THEORY   3 cr. (3 and 0)

The development of Western music from antiquity to 1750, emphasizing representative literature from various styles and periods.

MUS 316   MUSIC HISTORY   3 cr. (3 and 0)

Continuation of Mus 315. Music from 1750 to present. *Prerequisite:* Mus 315.

MUS 361   MARCHING BAND   1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Fall semester only. *Prerequisite:* Consent of director.

MUS 362   CONCERT BAND   1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. Spring semester only. *Prerequisite:* Consent of director.

MUS 365   UNIVERSITY CHORUS   1 cr. (0 and 3)

Ensembles: Devoted to the musical training of ensemble members through reading and rehearsal of appropriate music; public performances given periodically in addition to the minimum rehearsal time; may be repeated for credit, with a maximum of four hours of ensemble credit allowable toward a degree. *Prerequisite:* Consent of director.

MUS 400   MUSIC IN THE ELEMENTARY SCHOOL CLASSROOM
3 cr. (3 and 0)

Designed to give the teacher in the elementary school a familiarity with music suitable for use with children at the elementary level. Recordings of appropriate music, preband instruments, unison and part singing will be included. No previous training in music is required.

MUS 401   METHODS AND MATERIALS IN ELEMENTARY SCHOOL
MUSIC   3 cr. (3 and 0)

Materials, methods and techniques in elementary school. *Prerequisite:* Mus 400.

MUS 421   VOCAL ARRANGING   3 cr. (3 and 0)

Techniques of arranging for voices and accompanying instruments are studied and appropriate arrangements prepared. *Prerequisite:* Mus 305.

MUS 422   INSTRUMENTAL ARRANGING   3 cr. (3 and 0)

Transpositions, characteristics and range of the instruments of the band and orchestra are studied. Techniques of arranging for small instrumental ensembles are studied and appropriate arrangements prepared. *Prerequisite:* Mus 305.

MUS 423   CONDUCTING   3 cr. (3 and 0)

Basic principles and techniques of conducting, interpretation and score reading are studied and applied with vocal or instrumental ensembles. *Prerequisite:* Mus 306 and 4 hours of ensemble credit.

Nursing

(Associate in Arts Degree Program)

Associate Professor: L. Roswal, *Director*

Assistant Professors: Aileen S. Prevost, Harriett E. Whitley

Instructors: Julia H. Higgins, Mary A. Kelly, Audra P. McPeak, Esther B. Privette, Sara T. Stokes, Mary A. Teklits

NURS 100   ORIENTATION   1 cr. (1 and 0)

Series of lectures and discussions on nursing and careers in nursing; personal and professional guidance.

NURS 101   FUNDAMENTALS OF NURSING I   6 cr. (3 and 9)

This introductory course is oriented to the normal health needs of all people, sick and well. Study of the concepts and scientific principles of the biosocio-psychological sciences that are applicable in the nursing practices common to all patients. College and hospital laboratory learning experiences provide an opportunity to adapt these principles and develop beginning skill in selected technical and interpersonal aspects of nursing.

NURS 102   FUNDAMENTALS OF NURSING II   6 cr. (3 and 9)

In this course, sequential to Nurs 101, the skills, knowledge and principles are further developed. A patient-centered orientation to basic-nursing practices is continued in assisting the individual to attain and/or maintain homeostasis. Dietary, pharmacological, fluid and electrolyte balance and mental concepts are integrated and correlated. *Prerequisite:* Satisfactory completion of Zool 110; concurrent enrollment or completion in Psych 201, Engl 102.

NURS 200   MATERNAL AND CHILD HEALTH NURSING   5 cr. (3 and 6)

This course is built around the family unit and the role of the nurse and others in providing for the child-bearing health needs of families. The normal aspects and common health problems which occur during the maternity cycle are stressed. Includes concurrent guided learning experiences in the hospital and other health agencies. *Prerequisite:* Satisfactory completion of Zool 111, concurrent enrollment or completion in Nurs 201, Psych 211, Soc 201.

NURS 201   MAJOR HEALTH PROBLEMS I   5 cr. (3 and 6)

This course is the first of the three interrelated sequential courses designed to develop a knowledge of principles which can be applied when planning and giving care to various age groups with major health problems (acute and long term patients). *Prerequisite:* Satisfactory completion of Zool 111, concurrent enrollment or completion in Nurs 200, Psych 211, Soc 201.

NURS 202   MAJOR HEALTH PROBLEMS II   5 cr. (3 and 6)

Continuation of major health problems encountered by individuals throughout life cycle, with emphasis on prevention, treatment, promotion of health and rehabilitation. Guided learning experiences in nursing care are concurrently provided in the hospital and other agencies.

NURS 203   MAJOR HEALTH PROBLEMS III   5 cr. (3 and 6)

A continuation of Nurs 201 and concomitant with Nurs 202. It is directed toward the nursing care of the patient with intensive and long-term illness as mobility disorders and mental illness. Further planned experiences designed to develop skill and knowledge in the selected nursing care of patients with a complexity of problems.

NURS 204   NURSING SEMINAR   1 cr. (1 and 0)

A course planned to consider contemporary social, legal and ethical forces that affect the nurse, the field of nursing and society. Discussion will focus on socio-economics aspects, legislative and health care issues.

Nursing

(Baccalaureate Degree Program)

Professor: Geraldine Labecki, *Director*

Associate Professors: Arline M. Duvall, Rose A. Godbout, Elizabeth J. Hall

Assistant Professors: Opal S. Hipps, Catherine P. Marino, Regina Thompson

Instructors: Jeanette C. Bernhardt, Claudia M. Blanford, Carolyn J. Kelley, Cynthia A. Leahy, Anne V. Miller, Ann M. Mullen, Susan Rockwell

Lecturers: D. K. Freeman, Jr., Ann R. Lukawecki

NURS 100   ORIENTATION   1 cr. (1 and 0)

NURS 207   DYNAMICS OF HUMAN RELATIONS   3 cr. (2 and 3)

The nursing appraisal of theoretical and clinical approaches to the understanding of the dynamics of human behavior. The identification of behaviors through observing and participating in laboratory experiences in community agencies providing service to adults and children.

NURS 208   PROBLEM SOLVING IN NURSING   3 cr. (2 and 3)

Introduction to the concept of problem solving in nursing throughout health-illness cycle. Selected models are presented and analyzed. Relevant technical skills identified in the analysis are learned. Emphasis on creative approach to solving nursing problems and the utility of the technic to the solution. Laboratory experience in the classroom and with hospitalized patients.

NURS 309   HUMAN VALUES IN NURSING   3 cr. (3 and 0)

The values guiding nursing theory and practice, including common human needs; the nature of man and his community.

NURS 310   PERSPECTIVES IN NURSING INTERVENTION   3 cr. (3 and 0)

Analysis of processes used in making nursing judgments. Emphasis on planning, intervention, and evaluation.

NURS 311   NURSING DURING ALTERATIONS IN LIFE PATTERNS   5 cr. (2 and 9)

Study of the ways in which people perceive and cope with changes in their life patterns; emphasis on the synthesis of knowledge from the arts and sciences as a basis for deliberative nursing action. Laboratory experience in a variety of settings with all age groups.

NURS 312   NURSING OF THE ACUTELY AND CHRONICALLY DISTRESSED   5 cr. (2 and 9)

Nursing concepts based on a broad patho-psychophysiologic approach toward understanding changes in functions as a result of stress and/or disease. Laboratory experience in agencies providing care for the mentally and physically distressed.

NURS 313   THE PROMOTION OF HEALTH   3 cr. (2 and 3)

Role of the nurse in the teaching of health in the home and in agencies concerned with the prevention of illness. Emphasis on nutrition as a positive approach to the improvement of health throughout the life cycle. Laboratory experience in clinics, homes, and selected community programs.

NURS 314   NURSING IN THE HOME   3 cr. (2 and 3)
The dimensions of caring for the ill in the home; includes early detection, treatment, and the use of resources with emphasis on continuity of care. Laboratory experience with agencies providing home care.

NURS 415   NURSING AS A SOCIAL FORCE   3 cr. (3 and 0)
Role of professional nursing in comprehensive health planning related to changing social forces.

NURS 417   INTENSIVE NURSING   4 cr. (1 and 9)
Nursing in highly stressful situations. Assisting individuals and families in coping with life-threatening experiences. Laboratory experience in the home and acute care facilities.

NURS 419   THE MULTIPROBLEM FAMILY   3 cr. (2 and 3)
Focus on the family as a unit of care. Use of the epidemiologic approach as a tool in understanding conditions influencing the family. Laboratory experience through community care facilities.

NURS 421   HISTORY AND PHILOSOPHY OF NURSING   3 cr. (3 and 0)
Analysis of the development of modern nursing. Emphasis will be placed on how the nursing profession articulates with society and the role of nurses as change agents. Consideration will be given to the legal and ethical implications in nursing practice.

NURS 422   CURRENT RESEARCH IN NURSING   3 cr. (3 and 0)
A study of approaches to problematic situations in nursing, with emphasis on interpretation of findings.

NURS 425   INDEPENDENT STUDY IN NURSING   7 cr. (3 and 12)
Opportunity for in-depth study in an area of special interest in clinical nursing. Laboratory experience arranged. *Prerequisite:* Nurs 422.

Nutrition

Professors: B. D. Barnett, R. F. Borgman, W. A. King, J. H. Mitchell, Jr., G. C. Skelley, Jr., R. F. Wheeler, W. P. Williams, Jr.

Associate Professors: R. L. Edwards, D. L. Handlin, D. M. Henricks, J. E. Jones, G. D. O'Dell, D. E. Turk

Assistant Professor: J. C. McConnell, Jr.

(See courses listed under Animal Science, Biochemistry, Dairy Science, Food Science, and Poultry Science)

NUTR 201   INTRODUCTION TO NUTRITION   3 cr. (3 and 0) S
Principles of the nutrition of domestic animals and man includes: sources, digestion, absorption, utilization and functions of nutrients; effects of dietary deficiencies; and nutrients required for maintenance, growth, reproduction, lactation, work, and egg-shell quality.

NUTR 401, 601   FUNDAMENTALS OF NUTRITION   3 cr. (3 and 0) F
Biochemical and physiological fundamentals of nutrition applicable to domestic animals and man. Considered are digestive processes, and absorption and metabolism of carbohydrates, lipids, proteins, water, minerals and vitamins. Energy metabolism and comparative anatomy and physiology of digestive systems are discussed.

NUTR 451, 651 HUMAN NUTRITION 3 cr. (3 and 0)
Essentials of nutrition and principle nutritional deficiency conditions. Factors affecting adequacy of dietary intake, methods of determining nutritional status, the development of nutrition standards, and recent advances in human nutrition.

NUTR 701 THERAPEUTIC NUTRITION 3 cr. (3 and 0)

NUTR 702 PUBLIC HEALTH NUTRITION 3 cr. (3 and 0)

NUTR 703 NUTRITION EDUCATION 3 cr. (3 and 0)

NUTR 704 FEEDING METHODS 3 cr. (3 and 0)

NUTR 705 FIELD TRAINING IN NUTRITION 6 cr. (6 and 0)

NUTR 801 TOPICAL PROBLEMS IN NUTRITION 1-3 cr.

NUTR 808 MONOGASTRIC NUTRITION 3 cr. (3 and 0)

NUTR 809 POLYGASTRIC NUTRITION 3 cr. (3 and 0)

NUTR 812 METABOLISM OF NUTRIENTS 3 cr. (3 and 0)

NUTR 813 NUTRITION TECHNIQUES WITH LARGE ANIMALS 2 cr. (1 and 3)

NUTR 814 NUTRITION TECHNIQUES WITH LABORATORY ANIMALS 2 cr. (1 and 3)

NUTR 816 AMINO ACIDS AND PROTEIN NUTRITION 2 cr. (2 and 0)

NUTR 818 VITAMINS AND MINERALS 4 cr. (3 and 3)

NUTR 851 NUTRITION SEMINAR I 1 cr. (1 and 0)

NUTR 852 NUTRITION SEMINAR II 1 cr. (1 and 0)

NUTR 891 RESEARCH. Credit to be arranged.

NUTR 991 DOCTORAL RESEARCH. Credit to be arranged.

Philosophy

Assistant Professors: J. L. McCollough, D. F. White, Jr.
Instructor: W. M. Pharr, Jr.

PHIL 201 INTRODUCTION TO PHILOSOPHY 3 cr. (3 and 0)
A discussion of representative philosophical questions which arise from human thought and action. Characteristic topics are: the conditions of knowledge; the nature of man; the individual and society.

PHIL 211 PHILOSOPHY AND CURRENT ISSUES 3 cr. (3 and 0)
An introduction to philosophic reflection as found in writers from many fields analyzing today's cultural predicaments. This social criticism is discussed in a search for the philosophical basis of some familiar conflicts over the value system implicit in our way of life.

PHIL 302 LOGIC 3 cr. (3 and 0)
An introduction to methods of evaluating arguments. Simple valid argument forms are given which can be joined together to produce the logical form of virtually any argument. Informal fallacies may also be considered.

PHIL 303   PHILOSOPHY OF RELIGION   3 cr. (3 and 0)

A critical consideration of the meaning and justification of religious be-
liefs. Representative topics are: the nature and existence of God; religious
knowledge; religious language; the problem of evil.

PHIL 304   INTRODUCTION TO ETHICAL THEORY   3 cr. (3 and 0)

An examination of moral judgment; its concepts, criteria and relations to
factual judgment. Classical theories and current issues are searched for an
ideal of the good man and the life we prize. Construction of a model theory
of obligation, value, justice, and punishment is attempted.

PHIL 305   AESTHETICS   3 cr. (3 and 0)

A study of the function of art in human life along with a consideration of
the various philosophical elements involved in art and art criticism. Various
historical types of aesthetic theory will be considered. *Prerequisite:* Junior
standing or permission of instructor.

PHIL 309   ORIENTAL PHILOSOPHIES AND RELIGIONS   3 cr.
(3 and 0)

A study of the philosophical and religious teachings of Hinduism, Bud-
dhism, Confucianism, and Taoism.

PHIL 312   MODERN PHILOSOPHY   3 cr. (3 and 0)

The development of the modern outlook as seen in the major Western
philosophers of the seventeenth and eighteenth centuries. The thought of
Descartes, Spinoza, Leibniz, Locke, Berkeley, Hume, Kant, and Hegel is
considered, illustrating the development of rationalism, empiricism, and
idealism.

PHIL 318   CONTEMPORARY PHILOSOPHY   3 cr. (3 and 0)

A study of the dominant movements in Western philosophy today, partic-
ularly existentialism and analytical philosophy. The object is to acquire
sufficient background for reading current philosophical or philosophically
influenced literature.

PHIL 322   SYMBOLIC LOGIC   3 cr. (3 and 0)

The fundamentals of modern symbolic logic. Leading topics are: transla-
tion from ordinary language to logical form; rules of inference for the logic
of sentences and the logic of predicates; tests of validity. *Prerequisite:* Phil
302, or Math 108, or a computer programming course.

PHIL 344   CURRENT ETHICAL THEORY   3 cr. (3 and 0)

An examination of present trends in ethical and meta-ethical theory for their
bearing upon the criteria of our judgments of human conduct and character
and upon current moral issues. Selected topics from the logic, epistemology,
and psychology of ethical judgment will be considered, with review of rele-
vant journal literature. *Prerequisite:* Phil 304 or permission of instructor.

PHIL 422   MATHEMATICAL LOGIC   3 cr. (3 and 0)

A detailed and rigorous study of a logical system as a foundation for math-
ematics. An analysis of basic concepts occurring in the foundations of mathe-
matics. *Prerequisite:* Phil 322 or sufficient mathematical background.

PHIL 425   PHILOSOPHY OF SCIENCE   3 cr. (3 and 0)

A study of the presuppositions, categories, and implications of the physical
and social sciences with special reference to the concepts of space and time,

matter, causation, and relativity. The logic of "scientific method" and the unity of the sciences are considered. *Prerequisite:* Junior standing and permission of instructor.

PHIL 825 SEMINAR IN PHILOSOPHY OF SCIENCE 3 cr. (3 and 0)

Physical Science

(Jointly administered by the Chemistry Department and the Department of Physics and Astronomy)

PHY SC 101, H101 PHYSICAL SCIENCE I 4 cr. (3 and 2)
    An introduction to the physical sciences. Selected topics will be discussed to illustrate the structure and meaning of the physical sciences. Course cannot be taken for credit by students who have completed one year of a course in the physical science area. Admission to HONORS section by invitation.

PHY SC 102 PHYSICAL SCIENCE II 4 cr. (3 and 2)
    A continuation of Phy Sc 101. Course cannot be taken for credit by students who have completed one year of a course in the physical science area.

Physics

Professors: R. L. Chaplin, Jr., W. E. Gettys, H. W. Graben, M. J. Skove, E. P. Stillwell, Jr., *Head;* H. E. Vogel

Associate Professors: B. B. Bookmyer, B. V. Bronk, P. B. Burt, J. L. Ging, F. J. Keller, A. L. Laskar, D. P. Miller, M. G. Miller, J. R. Ray, M. D. Sherrill, C. W. Ulbrich*

Assistant Professors: T. F. Collins, J. A. Gilreath, L. L. Larcom, J. R. Manson, R. J. Roedersheimer, P. A. Steiner, R. C. Turner

PHYS 101 CURRENT TOPICS IN MODERN PHYSICS 1 cr. (0 and 2)
    Demonstrations and lectures supplemented by slides and motion pictures on current topics in physics, such as superfluids, lasers, superconductors, elementary particles, etc., chosen from the fields of atomic, nuclear, solid state physics, and astrophysics. Several members of the staff will participate.

PHYS 115 CLASSICAL PHYSICS I 3 cr. (3 and 0)
    A survey of classical physics in which emphasis is placed on those principles which are of greatest utility in modern applications. Some of the history and philosophy of physics is included. Topics discussed include mechanics, astronomy, fluid mechanics applied to the properties of air and water, and wave motion with emphasis on sound waves. *Corequisite:* A course that includes calculus or permission of instructor.

PHYS 116 CLASSICAL PHYSICS II 3 cr. (3 and 0)
    A continuation of Phys 115. Topics covered include thermodynamics with emphasis on the properties of air and water, electricity and magnetism with a brief introduction to electronics, optics, and an introduction to materials science. *Prerequisite:* Phys 115.

PHYS 122, H122 MECHANICS AND WAVE PHENOMENA 3 cr. (3 and 0)
    Vectors; laws of motion; rotation; vibratory and wave motion; mechanical properties of materials. Admission to HONORS section by invitation. *Prerequisite:* Registration in Math 108.
    * On leave.

PHYS 132 GENERAL PHYSICS FOR PHYSICS MAJORS I 3 cr.
(3 and 0)

Introduction to physical quantities, linear and rotational motion, conservation laws, gravitational and electric fields, and kinetic theory. *Prerequisite:* Registration in Math 108.

PHYS 207 GENERAL PHYSICS 4 cr. (3 and 2)

An introductory course for students who are not majoring in a pure science or engineering. Includes mechanics, light, and astronomy. *Corequisite:* A course that includes trigonometry.

PHYS 208 GENERAL PHYSICS 4 cr. (3 and 2)

Continuation of Phys 207. Includes electricity, magnetism, thermal phenomena, and quantum theory. *Prerequisite:* Phys 207.

PHYS 221, H221 THERMAL AND ELECTRICAL PHENOMENA 3 cr.
(3 and 0)

Thermal properties of matter; electric and magnetic fields; electric currents and circuits; motions of charged particles in fields. Admission to HONORS section by invitation. *Prerequisite:* Phys 122.

PHYS 222, H222 OPTICS AND MODERN PHYSICS 3 cr. (3 and 0)

Theory of light waves and photons; optical instruments; relativity; atomic particles; nuclear physics. Admission to HONORS section by invitation. *Prerequisite:* Phys 221.

PHYS 223 ELECTRON PHYSICS LABORATORY 1 cr. (0 and 3)

An introduction to physical experimentation employing the Berkeley A laboratory course. Experiments are performed in acceleration and deflection of electrons, measurement of electron charge to mass ratio by helical motion and time of flight, oscillating systems involving capacitance, resistance and inductance, resonance, modulation, negative resistance and relaxation oscillations. *Prerequisite:* Registration in Phys 221 or 231.

PHYS 224 MODERN PHYSICS LABORATORY 1 cr. (0 and 3)

Continuation of Phys 223. Experiments in the areas of solid state, optical and modern physics. Experiments are performed on electrical carrier mobility in solids, minority carrier lifetime, transistor action, microwave optics, interference and diffraction, light polarization, gas laser optics, optical spectra, electron and X-ray diffraction, radioactive particle counting. Compton scattering of X-rays, radioactivity decay and Mossbauer effect. *Prerequisite:* Registration in Phys 222 or 232.

PHYS 231 GENERAL PHYSICS FOR PHYSICS MAJORS II 3 cr.
(3 and 0)

A continuation of Phys 132. An introduction to the magnetic field, electric circuits, wave motion, reflection, refraction, diffraction of waves, electromagnetic waves. *Prerequisite:* Phys 132; registration in Phys 223.

PHYS 232 GENERAL PHYSICS FOR PHYSICS MAJORS III 3 cr.
(3 and 0)

A continuation of Phys 231. An introduction to thermodynamics, relativity, particle and wave descriptions of matter and light. Includes a description of experiments which were crucial to recent developments in physics. *Prerequisite:* Phys 231; registration in Phys 224.

PHYS 240   PHYSICS OF THE ATMOSPHERIC ENVIRONMENT   3 cr. (3 and 0)

An introduction to meteorological processes with emphasis placed on qualitative descriptions. Includes thermodynamics of the atmosphere, solar radiation and the heat budget, circulation of the atmosphere, force laws governing air mass motions, fronts, condensation processes, synoptic prediction. Special topics would consider the effects of environmental pollution on weather and the effects of weather on health.

PHYS 245   ENERGY SOURCES AVAILABLE TO MAN   2 cr. (2 and 0)

A study of possible sources of energy including fossil fuels, solar energy, and nuclear energy. The basic physical concepts, the economic feasibility, and the environmental impact of the use of these sources of energy will be discussed and compared. *Prerequisite:* Two semesters of chemistry, physical science, or physics.

PHYS   262   PHYSICS OF MUSIC   3 cr. (3 and 0)

An elementary study of the relationship between the basic laws of physics and the production of all forms of music. A nontechnical course utilizing only an elementary knowledge of mathematics, and designed for the music student or music lover who wishes to gain a better understanding of the underlying physical principles of the art. Special topics to be discussed include elementary laws of mechanics and acoustics, harmonic analysis, musical scales, sound production in musical instruments, pitch perception and the physiology of hearing, elements of electronic music, and acoustical properties of buildings.

PHYS 321, 621   MECHANICS I   3 cr. (3 and 0)

Statics; motions of particles and rigid bodies; vibratory motion; gravitation; properties of matter, flow of fluids. *Prerequisite:* Phys 221 or 231.

PHYS 322, 622   MECHANICS II   3 cr. (3 and 0)

Dynamics of particles and of rigid bodies, Lagrangian and Hamiltonian formulations, vibrations of strings, wave propagation. *Prerequisite:* Phys 321 or permission of instructor.

PHYS 325, 625   EXPERIMENTAL PHYSICS I   4 cr. (2 and 6)

Introduction to laboratory techniques, measurement of fundamental constants, and performance of some of the experiments (Stern-Gerlach, Zeeman, Photoelectric, specific charge of electrons and protons, etc.) which are crucial to the development of our present concepts of physics. *Prerequisite:* Phys 321 or equivalent, or enrollment in Phys 321, or by permission of instructor.

PHYS 326, 626   EXPERIMENTAL PHYSICS II   4 cr. (2 and 6)

Continuation of Phys 325.

PHYS 340, 640   ELECTRICITY AND MAGNETISM I   3 cr. (3 and 0)

Electric potential and electrostatic fields; solutions of Laplace's and Poisson's equations; properties of dielectrics and of capacitors; electrostatic energy; current and treatment of circuit problems. Vector analysis is used throughout after introduction. *Prerequisite:* Phys 221 or 231.

PHYS 401   SENIOR THESIS I   1-3 cr.

The senior thesis is a semi-original piece of work performed under the direction of a member of the physics staff. Theoretical fields available include relativity, statistical mechanics, nuclear physics and astrophysics. Experimen-

tal work may be done in the fields of X-ray diffraction elasticity, low-temperature thermal conductivity, super-conductivity, radiation damage in metals, and electron paramagnetic resonance. *Prerequisite:* At least three physics courses beyond general physics.

PHYS 402   SENIOR THESIS II   1-3 cr.

A continuation of Phys 401.

PHYS 417, 617   INTRODUCTION TO BIOPHYSICS I   3 cr. (3 and 0)

An introduction to the application of the ideas and methods of physics to biological problems. An introductory survey of sufficient material from biology and chemistry to enable the physics or mathematics student to appreciate the importance of a biophysical approach to modern biology. The course will continue with a treatment of the physics of biological molecules and aspects of radiation biophysics. *Prerequisite:* Phys 221, Math 206, or permission of instructor.

PHYS 418, 618   INTRODUCTION TO BIOPHYSICS II   3 cr. (3 and 0)

Continuation of Phys 417. Discussion of radiation biophysics is completed and mathematical aspects of cell population kinetics are discussed. The second half of the term will be devoted to a treatment of some area of current interest selected from topics such as membrane biophysics; control theory and molecular biophysics; muscle studies; statistical mechanics applied to ecosystems; irreversible thermodynamics in biophysics; physics of enzymes. *Prerequisite:* Math 206, Phys 221, 417, or permission of instructor.

PHYS 432, 632   PHYSICAL OPTICS AND INTRODUCTION TO SPECTROSCOPY   3 cr. (3 and 0)

Theory and application of interference and diffraction phenomena, polarized light, magneto-optics and electro-optics. Introductory theory of spectroscopy. *Prerequisite:* Phys 222 or 232.

PHYS 441, 641   ELECTRICITY AND MAGNETISM II   3 cr. (3 and 0)

A continuation of Phys 340. Magnetic fields and energy; magnetic properties of materials; electromagnetic induction; A. C. circuit problems with vector methods and complex numbers; Maxwell's field equations with applications. *Prerequisite:* Phys 340 or equivalent.

PHYS 446, 646   SOLID STATE PHYSICS   3 cr. (3 and 0)

An introductory treatment of the crystal structure of solids and the properties of solids which depend on crystal structure; free electron model of metals; band theory of solids; Brillouin zones, crystalline defects and diffusion. *Prerequisite:* Phys 222, or 232, or permission of instructor.

PHYS 452, 652   INTRODUCTORY NUCLEAR PHYSICS   3 cr. (3 and 0)

Various phases of nuclear physics including natural and induced radioactivity; properties of alpha, beta and gamma-rays; cosmic rays; nuclear energy levels and decay schemes; particle accelerators, fission, fusion and nuclear reactors. *Prerequisite:* Phys 222 or 232.

PHYS 454   NUCLEAR PHYSICS LABORATORY   1 cr. (0 and 3)

Techniques and instruments used in detection and measurement of nuclear radiation. Experiments include half-life determination, absorption measurements, neutron activation, coincidence measurements, decay schemes, and gamma ray spectroscopy. *Prerequisite:* Registration in Phys 452.

PHYS 455, 655   QUANTUM PHYSICS I   3 cr. (3 and 0)

Discussion of solution of the Schroedinger equation for free particles, the hydrogen atom and the harmonic oscillator. *Prerequisite:* Phys 322, 340, or permission of instructor.

PHYS 456, 656   QUANTUM PHYSICS II   3 cr. (3 and 0)

Continuation of Phys 455. Application of principles of quantum mechanics as developed in Phys 455 to atomic, molecular, solid state and nuclear systems. *Prerequisite:* Phys 455.

PHYS 460, 660   CONTEMPORARY PHYSICS FOR HIGH SCHOOL TEACHERS   3 cr. (3 and 0)

A study of later developments including the measurements of atomic particles. The formulation of new laws and the modifications of old ideas needed to describe the interactions of these particles.

PHYS 465, 665   THERMODYNAMICS AND STATISTICAL MECHANICS   3 cr. (3 and 0)

A study of temperature, development of the laws of thermodynamics and their application to thermodynamic systems. An introduction to low temperature physics is given. *Prerequisite:* Six hours of physics beyond Phys 222 or permission.

PHYS 471, 671   ELECTRON MICROSCOPY   3 cr. (2 and 3)

The theory and operation of the electron microscope. Magnetic lens theory. The technique of specimen mounting and the interpretation of electron micrographs and diffraction patterns. Each student may choose specimens from his major field. *Prerequisite:* General physics, Math 206, and permission of instructor.

PHYS 473, 673   X-RAY CRYSTALLOGRAPHY   3 cr. (2 and 3)

A study of crystal symmetry, elementary space group theory, diffraction of X-rays by electronic charge distribution. Experimental methods of optical goniometry, powder diffraction and single crystal techniques are used to obtain diffraction intensities from a simple crystalline solid and electron charge distribution is determined. Applications of X-ray diffraction to chemical, physical and metallurgical investigations are discussed.

PHYS 701   PHYSICS FOR HIGH SCHOOL TEACHERS I   4 cr. (3 and 3)

PHYS 702   PHYSICS FOR HIGH SCHOOL TEACHERS II   4 cr. (3 and 3)

PHYS 703   MODERN PHYSICS FOR HIGH SCHOOL TEACHERS   3 cr. (3 and 0)

PHYS 715   EXPERIMENTAL PHYSICS FOR HIGH SCHOOL TEACHERS I   4 cr. (2 and 4)

PHYS 716   EXPERIMENTAL PHYSICS FOR HIGH SCHOOL TEACHERS II   4 cr. (2 and 4)

PHYS 811   METHODS OF THEORETICAL PHYSICS I   3 cr. (3 and 0)

PHYS 812   METHODS OF THEORETICAL PHYSICS II   3 cr. (3 and 0)

PHYS 813   ADVANCED THERMODYNAMICS AND STATISTICAL MECHANICS I   3 cr. (3 and 0)

PHYS 814   ADVANCED THERMODYNAMICS AND STATISTICAL MECHANICS II   3 cr. (3 and 0)

PHYS 821   CLASSICAL MECHANICS I   3 cr. (3 and 0)

PHYS 822   CLASSICAL MECHANICS II   3 cr. (3 and 0)

PHYS 841   ELECTRODYNAMICS I   3 cr. (3 and 0)

PHYS 842   ELECTRODYNAMICS II   3 cr. (3 and 0)

PHYS 845   SOLID STATE PHYSICS I   3 cr. (3 and 0)

PHYS 846   SOLID STATE PHYSICS II   3 cr. (3 and 0)

PHYS 853   NUCLEAR PHYSICS I   3 cr. (3 and 0)

PHYS 854   NUCLEAR PHYSICS II   3 cr. (3 and 0)

PHYS 856   CRYSTALLOGRAPHY   3 cr. (3 and 0)

PHYS 875   SEMINAR IN CONTEMPORARY PHYSICS   1-3 cr. (1-3 and 0)

PHYS 891   RESEARCH.   Credit to be arranged.

PHYS 922   HYDRODYNAMICS   3 cr. (3 and 0)

PHYS 951   QUANTUM MECHANICS I   3 cr. (3 and 0)

PHYS 952   QUANTUM MECHANICS II   3 cr. (3 and 0)

PHYS 955   ADVANCED MODERN PHYSICS I   3 cr. (3 and 0)

PHYS 956   ADVANCED MODERN PHYSICS II   3 cr. (3 and 0)

PHYS 966   RELATIVITY   3 cr. (3 and 0)

PHYS 991   DOCTORAL RESEARCH.   Credit to be arranged.

Plant Pathology

Professors: L. W. Baxter, W. M. Epps, *Head;* J. E. Halpin, W. Witcher
Associate Professors: G. C. Kingsland, F. H. Smith
Assistant Professors: O. W. Barnett, R. W. Miller, Jr., E. I. Zehr
Lecturer: W. M. Dowler

PL PA 401, H401, 601   PLANT PATHOLOGY   3 cr. (2 and 3) F, S
   The principles of the interrelationships between plant pathogens, their hosts, and the environment. Economically important plant diseases are used to illustrate these principles and the application of these principles to disease control. Admission to HONORS section by invitation. *Prerequisite:* Bot 101.

PL PA 405, H405, 605   FOREST PATHOLOGY   3 cr. (2 and 3) F
   Principles of plant pathology as related to forest tree diseases; casual agents and their effects on the suscept; prevention and control and minimizing losses; relation of disease control to silviculture, management, and forest products utilization. Admission to HONORS section by invitation. *Prerequisite:* Bot 101, 352, or permission of instructor.

PL PA 451, 651   BACTERIAL PLANT PATHOGENS   3 cr. (2 and 3) S, '75 and alternate years.

The nature, development, and control of plant diseases caused by bacteria. Taxonomic considerations, host-parasite relations and techniques used in isolating, identifying, and preserving bacterial plant pathogens. *Prerequisite:* Pl Pa 401 or 405, Micro 305, or permission of instructor.

PL PA 456, H456, 656   PLANT VIROLOGY   3 cr. (3 and 0) S, '74 and alternate years.

Plant viruses with emphasis on their morphology, biochemistry, purification and transmission; symptoms resulting from virus infection; virus-vector relationships; and serological procedures. The importance and control of plant virus diseases will be discussed. Admission to HONORS section by invitation. *Prerequisite:* Bot 101.

PL PA 458, H458, 658   PLANT PARASITIC NEMATODES   3 cr. (2 and 3) F, '73 and alternate years.

Morphology and taxonomy of stylet bearing nematodes and their relationship with plant diseases. Admission to HONORS section by invitation. *Prerequisite:* Bot 101, Zool 101.

PL PA 800   ADVANCED PLANT PATHOLOGY I   3 cr. (3 and 0)

PL PA 801   ADVANCED PLANT PATHOLOGY II   3 cr. (3 and 0)

PL PA 804   PHYSIOLOGICAL PLANT PATHOLOGY   3 cr. (3 and 0)

PL PA 805   SPECIAL PROBLEMS IN PLANT PATHOLOGY.   Credit to be arranged.

PL PA 807   SEMINAR   1 cr. (1 and 0)

PL PA 808   TECHNIQUES AND METHODS IN PLANT PATHOLOGY I   1 cr. (0 and 3)

PL PA 809   TECHNIQUES AND METHODS IN PLANT PATHOLOGY II   1 cr. (0 and 3)

PL PA 811   PLANT DISEASE DIAGNOSIS I   1 cr. (0 and 3)

PL PA 812   PLANT DISEASE DIAGNOSIS II   1 cr. (0 and 3)

PL PA 891   RESEARCH.   Credit to be arranged.

PL PA 991   DOCTORAL RESEARCH.   Credit to be arranged.

Political Science

Associate Professors: C. W. Dunn, *Head;* W. H. Owens, Jr., J. E. Tuttle
Assistant Professors: H. E. Albert, E. M. Coulter, R. A. Rimkus, M. W. Slann
Instructor: H. W. Fleming, Jr.

POL SC 101   INTRODUCTION TO POLITICAL SCIENCE I. AMERICAN GOVERNMENT   3 cr. (3 and 0)

A general introduction to public administration, political behavior, and public law, with a concentrated treatment of American institutions. (Formerly Pol Sc 202.)

**POL SC 201   INTRODUCTION TO POLITICAL SCIENCE II   3 cr.
(3 and 0)**

A basic introduction to the study, analysis, scope, and sources of government. Emphasis is given to the comparative institutions of government, the international relations of government, the theoretical conceptions man has entertained about government, and analysis of the ways in which man has behaved in response to government. *Prerequisite:* Pol Sc 101 or permission of instructor.

POL SC 302   STATE AND LOCAL GOVERNMENT   3 cr. (3 and 0)

The structural features, functions, and legislative, executive and judicial processes of American state and local government.

POL SC 321   GENERAL PUBLIC ADMINISTRATION   3 cr. (3 and 0)

An introduction to public administration including the elements of organization, personnel and financial management, and admininistrative law, and administrative responsibility. *Prerequisite:* Pol Sc 101, 201.

**POL SC 331   CONSTITUTIONAL DEVELOPMENT OF THE UNITED
STATES   3 cr. (3 and 0)**

The origin and growth of the Constitution of the United States. *Prerequisite:* Pol Sc 101 or 201.

POL SC 341   POLITICAL BEHAVIOR   3 cr. (2 and 3)

An introduction to behavioral methods. Identification of regularities in the type, degree, and direction of political participation. Laboratory training and field work in interviewing. *Prerequisite:* Junior standing and permission of instructor.

POL SC 351   CLASSICAL POLITICAL THOUGHT   3 cr. (3 and 0)

Political philosophy from the pre-Socratic period to Machiavelli. *Prerequisite:* Pol Sc 101, 201.

POL SC 352   MODERN POLITICAL THOUGHT   3 cr. (3 and 0)

The early theories of the nation state in the sixteenth century and the major political thinkers, problems and movements through the twentieth century. *Prerequisite:* Pol Sc 101, 201.

POL SC 361   INTERNATIONAL POLITICS   3 cr. (3 and 0)

An introduction to foreign policy, international law, and international organizations. *Prerequisite:* Pol Sc 101, 201.

**POL SC 371   COMPARATIVE EUROPEAN GOVERNMENTS I;
CONSTITUTIONAL SYSTEMS   3 cr. (3 and 0)**

Major emphasis on the United Kingdom, France, Germany, and the U.S.S.R., with brief attention given to Italy and Switzerland, Current methods of comparison will be studied and applied to the formal and informal functioning of these governments. *Prerequisite:* Pol Sc 101, 201.

**POL SC 372   COMPARATIVE EUROPEAN GOVERNMENT II;
TOTALITARIAN SYSTEM   3 cr. (3 and 0)**

A continuation of Pol Sc 371. This course will deal specifically with the Soviet Union as an example of totalitarian political systems, with references made to Nazi Germany and the present Eastern European political systems. *Prerequisite:* Pol Sc 101, 201.

POL SC 403   LEGISLATIVE PROCESS   3 cr. (3 and 0)

Individual behavior and the decision-making process within legislatures; legislative functions; the relationship of legislatures to the executive and other entities in the political system. *Prerequisite:* Pol Sc 101, 201, or permission of instructor.

POL SC 405   AMERICAN PRESIDENCY   3 cr. (3 and 0)

An examination of the organizational patterns, administrative behavior, and political forces in the Presidency with considerable emphasis on relations between the Presidency and Congress, the courts, and administrative-regulatory agencies. *Prerequisite:* Pol Sc 101, 201, or permission of instructor.

POL SC 409, 609   DIRECTED STUDY IN AMERICAN INSTITUTIONS   3 cr. (3 and 0)

Supervised reading and/or research in selected areas of American government. *Prerequisite:* 18 semester hours in political science and permission of instructor.

POL SC 422, 622   PROBLEMS OF PUBLIC ADMINISTRATION   3 cr. (3 and 0)

Selected views of public administration and the problems involved. *Prerequisite:* Pol Sc 101, or permission of instructor.

POL SC 423, 623   MUNICIPAL ADMINISTRATION   3 cr. (3 and 0)

Interaction of political, technical, and administrative processes in urban America. *Prerequisite:* Pol Sc 101, or permission of instructor.

POL SC 426   GOVERNMENT ORGANIZATION THEORY   3 cr. (3 and 0)

A study of the political-economic approach to the analysis of organization, management, and policy administration. Emphasis will be placed on organizational design, structure, and operation; participation and leadership; and evaluation of organizational effectiveness. *Prerequisite:* Pol Sc 321.

POL SC 428   NATIONAL DEFENSE POLICY ANALYSIS   3 cr. (3 and 0)

A study of the possibilites and problems in formulating policies of national defense. Examination of alternatives, consequences and effectiveness of current techniques in nuclear weaponry, guerilla and conventional warfare. *Prerequisite:* Pol Sc 101, 201, or permission of instructor

POL SC 432, 632   AMERICAN CONSTITUTIONAL LAW I   3 cr. (3 and 0)

A brief introduction to the judicial process followed by a detailed examination of leading cases pertaining to the judiciary, the Congress, the Presidency, and the federal system. *Prerequisite:* Pol Sc 101, 201, and preferably 331.

POL SC 433   AMERICAN CONSTITUTIONAL LAW II   3 cr. (3 and 0)

An examination of the relationship of the individual to his government; focusing on the safeguards of liberty and property including freedoms of speech, press and religion, and criminal procedures. *Prerequisite:* Pol Sc 101, 201, and preferably 331.

POL SC 434   THE JUDICIAL PROCESS AND JURISPRUDENCE   3 cr. (3 and 0)

Courts as political subsystems; judicial decision making; the development of public policy through the judicial process; theories of law and jurisprudence. *Prerequisite:* Pol Sc 101, 201.

POL SC 435　ADMINISTRATION OF JUSTICE　3 cr. (3 and 0)

Examination of selected issues and questions adjudicated in the nation's courts with emphasis upon the manners in which the courts and related law enforcement agencies deal with problems of deviance under the criminal law; an evaluation from a social science perspective of the courts and these related agencies as arbiters in the resolution of conflicts under the law. *Prerequisite:* Pol Sc 101, 201.

POL SC 442　POLITICAL PARTIES AND POLITICS　3 cr. (3 and 0)

A study of the historical development of political parties, and the role they play in the organization and functions of our national government, and the influence of politics in policy making. *Prerequisite:* Pol Sc 101, 201.

POL SC 443　PUBLIC OPINION AND PROPAGANDA　3 cr. (3 and 0)

This course examines the nature of public opinion, its social and political context, the social-psychological processes basic to it, the dynamics of its formation and change and its measurement. *Prerequisite:* Pol Sc 341, IM 410, or permission of instructor.

POL SC 462, 662　INTERNATIONAL ORGANIZATIONS　3 cr. (3 and 0)

Emphasis on international organizations. Analysis of current problems and proposed solutions. *Prerequisite:* Pol Sc 101, 201.

POL SC 463　UNITED STATES FOREIGN POLICY　3 cr. (3 and 0)

Focus on foreign policy in its historical perspective, examining the decision-making process in foreign policy; evaluates contemporary American capabilities, and analyzes specific issues. *Prerequisite:* Pol Sc 101, 201.

POL SC 464　INTERNATIONAL LAW　3 cr. (3 and 0)

An examination of cases and other legal materials on the nature of international law, recognition of states, succession, the territory of states, and nationality. *Prerequisite:* Pol Sc 101, 201.

POL SC 465　FOREIGN POLICIES OF THE MAJOR POWERS　3 cr. (3 and 0)

A study in the foreign policies of the leading world powers with special reference to the geographic, economic, historical and political determinants of each. A general introduction to the field of foreign policy. United States foreign policy is not emphasized. *Prerequisite:* Pol Sc 361.

POL SC 469　PROSEMINAR IN INTERNATIONAL STUDIES　3 cr. (3 and 0)

Assessment of various theories and methods employed in the systematic study of international relations; class discussions, readings, and reports. *Prerequisite:* Pol Sc 101, 201, and permission of instructor.

POL SC 473　POLITICS OF THE DEVELOPING NATIONS　3 cr. (3 and 0)

A comparative analysis of the political and social problems of the developing nations of Africa, the Near East, East Asia, and Latin America. *Prerequisite:* Pol Sc 101, 201, or permission of instructor.

POL SC 479　DIRECTED STUDY IN COMPARATIVE GOVERNMENT　3 cr. (3 and 0)

A study of the several methodological approaches to the analysis of comparative politics, emphasizing individual research and readings. *Prerequisite:* Pol Sc 201, 371, or permission of instructor.

Poultry Science

Professors: B. D. Bennett, *Head;* B. W. Bierer, M. A. Boone,° W. H. Wiley°
Associate Professors: J. B. Cooper, J. E. Jones, D. E. Turk

PS 203   AVIAN SCIENCE   2 cr. (2 and 0)

A study of the digestive, reproductive, respiratory, and excretory systems
and the feather structure and general physical makeup of the avian species.
Aspects of brooding, rearing, feeding, and incubation as applied to poultry,
game birds, and water fowl will be discussed as well as problems of diseases
and parasites.

PS 352, 652   BREEDER FLOCK AND HATCHERY MANAGEMENT
3 cr. (3 and 0) F, '74 and alternate years.

Principles of genetics and physiology applicable to efficient multiplication
of economically important avian species. The principles of embryology, incu-
bation, hatchery organization and operation essential to production of healthy
young birds.

PS 353, 653   BREEDER FLOCK AND HATCHERY MANAGEMENT
LABORATORY   1 cr. (0 and 3) F, '74 and alternate years.

Laboratory demonstrating material covered in PS 352.

PS 355, 655   POULTRY PRODUCTS GRADING AND TECHNOLOGY
3 cr. (2 and 3) F, '73 and alternate years.

Factors important in the quality of poultry products will be considered.
The effects of production, handling, packaging and storage on consumer
acceptability will be discussed. Quality evaluation will be considered from
the standpoint of tenderness, flavor, microbiology, and USDA grades.

PS 359, 659   MANAGEMENT OF EGG, BROILER AND TURKEY
ENTERPRISES   3 cr. (2 and 3) S, '74 and alternate years.

The application of technology to the production of commercial eggs,
broilers and market turkeys. The application of labor and equipment to
animal requirements in such a way as to result in efficient production of
wholesome meat and eggs.

PS 363   PROPAGATION OF GAME AND EXOTIC BIRDS   3 cr. (2 and 3)

Study of the techniques of production in confinement of game and exotic
birds for use in recreation and for ornamental purposes. Discussion of the
use of various avian species for nonfood purposes in the home, parks, zoos,
and in hunting preserves.

PS 401, 601   ANIMAL ENVIRONMENTAL TECHNOLOGY   2 cr.
(2 and 0) F, '74 and alternate years.

A study of the physiological response of all domestic animals to environ-
mental factors of importance in their production. The physical aspects of
light, temperature, humidity, and the gaseous environment and methods of
controlling these factors by such methods as housing systems, ventilation,
artificial light, insulation, and waste disposal will be discussed.

PS 403, 603   ANIMAL ENVIRONMENTAL TECHNOLOGY LABORATORY
1 cr. (0 and 3) F, '74 and alternate years.

Demonstrations of subjects covered in PS 401.

° On leave.

PS 405, 605   TOPICAL PROBLEMS   1-3 cr. (0 and 3-9)

Topics of interest to the student at senior, master, doctor, and professional levels. The course is designed to give experience with avian problems not covered in other courses or on thesis research. Credit varies with the problem selected.

PS 451, 651   POULTRY NUTRITION   2 cr. (2 and 0) S, '74 and alternate years.

Nutrient requirements of the various classes of poultry and the use of feedstuffs in meeting these needs. *Prerequisite:* An Sc 301.

PS 458, 658   AVIAN MICROBIOLOGY AND PARASITOLOGY   4 cr. (3 and 3)

Agents causing poultry diseases; the diagnosis, prevention, and treatment of specific diseases and their economic and public health significance.

PS 460, 660   SEMINAR   2 cr. (2 and 0) S, '75 and alternate years.

Current research reported in journals covering the various areas of avian science. Students will practice scientific writing and interpretation of technical material for lay readers. *Prerequisite:* Permission of instructor.

PS 804   POULTRY PATHOLOGY   3 cr. (1 and 6)

PS 805   SEMINAR   1 cr. (1 and 0)

PS 891   RESEARCH.   Credit to be arranged.

Psychology

Associate Professors: C. B. Caffrey, *Head;* S. N. Cole, J. D. Davenport*

Assistant Professors: L. Berger, W. R. Fowler, Jr., J. D. Marx, Lauretta I. Park, T. G. Titus, J. M. Vacher

Instructors: Barbara S. Poteat, Nancy C. Simmons

Lecturer: D. K. Freeman, Jr.

PSYCH 101   ORIENTATION TO PSYCHOLOGY   1 cr. (1 and 0)

A general orientation to the field of psychology; emphasis on areas treated by the discipline as well as interests which psychologists hold in common. (Not open to students who have taken Psych 201.)

PSYCH 201   GENERAL PSYCHOLOGY   3 cr. (3 and 0)

A survey of the field of psychology: development and adjustment, motivation, emotions, intelligence, personality, the sensory experiences, perception, learning, thinking, imagination, and mental hygiene.

PSYCH 202   INTRODUCTORY EXPERIMENTAL PSYCHOLOGY   3 cr. (3 and 0)

A survey of the major areas of psychological research with emphasis on methods of experimentation and other forms of research. Required of all psychology majors and minors. *Prerequisite:* Psych 201.

PSYCH 211   GROWTH AND DEVELOPMENT   3 cr. (3 and 0)

The course will focus on changes in personal and social behavior throughout the human life span. *Prerequisite:* Psych 201.

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* On leave.

PSYCH 301   INDUSTRIAL PSYCHOLOGY   3 cr. (3 and 0)

Topics in personnel selection, including application forms, testing and interviews, job analysis, performance appraisal, and achievement tests. The applied use of learning principles, supervisory training methods, discovery of training needs, motivation and morale in industry, consumer psychology, financial incentive plans, and organizational theories. *Prerequisite:* Psych 201.

PSYCH 302   SOCIAL PSYCHOLOGY   3 cr. (3 and 0)

The interaction between the individual and the forces of society: the classical theories, the psychobiological bases of human behavior, the sociocultural bases of behavior, types of human behavior, overt and covert experiences, symbolism, personality and social interaction. *Prerequisite:* Psych 201.

PSYCH 303   THE PSYCHOLOGY OF ADJUSTMENT   3 cr. (3 and 0)

A course in personal adjustment dealing with the appropriate and inappropriate reactions to frustration and stress, including ways of handling conflicts, anxiety, fears, and the promotion of personal emotional adjustment. Not open to Psychology majors. *Prerequisite:* Psych 201 or permission of instructor.

PSYCH 321   DEVELOPMENTAL PSYCHOLOGY   3 cr. (3 and 0)

A survey of current theory and research concerned with the psychological aspects of human growth and development. *Prerequisite:* Psych 201, 202.

PSYCH 331   THEORIES OF LEARNING   3 cr. (3 and 0)

A historical approach to the study of the major modern learning theories. *Prerequisite:* Psych 201, 202.

PSYCH 332   BEHAVIOR PRINCIPLES   3 cr. (3 and 0)

A comprehensive study of the principles of operant conditioning, supported by individual work with animals. Instructional methods based on operant principles. *Prerequisite:* Psych 201, 202.

PSYCH 341   PHYSIOLOGICAL PSYCHOLOGY   3 cr. (3 and 0)

The study of human neuroanatomy, with an emphasis on the functions of the nervous system. Treats of the biological bases of behavior in both normal and abnormal dimensions. *Prerequisite:* Psych 201, 202.

PSYCH 343   PERCEPTUAL PROCESSES   3 cr. (3 and 0)

An investigation of the various processes by which we attain a meaningful picture of our immediate physical environment. Subjects dealt with include: attention, perceptual learning, innate aspects of perception, and perception through vision, audition, and other sense modalities. *Prerequisite:* Psych 201, 202.

PSYCH 351   HISTORY AND SYSTEMS OF PSYCHOLOGY   3 cr. (3 and 0)

A treatment of the science of psychology as understood in the light of the ideas of men who have been responsible for its development. *Prerequisite:* Psych 201, 202.

PSYCH 361   MOTIVATION   3 cr. (3 and 0)

The various aspects of motivation are considered through a study of contributions of biologists, sociologists, anthropologists, and psychologists. The orientation is empirical rather than theoretical, with emphasis on pertinent research and research methods, and on the measurement of motives. *Prerequisite:* Psych 201, 202.

PSYCH 363   ADVANCED EXPERIMENTAL PSYCHOLOGY   4 cr.
(3 and 3)

A continuation of Psych 202, with a stress on the carrying out of original research in the scientific study of human and animal behavior. Laboratory periods stress the refinement of techniques and the execution of research in a guided setting. *Prerequisite:* Psych 201, 202.

PSYCH 380   COGNITIVE PROCESS   3 cr. (3 and 0)

The study of higher cognitive functioning which includes such areas as memory, concept acquisition, the acquisition and use of language, speech perception, pattern recognition, and problem solving. *Prerequisite:* Psych 201, 202.

PSYCH 401   APPLIED PSYCHOLOGY   3 cr. (3 and 0)

A study of the concepts of psychology as applied to individual, business, and professional behavior. *Prerequisite:* Psych 201.

PSYCH 402   ABNORMAL PSYCHOLOGY   3 cr. (3 and 0)

Mental and emotional disorders: theories of causation and problems of treatment; special phenomena of consciousness and unconsciousness, *e. g.,* dreams, dissociation, hypnosis; analysis of pathological behavior: alcoholism, drug addiction, suicide, criminality, neurosis, and psychoneurosis. *Prerequisite:* Psych 201.

PSYCH 403   PERSONALITY   3 cr. (3 and 0)

An analysis of the theories of personality: Freud, Adler, Jung, Sullivan, Horney, Allport, *et al. Prerequisite:* Psych 201 or permission of instructor.

PSYCH 411   PERSONALIZED INSTRUCTION METHODS   3 cr. (3 and 0)

A consideration of the behavioral principles underlying the Personalized System of Instruction approach. Students will utilize these principles while serving as proctors for the introductory psychology course. *Prerequisite:* Psych 201 and permission of instructor.

PSYCH 422, 622   CROSS-CULTURAL STUDIES IN DEVELOPMENTAL PSYCHOLOGY   3 cr. (3 and 0)

A comparative study of the development of human behavior and personality emphasizing the contributions of learning theory, psychoanalysis, role theory, and cultural anthropology. *Prerequisite:* Psych 201, 202, 321, 402 or 403, or permission of instructor.

PSYCH 425   THE PSYCHOLOGY OF AGING   3 cr. (3 and 0)

A special consideration of the social, biological, and cultural aspects of aging. Included is the influence of aging on the senses and perception, psychomotor skills, learning, thinking and intelligence, employment and productivity, personality changes, and psychopathology. *Prerequisite:* Psych 201.

PSYCH 442   SENSORY PROCESSES   3 cr. (3 and 0)

A continuation of Psych 341. The psychophysics, sensory psychology, and sensory neurophysiology of vision, audition, the chemical senses, and the skin senses. *Prerequisite:* Psych 201, 202, 341, or permission of instructor.

PSYCH 471   PSYCHOMETRICS   3 cr. (3 and 0)

An introduction to the theory of psychological testing. Emphasis is on essentials of testing with experience in administering, scoring, and interpreting test, including those of scholastic achievement, mental ability, scholastic apti-

tude, interests and personality. *Prerequisite:* Nine hours of psychology including 201, 202.

PSYCH 475   GROUP DYNAMICS   3 cr. (3 and 0)

A review of current research and theory on small-group processes with special emphasis on group structure, the dynamic forces within a group, social power, group problem solving, and leadership. *Prerequisite:* Psych 201, 302, or permission of instructor.

PSYCH 482   ATTITUDE ORGANIZATION AND CHANGE   3 cr. (3 and 0)

A review of current research and major theoretical positions which attempt to explain the various processes involved in attitude formation, attitude, structures, and attitude change. The primary emphasis in the course will be placed on the role of cognition in these various attitudinal processes with considerable attention being devoted to the information theory and learning theory approaches to the explanation of attitudes. *Prerequisite:* Psych 201, 302, or permission of instructor.

PSYCH 490, 690   SPECIAL TOPICS IN PSYCHIATRY AND NEUROLOGY   3 cr. (3 and 0)

Selected aspects of medical sciences related to clinical psychology—psychiatric examination and nosology, central nervous system pathology, psychopharmacology, child psychiatry, etc.—designed to assist the psychologist in working effectively with representatives of these disciplines. *Prerequisite:* Psych 201, 202, 402, 403, and/or permission of instructor.

PSYCH 493   PRACTICUM IN PSYCHOLOGY   3 cr. (3 and 0)

The intent of this practicum is to afford the student an opportunity to apply classroom theory in solving individual and community problems through interaction with community agencies and other professional groups in the mental health area. In addition, the student will be allowed to have limited but well-controlled contact with patients on both an individual and group basis. *Prerequisite:* Psych 201, 202, 402, or permission of instructor.

PSYCH 495   DIRECTED RESEARCH IN BEHAVIOR   2 cr. (2 and 0)

Consists of individual research projects carried out by students under the direct guidance of a particular faculty member. The research will be conducted in psychology or in a related field, provided that key variables are related to human or animal behavior. *Prerequisite:* Psych 363 completed; status as a senior.

PSYCH 498   SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY I   2 cr. (2 and 0)

Reading and discussion of research being published in current psychological and related journals. For advanced psychology students. *Prerequisite:* Psych 201, 202, 363, or permission of instructor.

PSYCH 499, 699   SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY II   3 cr. (3 and 0)

Reading and discussion of research being published in current psychological and related journals. For advanced psychology students. *Prerequisite:* Psych 201, 202, 363, or permission of instructor.

Recreation and Park Administration

Professor: H. Brantley, *Head*

Associate Professors: R. M. Frye, L. W. Gahan, G. E. Howard, R. W. Mc-Lellan, J. L. Stevenson

Assistant Professors: H. J. Grove, B. E. Trent, C. R. White

Instructor: P. B. Hamel

Lecturer: J. R. Vaughn, Jr.

RPA 101   INTRODUCTION TO COMMUNITY RECREATION   3 cr. (3 and 0)
History and foundations of community recreation in public, private and commercial settings; job opportunities, specifications, and demands.

RPA 102   HISTORY AND PRINCIPLES OF OUTDOOR RECREATION 3 cr. (3 and 0)
Includes the study of the history, present status and the principles of operation of parks and park systems in America; outdoor education programs; implications for continued growth of this leisure phenomenon.

RPA 150   BEGINNING SWIMMING   1 cr. (0 and 3)
Fundamentals of swimming and water safety.

RPA 151   DIVING   1 cr. (0 and 3)
An introduction to basic springboard diving.

RPA 152   SAILING   1 cr. (0 and 3)
Basic instruction in the nomenclature, safety and rescue techniques, and skills required to skipper sailing craft. *Prerequisite:* Basic swimming skills.

RPA 153   CANOEING   1 cr. (0 and 3)
Basic instruction in the nomenclature, strokes, and safety techniques in canoeing. *Prerequisite:* Basic swimming skills.

RPA 160   BEGINNING TENNIS   1 cr. (0 and 3)
A fundamentals course stressing rules, basic strokes and strategy, with ample opportunity for practice.

RPA 161   BEGINNING BADMINTON   1 cr. (0 and 3)
Individual and group instruction for beginners in the history, rules, strategy, and skills of this individual and family sport.

RPA 162   HANDBALL   1 cr. (0 and 3)
A thorough knowledge and understanding of the rules, strategy, fundamental skills, and techniques of handball for the beginning player.

RPA 163   RACQUETBALL   1 cr. (0 and 3)
The basic skills, knowledge of rules, and strategy of racquetball.

RPA 170   BEGINNING GOLF   1 cr. (0 and 3)
A fundamentals course stressing rules, strategy, and basic strokes.

RPA 180   ADAPTIVE EXERCISE   1 cr. (0 and 3)
Instruction in sports skills and knowledge for students who, due to physical limitations, cannot participate to their full advantage in other activity courses.

RPA 203   PERSONAL AND COMMUNITY HEALTH   3 cr. (3 and 0)

The course deals with health problems, disease prevention and control, school health practices, public health administration, and other health information which may enable one to live intelligently in today's complex society.

RPA 204   SPORTS IN RECREATION   3 cr. (2 and 3)

Administrative and supervisory skills indigenous to public and/or private agency athletic programs are considered. Group instruction is given in individual and team sports and officiating techniques applicable to these sports are taught.

RPA 205   PROGRAM PLANNING FOR RECREATION   3 cr. (2 and 3)

Course includes fields of activity available to participants; principles and methods of program development; utilization of time-blocks and facilities. (Formerly RPA 303.) *Prerequisite:* Junior standing.

RPA 260   INTERMEDIATE-ADVANCED TENNIS   1 cr. (0 and 3)

The opportunity to advance and correct mistakes in basic tennis skills. *Prerequisite:* Basic tennis skills.

RPA 300   HISTORY AND PHILOSOPHY OF RECREATION SERVICE AGENCIES   3 cr. (3 and 0)

A comprehensive study of the history and philosophy of recreation service agencies that include recreation programs as an integral part of their purposes and objectives. Course includes such agencies as the Boy Scouts, Girl Scouts, YMCA, YWCA, Red Cross, boys' clubs, girls' clubs, college unions, and others.

RPA 302   CAMP ORGANIZATION AND ADMINISTRATION   3 cr. (2 and 3)

Surveys the development and trends of camping in America. Considers programming for the operations of agency and private camps. Enables student to master the techniques of group living. Laboratory offers practical experience in camp craft including trips and outdoor cooking.

RPA 304   RECREATION IN MODERN SOCIETY   3 cr. (3 and 0)

A historical study of the growth of leisure with special attention given to the utilization of community resources for recreation.

RPA 305   PHYSICAL ASPECTS OF SPORTS IN RECREATION   3 cr. (2 and 3)

The course considers the physiology of exercise as it relates to safety in recreational sports programs, the practice of first aid, and the treatment of athletic injuries.

RPA 306   PRINCIPLES OF OUTDOOR EDUCATION   3 cr. (3 and 0)

A study of the development of outdoor education in public, private and professional agencies with special emphasis on schools and park and recreation departments. Attention will be focused on our national land problems and on land needs for tomorrow.

RPA 307   PARK MAINTENANCE AND OPERATION   4 cr. (3 and 3)

Maintenance techniques and materials, interpretive programs, job planning and scheduling, problems of overuse and preventive maintenance are included. (Formerly RPA 401.)

RPA 308   METHODS AND TECHNIQUES OF RECREATION LEADERSHIP   3 cr. (3 and 0)

Considers characteristics of the several levels of recreation leadership with special emphasis on supervision. Examination is made of the Group Processes. Also includes a study of community resources for leadership in specialized program areas.

RPA 400, 600   SUPERVISION OF RECREATION PERSONNEL PATTERNS AND PROCESSES   3 cr. (3 and 0)

A comprehensive study of the supervisory process in relation to individuals, programs, and groups in recreation agencies. *Prerequisite:* RPA 308, IM 307, or permission of instructor.

RPA 402, 602   RECREATION ADMINISTRATION   3 cr. (3 and 0)

An analysis of the internal organization of a recreation department dealing with finances and accounting; records and reports; publicity and public relations; state and federal legislation; staff organization; coordination of community resources. *Prerequisite:* Senior standing.

RPA 403   FACILITY AND SITE PLANNING   3 cr. (2 and 3)

Trends in recreation facility development, planning principles involved in design of recreation buildings, and orientation of facilities to a given area are integrated into sound planning programs. *Prerequisite:* RPA 307 or permission of instructor.

RPA 405   FIELD TRAINING IN RECREATION   8 cr.

The student, in a ten-week program, has the opportunity to observe recreation programs in operation. He will also have responsibilities of organizing and conducting activities under supervision. Maintenance and operation of facilities will be observed and practiced. Total of 360 hours required. *Prerequisite:* Senior standing.

RPA 406, 606   RECREATION FOR THE ILL AND HANDICAPPED   3 cr. (3 and 0)

Surveys the recreational opportunities and benefits available to the ill and handicapped citizens. Designed to provide the student with an awareness of the role of the professional recreator in serving the needs of such special groups as the mentally retarded, cerebral palsied, emotionally disturbed— institutionalized, hospitalized, etc. Particular emphasis will be given to program development applicable to each specific situation.

RPA 407, 607   METHODS OF ENVIRONMENTAL INTERPRETATION   3 cr. (2 and 3)

Practice and instruction in the use of equipment and methods available to the interpreter in public contact work. Coaching in presentation and evaluation of live programs and in design, execution, and evaluation of mediated programs will be the major emphasis. Programs will be delivered to public audiences in the Clemson area. Limited to fifteen students per semester. *Prerequisite:* RPA 306, or permission of instructor.

RPA 408   THE APPLICATION OF RECREATION THERAPY   3 cr. (3 and 0)

The study of the responsibility and role of the recreator as a member of the therapeutic team.

RPA 409   METHODS OF RECREATION RESEARCH I   3 cr. (3 and 0)

An analysis of the principle methods of recreation research, the application of descriptive statistics to recreation research, and the development of a research proposal. *Prerequisite:* Senior standing and permission of instructor.

RPA 410   METHODS OF RECREATION RESEARCH II   3 cr. (3 and 0)

A continuation of RPA 409 to include the supervised execution and reporting of the results of the research proposal developed in RPA 409 and the application of inferential statistics to recreation research. *Prerequisite:* RPA 409, or permission of instructor.

RPA 701   PHILOSOPHICAL FOUNDATIONS OF RECREATION AND PARK ADMINISTRATION   3 cr. (3 and 0)

RPA 702   GROUP PROCESSES IN LEISURE SERVICES   3 cr. (3 and 0)

RPA 703   SEMINAR IN RECREATION AND PARK ADMINISTRATION   3 cr. (3 and 0)

RPA 704   COMPREHENSIVE RECREATION PLANNING   3 cr. (3 and 0)

RPA 705   RECREATIONAL ASPECTS OF WATER RESOURCES   3 cr. (3 and 0)

RPA 706   URBAN RECREATION ANALYSIS   3 cr. (3 and 0)

RPA 707   PRINCIPLES OF ENVIRONMENTAL INTERPRETATION   3 cr. (3 and 0)

RPA 708   SELECTED TOPICS   3 cr. (3 and 0)

RPA 709   SPECIAL PROBLEMS   1-3 cr. (1-3 and 0)

RPA 710   CURRENT ISSUES IN RECREATION   1 cr. (1 and 0)

Religion

Assistant Professor: D. F. White, Jr.

REL 301   THE OLD TESTAMENT   3 cr. (3 and 0)

A survey of books of the Old Testament with special consideration given to the development of the concepts, institutions, and theology of the ancient Hebrews.

REL 302   A SURVEY OF NEW TESTAMENT LITERATURE   3 cr. (3 and 0)

A study of the books of the New Testament from the standpoint of their occasion, content, literary form, and basic theology.

REL 306   RELIGION OF THE WEST   3 cr. (3 and 0)

A study of the origin, evolution, and contemporary status of Judaism, Christianity, and Islam. *Prerequisite:* Junior standing.

REL 309   ORIENTAL PHILOSOPHIES AND RELIGIONS   3 cr. (3 and 0)

A study of the philosophical and religious teachings of Hinduism, Buddhism, Confucianism, and Taoism.

Rural Sociology

Professor: W. J. Lanham, *Head*

Associate Professors: V. A. Boyd, E. L. McLean

RS 301   RURAL SOCIOLOGY   3 cr. (3 and 0) F, S

A study of human social relationships as influenced by life in the open country and in small towns and villages including considerations of the rural population, rural social institutions, processes of change in agricultural technology, and community area planning and development.

RS 359, 659   THE COMMUNITY   3 cr. (3 and 0) F

An examination of the sociological aspects of contemporary communities and of their growth and development. The structural relations of social class, status and power and the relationships among social institutions within the community are examined. Emphasis is placed on the organization and development of communities in a constantly changing environment.

RS 401, 601   HUMAN ECOLOGY   3 cr. (3 and 0)

Analysis of the interrelationships between man and his natural and man-made environments; study of settlement patterns, social organization, and institutions of human populations. Special emphasis will be given to interdependence of natural resources, human resources, and man-land relationships.

RS 461, 661   RURAL LEADERSHIP   3 cr. (3 and 0) S

A consideration of the social and psychological factors involved in leadership including an examination and analysis of characteristics of the successful leader. Particular attention is paid to the role of the leader in the process of economic and social development of rural communities and small towns.

RS 801   RURAL SOCIAL SYSTEMS   3 cr. (3 and 0)

RS 881   SPECIAL PROBLEMS IN RURAL SOCIAL RESEARCH   3 cr. (3 and 0)

Russian

Lecturer: Ludmila A. Savitsky

RUSS 101   ELEMENTARY RUSSIAN   4 cr. (3 and 1)

Training in pronunciation, grammatical forms, and syntax with a view of giving the student the fundamentals necessary to read simple Russian texts. Three hours a week classroom instruction and one hour a week in the language laboratory.

RUSS 102   ELEMENTARY RUSSIAN   4 cr. (3 and 1)

A continuation of Russ 101; three hours a week classroom instruction and one hour a week in the language laboratory.

RUSS 201   INTERMEDIATE RUSSIAN   3 cr. (3 and 0)

The reading of simple Russian prose; a review of grammar and syntax. Drill on vocabulary and idiom. *Prerequisite:* Russ 101, 102.

RUSS 202   INTERMEDIATE RUSSIAN   3 cr. (3 and 0)

A continuation of Russ 201.

RUSS 303   SURVEY OF RUSSIAN LITERATURE I   3 cr. (3 and 0)

Literary movements and authors from the beginning to 1850. *Prerequisite:* Russ 201, 202.

RUSS 304   SURVEY OF RUSSIAN LITERATURE II   3 cr. (3 and 0)

Literary movements and authors from 1850 to the present. *Prerequisite:* Russ 201, 202.

Safety and Health

SH 410   PUBLIC SAFETY   3 cr. (3 and 0)

Analysis of the fundamentals of accident prevention as it applies to the planning, design, and construction of places designed for public occupancy and use. Consideration will be given to places of assembly and recreation, transportation systems, stores, and office buildings. Emergency planning and disaster control consideration will also be discussed.

Sociology

Professors: F. A. Burtner, L. F. Fannin

Associate Professor: W. C. Capel, Jr.

Assistant Professor: R. J. Knapp

Instructors: G. W. Arling, Sue G. Ficker, Helen M. Fleishman, Allie F. Jones, S. K. Shernock, P. J. Wadsworth

SOC 201   INTRODUCTORY SOCIOLOGY   3 cr. (3 and 0)

The basic principles of sociology: culture, biological factors, the influence of geographical environment, human nature, group life, social stratification, communities, social institutions, and social change. *Prerequisite:* Sophomore standing.

SOC 202   SOCIAL PROBLEMS   3 cr. (3 and 0)

A survey of the major social problems, including problems of industry, education, religion, disease and public health, poverty, dependency and factors affecting social adjustment. *Prerequisite:* Soc 201.

SOC 206   INTRODUCTION TO METHODS OF SOCIOLOGICAL
RESEARCH   3 cr. (3 and 0)

An introduction to the use of scientific methods in sociology, their purpose, and limitations; the relationship between theory and research; research design, sampling, measurement and the social science techniques of reliability and validity. Required of all Sociology majors and minors. *Prerequisite:* Soc 201.

SOC 306   CONTEMPORARY SOCIO-ENVIRONMENTAL PROBLEMS
3 cr. (2 and 2)

A multidisciplinary study of national, social and environmental issues. Topics will include: regional population concerns, housing needs, regional health problems, the environment—air, water, land—delivery of justice, automation and technological change. *Prerequisite:* Junior standing or consent of instructor.

SOC 311   THE FAMILY   3 cr. (3 and 0)

The family as one of the basic institutions of society. The history of the family, and a study of its functions in early and modern social structures. A

comparative study of family life in other cultures is made. *Prerequisite:* Soc 201, 206.

SOC 321   INTRODUCTORY ANTHROPOLOGY   3 cr. (3 and 0)

Man as a biosocial animal, including theory of evolution and archaeological evidence of physical and cultural development, with emphasis on the relation of man to the environment. *Prerequisite:* Soc 201, 206.

SOC 322   CULTURAL ANTHROPOLOGY   3 cr. (3 and 0)

The general nature of human culture; emphasis on the constants and variants in human behavior affecting technology, social relations, social control, family systems, language, religion, and art. *Prerequisite:* Soc 321.

SOC 324   SOCIAL AND CULTURAL CHANGE   3 cr. (3 and 0)

An examination of theory and research on the processes of change; factors inducing or inhibiting change; the character, mechanisms, rate, extent, direction, and relative stabilization of change at different levels of social phenomena. *Prerequisite:* Soc 201, 206.

SOC 331   URBAN SOCIOLOGY   3 cr. (3 and 0)

A survey of the history and development of modern urban organization; rise of the city problems of modern urban life. *Prerequisite:* Soc 201, 206. (For Sociology majors and minors.)

SOC 341   POPULATION ANALYSIS   3 cr. (3 and 0)

An analysis of population growth and distribution and their bearing on current economic, political, and social problems. *Prerequisite:* Soc 201, 206.

SOC 351   INDUSTRIAL SOCIOLOGY   3 cr. (3 and 0)

Industry as a social organization; the factory as a social system; personality in industrial relations; power groupings within industry; industry and the community. *Prerequisite:* Soc 201 and permission of instructor.

SOC 361   COLLECTIVE BEHAVIOR   3 cr. (3 and 0)

Examination of the nature, development and consequences of human behavior in situations where usual social norms and behavior do not apply. Particular attention to such collective behavior phenomena as crowds, mobs, mass, cults, publics, and the initial states of social movements. *Prerequisite:* Soc 201, 206.

SOC 371   RESEARCH METHODS   3 cr. (3 and 0)

Analysis of scientific methods in social research and consideration of various techniques, methodological approaches and research designs. Required of all Sociology majors. *Prerequisite:* Ex St 301, Soc 201, 206.

SOC 381   SOCIETY AND SOCIALIZATION   3 cr. (3 and 0)

The relationship between social structure and personality. *Prerequisite:* Soc 201, 206.

SOC 391   SOCIOLOGY OF DEVIANT BEHAVIOR   3 cr. (3 and 0)

Analysis of advanced theory and research on the social processes by which behavior becomes defined as deviant, the conditions promoting such behavior, and the career patterns of deviant persons. *Prerequisite:* Soc 201, 206.

SOC 393   CRIME AND DELINQUENCY   3 cr. (3 and 0)

An overview of the area of crime and delinquency. The course will focus upon theories of criminology, the etiology of crime and delinquency, and the administration of criminal justice. *Prerequisite:* Soc 201, 206.

SOC 411, 611   CLASSICAL SOCIOLOGICAL THEORY   3 cr. (3 and 0)

A survey of sociological theory from Comte to Durkheim. Required of all Sociology majors. *Prerequisite:* 9 semester hours in sociology.

SOC 421, 621   CONTEMPORARY SOCIOLOGICAL THEORY   3 cr. (3 and 0)

A survey of sociological theory from Durkheim to the present. Required of all Sociology majors. *Prerequisite:* Soc 201, 206, 411.

SOC 431, 631   COMPLEX ORGANIZATIONS   3 cr. (3 and 0)

An examination and comparison of theories of formal organization; and analysis of the structure and function of specific organizations illustrating various theoretical approaches. *Prerequisite:* Soc 201, 206.

SOC 441, 641   SOCIAL STRATIFICATION   3 cr. (3 and 0)

Analysis of social structure in terms of class, status, prestige, rank and function. Attention is given to the social role of the elite, bureaucracies, the professional, and middle classes. *Prerequisite:* Soc 201, 206.

SOC 451, 651   SOCIOLOGY OF MEDICINE   3 cr. (3 and 0)

Consideration of the major contributions of sociology to medicine; an exploration of patterned social relationships in the field of health and medicine. *Prerequisite:* Soc 201, 206.

SOC 481   RACE RELATIONS   3 cr. (3 and 0)

The study of the problem of racial and ethnic groups in adjusting to American society. The nature and causes of prejudice and discrimination. Programs for the reduction of intergroup tensions and conflicts are evaluated in the light of observed facts and sociological principles. *Prerequisite:* Soc 201, 206, or permission of instructor.

SOC 499   SEMINAR IN SELECTED TOPICS IN CONTEMPORARY SOCIOLOGY   3 cr. (3 and 0)

Required of all sociology majors. *Prerequisite:* Soc 201, 206, 411, 421, or permission of senior adviser.

SOC 781   RACE RELATIONS   3 cr. (3 and 0)

Spanish

Associate Professor: G. J. Fernandez

Assistant Professors: B. G. Durham, S. C. King, R. F. Mixon, P. F. Parrado, L. E. Seamon, J. M. Whitmire

Instructor: L. T. Perry

Lecturer: Elena G. Fernandez

SPAN 101, H101   ELEMENTARY SPANISH   4 cr. (3 and 1)

A course for beginners in which the essentials of grammar are taught and a foundation is provided for a conversational and reading knowledge of the language. Three hours a week of classroom instruction and one hour a week in the language laboratory. Admission to HONORS section by invitation.

SPAN 102, H102   ELEMENTARY SPANISH   4 cr. (3 and 1)

A continuation of Span 101; three hours a week of classroom instruction and one hour a week in the language laboratory. Admission to HONORS section by invitation.

SPAN 201, H201   INTERMEDIATE SPANISH   3 cr. (3 and 0)

Grammar, vocabulary, and idioms; conversation, composition, and translation. Admission to HONORS section by invitation. *Prerequisite:* Span 102.

SPAN 202, H202   INTERMEDIATE SPANISH   3 cr. (3 and 0)

Introduction to Spanish literature: representative short stories, essays, novels, poetry, and plays. Admission to HONORS section by invitation. *Prererequisite:* Span 201.

SPAN 303   SURVEY OF SPANISH LITERATURE I   3 cr. (3 and 0)

Literary movements, influences, and authors from the beginnings to the end of the seventeenth century. Representative works, discussions. Required of Spanish majors. *Prerequisite:* Span 201, 202.

SPAN 304   SURVEY OF SPANISH LITERATURE II   3 cr. (3 and 0)

Literary movements, influences, and authors from the eighteenth century to the present. Required of Spanish majors. *Prerequisite:* Span 201, 202.

SPAN 305   CONVERSATIONAL SPANISH   3 cr. (3 and 0)

Practice in spoken Spanish with emphasis on vocabulary, pronunciation, intonation, and comprehension. Some written work to increase accuracy. Required of Spanish majors. Assignments in the language laboratory. *Prerequisite:* Span 201.

SPAN 306   ADVANCED CONVERSATION WITH COMPOSITION   3 cr. (3 and 0)

A continuation of Span 305 with more emphasis on written Spanish. *Prerequisite:* Span 305 or permission of the Head of the Department.

SPAN 307   SPANISH CIVILIZATION   3 cr. (3 and 0)

A study of the significant aspects of the culture of Spain from its origins to the present. *Prerequisite:* Span 202 or permission of the Head of the Department.

SPAN 308   SPANISH-AMERICAN CIVILIZATION   3 cr. (3 and 0)

A study of the significant aspects of the culture of Spanish-American countries from the Colonial period to the present. *Prerequisite:* Span 202 or permission of the Head of the Department.

SPAN 309   INTRODUCTION TO SPANISH PHONETICS   3 cr. (3 and 0)

A study of the fundamental principles of the pronunciation of Spanish. *Prerequisite:* Span 201 or equivalent.

SPAN 310   SURVEY OF SPANISH-AMERICAN LITERATURE I   3 cr. (3 and 0)

A study of Spanish-American literature from the Colonial period to Modernism. *Prerequisite:* Span 202 or permission of the Head of the Department of Languages.

SPAN 311   SURVEY OF SPANISH-AMERICAN LITERATURE II   3 cr. (3 and 0)

Literary movements, influences, authors, and works from Modernism to the present. *Prerequisite:* Span 202 or permission of the Head of the Department of Languages.

SPAN 401   CONTEMPORARY SPANISH LITERATURE   3 cr. (3 and 0)

Literary trends and representative authors since 1898. *Prerequisite:* Span 303 or 304.

SPAN 402   CONTEMPORARY SPANISH DRAMA   3 cr. (3 and 0)

The Spanish theater from Benavente to the present. *Prerequisite:* Span 303 or 304.

SPAN 405   NINETEENTH CENTURY SPANISH LITERATURE   3 cr.
(3 and 0)

Representative authors and movements of the nineteenth century; Romanticism, *costumbrismo,* and the regional novel. *Prerequisite:* Span 303 or 304.

SPAN 406   CERVANTES AND THE GOLDEN AGE   3 cr. (3 and 0)

A study of Cervantes and the theater of the Golden Age of Spanish literature. *Prerequisite:* Span 303 or 304.

SPAN 409   ADVANCED GRAMMAR AND COMPOSITION   3 cr.
(3 and 0)

An intensive study of syntax and stylistics through composition and translations. *Prerequisite:* Senior standing or permission of the Head of the Department of Languages.

SPAN 421   THE SPANISH-AMERICAN NOVEL   3 cr. (3 and 0)

A study of the Spanish-American novel from its beginning to the 1940's. *Prerequisite:* Span 310 or 311, or permission of the Head of the Department of Languages.

SPAN 422   THE CONTEMPORARY SPANISH-AMERICAN NOVEL   3 cr.
(3 and 0)

New trends in the development of the Spanish-American novel from the 1940's to the present. *Prerequisite:* Span 311 or permission of the Head of the Department of Languages.

SPAN 498   INDEPENDENT STUDY   1-3 cr. (1-3 and 0)

Independent in-depth study of selected topics in Spanish literature. May be repeated for a maximum of six credits. *Prerequisite:* Permission of the Head of the Department of Languages.

Systems Engineering

SE 480, 680   METHODS OF OPERATIONS RESEARCH I   3 cr.
(3 and 0)

Applications and elementary theory of selected topics from Operations Research. Topics included are linear algebra, linear programming, transportation and assignment problems, network analysis, and game theory.

SE 481, 681   METHODS OF OPERATIONS RESEARCH II   3 cr.
(3 and 0)

A continuation of SE 480. Topics include nonlinear programming, dynamic programming queuing theory, and markov processes. *Prerequisite:* Math 301 or equivalent.

SE 484, 684   ENGINEERING ECONOMIC ANALYSIS   3 cr. (3 and 0)

Basic principles and techniques of economic analysis of engineering projects. Consideration of time value of money, short- and long-term investments, replacement analysis, depreciation methods, cost allocation and measures of cost effectiveness. *Prerequisite:* Senior standing in Engineering or consent of instructor.

SE 486, 686   WORK-FLOW SYSTEMS AND CONTROL   3 cr. (3 and 0)
Fundamentals underlying the determination of production capacity requirements, economic lot sizes, and the regulation of flow and storage of materials to, within, and from the production system. Elements of forecasting, determination of materials requirements, scheduling, inventory control, etc. Consideration of data processing methods. *Prerequisite:* Math 301, consent of instructor.

SE 801   ANALYSIS OF LINEAR SYSTEMS   3 cr. (3 and 0)

SE 802   FOUNDATION AND METHODOLOGY OF SYSTEMS ENGINEERING   3 cr. (3 and 0)

SE 803   ENGINEERING APPLICATIONS OF OPTIMIZATION   3 cr. (3 and 0)

SE 804   ADVANCED PHYSICAL SYSTEMS ANALYSIS   3 cr. (3 and 0)

SE 805   ANALYTICAL METHODS OF SYSTEMS ANALYSIS I   3 cr. (3 and 0)

SE 808   OPERATIONS SYSTEM SIMULATION I   3 cr. (3 and 0)

SE 809   OPERATIONS SYSTEM SIMULATIONS II   3 cr. (3 and 0)

SE 860   DYNAMIC PROGRAMMING   3 cr. (3 and 0)

SE 861   NONLINEAR PROGRAMMING   3 cr. (3 and 0)

SE 880   ADVANCED METHODS OF OPERATIONS RESEARCH I   3 cr. (3 and 0)

SE 881   ADVANCED METHODS OF OPERATIONS RESEARCH II   3 cr. (3 and 0)

SE 882   RELIABILITY ENGINEERING   3 cr. (3 and 0)

SE 885   DESIGN AND ANALYSIS OF SIMULATION MODELS   3 cr. (3 and 0)

SE 886   OPERATIONS RESEARCH IN PRODUCTION CONTROL I   3 cr. (3 and 0)

SE 887   OPERATIONS RESEARCH IN PRODUCTION CONTROL II   3 cr. (3 and 0)

SE 888   APPLIED QUEUING THEORY AND MARKOV PROCESSES   3 cr. (3 and 0)

SE 890   SPECIAL TOPICS IN SYSTEMS ENGINEERING   1-3 cr. (3 and 0)

SE 891   RESEARCH.   Credit to be arranged.

SE 991   DOCTORAL RESEARCH.   Credit to be arranged.

Textile Chemistry

Professors: T. D. Efland, J. C. Hubbard, Jr., F. T. Simon, E. I. Stearns, *Head*
Associate Professors: R. H. Barker, D. W. Lyons, E. S. Olson, J. J. Porter,
   C. W. Roberts
Assistant Professor: E. A. Vaughn
Visiting Assistant Professor: J. D. Hatcher

TC 303   TEXTILE CHEMISTRY   3 cr. (3 and 0)

A study of the properties and reactions of aliphatic and aromatic organic compounds. Emphasis will be placed on mechanistic interpretations and the development of synthetic schemes leading to polyfunctional compounds of the types encountered in the textile industry. *Prerequisite:* Ch 102, Math 206.

TC 304   TEXTILE CHEMISTRY   3 cr. (3 and 0)

Fundamental principles of physical and organic chemistry with emphasis on those areas most frequently encountered in the textile industry including thermodynamics, kinetics, and solution properties. These concepts will be applied to the study of aliphatic organic compounds and organic reaction mechanisms. The basic principles of stereochemistry and conformational analysis will be developed. *Prerequisite:* TC 303.

TC 305   TEXTILE CHEMISTRY LABORATORY   1 cr. (0 and 3)

An introduction to the techniques used in the synthesis and characterization of organic compounds. To be taken concurrently with TC 303.

TC 306   TEXTILE CHEMISTRY LABORATORY   1 cr. (0 and 3)

The techniques used in the synthesis of organic compounds and the measurement of their physio-chemical properties. To be taken concurrently with TC 304.

TC 315, 615   INTRODUCTION TO POLYMER SCIENCE AND ENGINEERING   3 cr. (3 and 0)

The chemistry of monomers and polymers and the chemical and physical properties of polymers are discussed emphasizing fiber forming, synthetic polymers. Kinetics of polymerization, molecular characterization, structure, morphology, and mechanical properties of polymers are studied demonstrating design of polymer systems for end use in textiles.

TC 316, 616   CHEMICAL PREPARATION OF TEXTILES   3 cr. (2 and 3)

The chemicals used in the preparation of fabric for dyeing and finishing. Oxidizing and reducing agents and their control and effect on various fibers. Colloidal and surface active properties of various compounds and the fundamental factors influencing these properties.

TC 317   POLYMER AND FIBER LABORATORY   1 cr. (0 and 3)

High polymers, prepared from monomers, are characterized and spun to make fibers. Chemical and physical properties of fiber forming polymers are measured as functions of parameters critical to properties of textiles. To be taken concurrently with TC 315.

TC 457, 657   DYEING AND FINISHING I   3 cr. (3 and 0)

A study of the different classes of dyestuffs and the chemistry of their applications to different fibers. The theories, principles and mechanisms for the dyeing of textile fibers and fabrics will be presented as well as the reac-

tion mechanisms of various finishing agents applied to different substrates. *Prerequisite:* TC 315.

TC 458, 658   DYEING AND FINISHING II   3 cr. (3 and 0)
The kinetics and equilibria of dyeing processes. The use of conductivity, diffusion and other methods useful for measuring absorption isotherms and dyeing rates and the general thermodynamic relationships applicable to dyeing operations. Fiber properties such as zeta potential dye sites, relative amorphous area available will be included.

TC 459, 659   DYEING AND FINISHING LABORATORY I   1 cr.
(0 and 3)
To be scheduled concurrently wth TC 457. The course will introduce the student to common dyeing and printing methods and to some of the machinery necessary to carry out dyeing operations.

TC 460   DYEING AND FINISHING LABORATORY II   1 cr. (0 and 3)
To be scheduled concurrently with TC 458. The course will cover finishing in addition to dyeing operations and their instrumental control.

TC 461   SEMINAR AND RESEARCH   3 cr. (1 and 6)
An original investigation of a problem in textile or polymer chemistry under the direct supervision of a faculty member. After completing his experimental work, the student prepares a formal, written report which he defends before the textile faculty. *Prerequisite:* Senior standing or permission of instructor.

TC 466, 666   TEXTILE UNIT OPERATIONS   3 cr. (3 and 0)
Designed to cover some of the principles behind textile equipment operation such as heat transfer in drying and dyeing processes and fluid flow in pressure and open dye operations and polymer production.

TC 475, 675   CELLULOSE CHEMISTRY   2 cr. (2 and 0)
The organic chemistry of cellulose and its derivatives is developed from the basic principles of carbohydrate chemistry. Emphasis is placed in the substitution and degradation reactions which are of particular importance in textile applications. Fiber morphology is treated in relation to its effect on textile chemical processing. *Prerequisite:* TC 315 or permission of instructor.

TC 811   POLYMER SCIENCE I   3 cr. (3 and 0)

TC 812   POLYMER SCIENCE II   3 cr. (3 and 0)

TC 821   CHEMISTRY OF NATURAL POLYMERS I   3 cr. (3 and 0)

TC 822   CHEMISTRY OF NATURAL POLYMERS II   3 cr. (3 and 0)

TC 831   THE PHYSICAL CHEMISTRY OF DYEING   3 cr. (3 and 0)

TC 891   RESEARCH.   Credit to be arranged.

Textile Science and Textile Technology

Professors: T. D. Efland, J. C. Hubbard, Jr., F. T. Simon, E. I. Stearns, *Head;* J. V. Walters

Associate Professors: R. H. Barker, D. W. Lyons, J. H. Marvin, Jr., E. S. Olson, J. J. Porter, C. W. Roberts

Assistant Professor: E. A. Vaughn

Visiting Assistant Professor: J. D. Hatcher

TEXT 122   INTRODUCTION TO TEXTILES   2 cr. (1 and 3)

An introduction to the broad fields of textile, fiber and polymer science and engineering with emphasis on the description and formation of polymers, fibers, yarns, and fabrics including nonwoven structures and the dyeing, finishing, and chemistry and physics of textiles, fibers and polymers.

TEXT 301   FIBER PROCESSING I   3 cr. (2 and 3)

A study of fibrous materials and their relationship to the fiber processing systems. The objectives, theories, principles, and mechanisms of the machines used in the earlier stages of fiber processing. The course is directed primarily to the staple fiber processing systems. Mechanical and mathematical fundamentals are applied to the machines concerned.

TEXT 302   FIBER PROCESSING II   3 cr. (2 and 3)

Continuation of Text 301 emphasizing the later stages of fiber processing for the ultimate yarn strand. *Prerequisite:* Text 301.

TEXT 305   BASIC FIBERS   3 cr. (3 and 0)

A thorough survey of the origin, characteristics and properties of various textile fibers, both natural and man-made. The classification, identification, and the principal fields of applications will be studied.

TEXT 306   YARN FORMATION   3 cr. (3 and 0)

A fundamental study of the various systems of yarn formation from natural and man-made fibers and their blends. The course provides for the basic understanding of machines, theories and operations.

TEXT 311   FABRIC DEVELOPMENT I   3 cr. (2 and 3)

A study of the basic theory underlying the operation of the primary and secondary motions of the cam loom weaving machine. Students learn the principles of designs of the basic plain, twill, and sateen fabrics; and other weaves derived from these basic weaves. Special weaves such as the honeycomb, the mock leno, and the huckaback weave. Weave analysis and preparation of necessary drafts are essential parts of the study of elementary textile design.

TEXT 312   FABRIC DEVELOPMENT II   3 cr. (2 and 3)

A study of the theory and operation of the dobby head, Knowles head, Staubli dobby, Jacquard head, and multicolor selection for the above looms. Weave design for compound fabrics using two or more systems of warp and filling threads for three dimensional weaves, weave analysis, and preparation drafts are covered. *Prerequisite:* Text 311.

TEXT 313   FABRIC FORMATION   3 cr. (3 and 0)

An examination of the theories involved in the assembly of fibers and yarns into fabrics. The application of design, analysis and production of woven, knitted and nonwoven fabrics. A brief survey of the fabric producing machines.

TEXT 314   DYEING AND FINISHING   3 cr. (3 and 0)

The concepts of current procedures and future trends in the textile finishing industry are examined. The preparation of fabrics, dye processes and the application of various materials used in the finishing process are presented.

TEXT 321, 621   FIBER SCIENCE   3 cr. (2 and 3)

Fiber properties and the scientific evaluation of these properties. Dimensional, mechanical, optical, electrical, thermal, and moisture relationships are established and investigated.

TEXT 322, 622   PROPERTIES OF TEXTILE STRUCTURES   3 cr. (2 and 3)

Yarn and fabric properties, their scientific significance and analysis. Dimensional, structural, and mechanical interrelationships are established and evaluated.

TEXT 324   TEXTILE STATISTICS   3 cr. (3 and 0)

An introduction to statistics with particular application to the textile industry. Measures of central value and variation, probability, the normal curve, tests of hypotheses, elementary correlation and regression. *Prerequisite:* Junior standing.

TEXT 333   THE TEXTILE ARTS   3 cr. (2 and 3)

A survey of the textile arts from prehistoric times to the present with emphasis on the correlation between man's accomplishments in these arts and his progress from the simple tools of ancient origin to the automated systems currently employed in industry.

TEXT 401, 601   POLYMER AND FIBER MECHANICS   3 cr. (3 and 0)

Study of elasticity theory and viscoelasticity applied to polymers and extended to nonlinear behavior of fibers and nonlinear rheological behavior of polymers with application to extrusion and fiber spinning.

TEXT 403, 603   FIBER PROCESSING III   3 cr. (2 and 3)

The concepts of current fiber processing machines, techniques, practices, and their validity are investigated. Student group and individual problems are assigned that require use of acquired knowledge, textile testing equipment, and processing machines. Study and examination of the cause and effect relations of fibrous material properties and processing dynamics on the fiber assemblies produced. *Prerequisite:* Text 301, 302.

TEXT 404, 604   FIBER PROCESSING IV   3 cr. (2 and 3)

Continuation of Text 403 with respect to the various fiber assembles and yarn structures encountered in the fiber processing systems. Emphasis is placed on the machines and their fiber assemblies. *Prerequisite:* Text 301, 302, 403.

TEXT .411, 611   FABRIC DEVELOPMENT III   3 cr. (2 and 3)

A study of specifications and loom details for the production of fabrics woven to the customer's order to include multicolor layouts. Warp and filling preparation are covered as well as size formulations and their methods of application. Warping and dressing plans are developed for warper and the slasher. *Prerequisite:* Text 312.

TEXT 412, 612   FABRIC DEVELOPMENT IV   3 cr. (2 and 3)

A study of factors that a designer or fabric developer must consider in making of new fabrics or designs. Factors and how they control the con-

struction of cloth, blending of natural and synthetic fibers and the functional use they impart to fabrics, Worth Street rules to govern the selling and buying of cloth, cloth order and loom assignment problems, and analysis of woven fabrics to obtain necessary construction details. Students produce a fancy fabric in the laboratory. *Prerequisite:* Text 411.

TEXT 413 FABRIC DEVELOPMENT V 3 cr. (2 and 3)

Designing and development of fabrics from the leno mechanism, the Jacquard head motion, and the plush loom including tufting and weaving techniques for carpets. Each student will develop an original Jacquard design, prepare and punch cards, and produce the fabric.

TEXT 414 NONWOVEN AND KNITTED STRUCTURES 3 cr. (3 and 0)

A survey of nonwoven and knitted structures dealing with the principles and mechanisms involved. Various systems are covered with emphasis on yarn requirements and fabric properties.

TEXT 421 TEXTILE COSTING 3 cr. (2 and 3)

Actual and standard cost principles as they apply to the manufacture of textiles. Allocating the cost of material, labor and overhead; determining the cost of individual yarns and fabrics; valuing the inventory; making of cost reports, payroll analysis and the use of data processing. *Prerequisite:* Acct 201, Senior standing, or permission of instructor.

TEXT 426, 626 INSTRUMENTATION 3 cr. (3 and 0)

The principles of industrial and process instrumentation and process control. Static and dynamic characteristics of measurement devices. Transducer techniques for measurement of physical properties such as pressure, temperature, flow, weight, etc. Principles of process controllers.

TEXT 428 TEXTILE RESEARCH 0-3 cr.

An original investigation of a problem in textile, fiber, or polymer science under the direct supervision of a faculty member. After completing his experimental work, the student prepares a formal, written report which he defends before the textile faculty. *Prerequisite:* Senior standing or permission of instructor.

TEXT 429 TEXTILE RESEARCH 0-3 cr.

Same as Text 428.

TEXT 440, 640 COLOR SCIENCE 3 cr. (2 and 3)

The application of the science of color to industrial practice in textiles, plastics, paints, lighting, and ceramics. The laboratory work will be performed on modern instruments and computers.

TEXT 460, 660 TEXTILE PROCESSES 3 cr. (3 and 0)

Survey of machinery and processes of textile manufacturing from fiber formation through fabric finishing. (For students with a nontextile background.)

TEXT 475 TEXTILE MARKETING 3 cr. (3 and 0)

An examination of the activities involved in the distribution of textile products in today's market. Emphasis will be placed on the role of consumer research and the analysis of fashion in the design and promotion of textile products.

TEXT 821 FIBER PHYSICS I 3 cr. (3 and 0)

TEXT 822   FIBER PHYSICS II   3 cr. (3 and 0)

TEXT 830   TEXTILE PHYSICS   3 cr. (3 and 0)

TEXT 835   TEXTILE STRUCTURES I   3 cr. (3 and 0)

TEXT 836   TEXTILE STRUCTURES II   3 cr. (3 and 0)

TEXT 837   COMPOSITE STRUCTURES   3 cr. (3 and 0)

TEXT 840   SPECTROPHOTOMETRY   3 cr. (3 and 0)

TEXT 866   FIBER FORMATION   3 cr. (3 and 0)

TEXT 870   ADVANCES IN TEXTILE MANUFACTURING   3 cr.
(3 and 0)

TEXT 880   SELECTED TOPICS   3 cr. (3 and 0)

TEXT 891   RESEARCH.   Credit to be arranged.

TEXT 991   DOCTORAL RESEARCH.   Credit to be arranged.

Visual Studies

Professors: H. N. Cooledge, Jr., V. S. Hodges, R. H. Hunter
Associate Professors: J. T. Acorn, R. D. England, T. E. McPeak, *Head;*
   I. G. Regnier, S. Wang
Instructor: T. G. Turner, Jr.

VIS 203   VISUAL ARTS STUDIO   3 cr. (1 and 6)
   Studio work in visual elements and their organization; form, line, texture, space, light and color. Principles of design and formal organization of visual arts. *Prerequisite:* Permission of instructor.

VIS 205   BEGINNING DRAWING   3 cr. (1 and 6)
   Studio work in drawing and related media. *Prerequisite:* Vis 203 or permission of instructor.

VIS 207   BEGINNING PAINTING   3 cr. (1 and 6)
   Studio work in painting and related media. *Prerequisite:* Vis 203 or permission of instructor.

VIS 209   BEGINNING SCULPTURE   3 cr. (1 and 6)
   Studio work in sculpture and related media. *Prerequisite:* Vis 203 or permission of instructor.

VIS 211   BEGINNING PRINTMAKING   3 cr. (1 and 6)
   Studio work in lithography, silk screen, woodcuts, and graphics and related media. *Prerequisite:* Vis 203, or permission of instructor.

VIS 213·   BEGINNING PHOTOGRAPHY   3 cr. (1 and 6)
   Studio work in photography and related media. *Prerequisite:* Vis 203 or permission of instructor.

VIS 215   GRAPHIC DESIGN   3 cr. (1 and 6)
   Study and studio work with historical, contemporary and experimental letter forms. Emphasis is placed on the application of letter design components to convey visual images and ideas beyond normal word and sentence formulation. *Prerequisite:* Vis 203 or permission of instructor.

VIS 217 BEGINNING CERAMICS 3 cr. (1 and 6)
Applied studio work in ceramic hand building and pottery; creative experi-
ence in process of forming, decorating, glazing, and firing. *Prerequisite:*
Vis 203 or permission of instructor.

VIS 305 DRAWING 3 cr. (1 and 6)
Studio work in drawing and related material. *Prerequisite:* Vis 205.

VIS 306 DRAWING 3 cr. (1 and 6)
Continuation of Vis 305. *Prerequisite:* Vis 305.

VIS 307 PAINTING 3 cr. (1 and 6)
Studio work in painting and related media. *Prerequisite:* Vis 207.

VIS 308 PAINTING 3 cr. (1 and 6)
Continuation of Vis 307. *Prerequisite:* Vis 307.

VIS 309 SCULPTURE 3 cr. (1 and 6)
Studio work in sculpture and related media. *Prerequisite:* Vis 209.

VIS 310 SCULPTURE 3 cr. (1 and 6)
Continuation of Vis 309. *Prerequisite:* Vis 309.

VIS 311 PRINTMAKING 3 cr. (1 and 6)
Studio work in lithography, silk screen, etching, woodcuts and related
media. *Prerequisite:* Vis 211.

VIS 312 PRINTMAKING 3 cr. (1 and 6)
Continuation of Vis 311. *Prerequisite:* Vis 311.

VIS 313 PHOTOGRAPHY 3 cr. (1 and 6)
Studio work in still photography and related media. *Prerequisite:* Vis 213.

VIS 314 PHOTOGRAPHY 3 cr. (1 and 6)
Continuation of Vis 313. *Prerequisite:* Vis 313.

VIS 315 GRAPHIC DESIGN 3 cr. (1 and 6)
Study and studio work in layout, composition, illustration, investigation of
studio skills; terminology and theories of layout and composition; emphasis
on the different graphic formats and their use in advertising art. *Prerequisite:*
Vis 215 or permission of instructor.

VIS 316 GRAPHIC DESIGN 3 cr. (1 and 6)
Study and studio experimentation of original design layout compositions,
utilizing specific techniques and graphic process in offset, gravure, and letter
press printing. *Prerequisite:* Vis 315 or permission of instructor.

VIS 317 CERAMIC ARTS 3 cr. (1 and 6)
Continuation of Vis 217. *Prerequisite:* Vis 217.

VIS 318 CERAMIC ARTS 3 cr. (1 and 6)
Continuation of Vis 317. *Prerequisite:* Vis 217.

VIS 405, 605 DRAWING 3 cr. (0 and 9)
Studio work in advanced drawing and related media. *Prerequisite:* Vis 306
or permission of instructor.

VIS 406, 606   DRAWING   3 cr. (0 and 9)
Continuation of Vis 405. *Prerequisite:* 405.

VIS 407, 607   PAINTING   3 cr. (0 and 9)
Studio work in advanced painting and related media. *Prerequisite:* Vis 308 or permission of instructor.

VIS 408, 608   PAINTING   3 cr. (0 and 9)
Continuation of Vis 407. *Prerequisite:* Vis 407.

VIS 409, 609   SCULPTURE   3 cr. (0 and 9)
Advanced studio work in sculpture and related media. *Prerequisite:* Vis 310.

VIS 410, 610   SCULPTURE   3 cr. (0 and 9)
Continuation of Vis 409. *Prerequisite:* Vis 409.

VIS 411, 611   PRINTMAKING   3 cr. (0 and 9)
Advanced studio in printmaking and related media. *Prerequisite:* Vis 312.

VIS 412, 612   PRINTMAKING   3 cr. (0 and 9)
Continuation of Vis 411. *Prerequisite:* Vis 411.

VIS 413, 613   PHOTOGRAPHY   3 cr. (0 and 9)
Advanced studio work in photography. *Prerequisite:* Vis 314.

VIS 414, 614   PHOTOGRAPHY   3 cr. (0 and 9)
Continuation of Vis 413. *Prerequisite:* Vis 413.

VIS 415, 615   GRAPHIC DESIGN   3 cr. (0 and 9)
Utilization of graphic, scenic and other visual design requirements for motion picture and television. Emphasis on imagination and use of visual design in relation to media and function: entertainment, documentary, institutional or advertising. *Prerequisite:* Vis 316 or permission of instructor.

VIS 416, 616   GRAPHIC DESIGN   3 cr. (0 and 9)
Advanced study and studio investigation as it applies to specific areas of advertising art, book illustration, fashion, or institutional illustration. *Prerequisite:* Vis 415 or permission of instructor.

VIS 417, 617   ADVANCED CERAMIC ARTS   3 cr. (0 and 9)
Advanced applied studio work in ceramic sculpture and pottery. *Prerequuisite:* Vis 318.

VIS 418, 618   ADVANCED CERAMIC ARTS   3 cr. (0 and 9)
Continuation of Vis 417. *Prerequisite:* Vis 417.

VIS 419, 619   GRAPHIC DESIGN   3 cr. (0 and 9)
Study and studio usage of design forms (typography, photography, and illustration) in the development of corporate identification for total advertising programs. *Prerequisite:* Vis 416 or permission of instructor.

VIS 420, 620   GRAPHIC DESIGN   3 cr. (0 and 9)
Study and development of original design and advanced study into the graphic aspects for packaging, containers, and related materials in industry. Emphasis on original ideas and unique approaches to specific problems in packaging and graphics. *Prerequisite:* Vis 419 or permission of instructor.

VIS 421, 621   GRAPHIC DESIGN—STUDIO SEMINAR   3 cr. (0 and 9)

Experiences related to design studio, agency, or companies involving design responsibilities and procedures in an area related to the student's particular interests. *Prerequisite:* Permission of instructor.

VIS 490, 690   DIRECTED STUDIES   1-5 cr.

Comprehensive studies and research of special topics not covered in other courses. Emphasis will be placed on field studies, research activities, and current developments in visual studies.

VIS 850   VISUAL ARTS STUDIO   3 cr. (0 and 9)

VIS 851   VISUAL ARTS STUDIO   3-6 cr.

VIS 870   VISUAL ARTS STUDIO   6 cr. (1 and 15)

VIS 871   VISUAL ARTS STUDIO   3-6 cr.

VIS 880   VISUAL ARTS STUDIO   3-15 cr.

VIS 891   RESEARCH.   Credit to be arranged.

Water Resources Engineering

Professor: L. G. Rich, *Program Director*

WRE 450, 650   WATER RESOURCES ENGINEERING   3 cr. (3 and 0)

This course covers currently important topics in the water resources engineering area. Included is a consideration of the objectives and uses of water resources and how these have evolved over time. Emphasized are the comprehensive and systems aspects of water resources development. An introduction to the use of mathematical modeling and optimization in water resources planning and management is provided. *Prerequisite:* EM 320.

WRE 460, 660   PHYSICAL OCEANOGRAPHY   3 cr. (3 and 0)

An integrated treatment of the fluid dynamic, ecologic, geologic, and resource aspects of physical oceanography. The basic principles of the physical aspects of the oceans are presented together with techniques for the application of these fundamentals. Primary emphasis is placed on relating the oceanographic phenomena to relevant problems in the marine environment. *Prerequisite:* Ch 102, Phys 222, and permission of instructor.

WRE 461, 661   OCEANOGRAPHICAL ENGINEERING   3 cr. (3 and 0)

An integrated coverage of various facets of coastal and ocean engineering. Emphasis is placed on introducing the student to selected areas of oceanographical engineering and indicating the basic principles and current applications in these areas. Although the course is engineering oriented, the interaction of the engineer and the marine environment is included where applicable. *Prerequisite:* EM 320.

WRE 811   CLIMATOLOGY   3 cr. (3 and 0)

WRE 812   METEOROLOGY   3 cr. (3 and 0)

WRE 822   WATER MOVEMENT IN SOILS   3 cr. (3 and 0)

WRE 865   HYDROLOGY I   3 cr. (3 and 0)

WRE 866   HYDROLOGY II   3 cr. (3 and 0)

WRE 870 STREAM AND ESTUARINE ANALYSIS 3 cr. (3 and 0)

WRE 871 COASTAL HYDRODYNAMICS 3 cr. (3 and 0)

WRE 872 MARINE POLLUTION CONTROL 2 cr. (2 and 0)

WRE 875 RIVER BASIN PLANNING 2 cr. (2 and 0)

WRE 876 WATER RESOURCES SYSTEMS 2 cr. (2 and 0)

WRE 881 SPECIAL PROBLEMS IN WATER RESOURCES ENGINEERING 1-4 cr. (1-4 and 0)

WRE 883 SELECTED TOPICS IN WATER RESOURCES ENGINEERING 1-3 cr. (1-3 and 0)

WRE 891 RESEARCH. Credit to be arranged.

WRE 991 DOCTORAL RESEARCH. Credit to be arranged.

Wildlife Biology

Professor: S. B. Hays, *Head*
Associate Professor: L. G. Webb
Assistant Professor: H. A. Loyacano, Jr.

WB 306 WILDLIFE RESOURCES OF THE SOUTHEASTERN UNITED STATES 2 cr. (2 and 0) F, S
A study of the wildlife resources of the Southeastern states, including population trends, life histories and economic importance. Conservation and proper utilization by man is emphasized.

WB 412, 612 WILDLIFE MANAGEMENT 3 cr. (2 and 3) F, S
Basic principles and general practices of wildlife management and conservation will be covered. This course deals with the major problems concerning the management of wildlife resources, with emphasis on upland game species. The laboratory work includes practical work on the Clemson University woodlands and field trips to several areas where wildlife management is being practiced.

WB 416, 616 FISH CULTURE 3 cr. (2 and 3)
Principles underlying fish production; water quality as measured by chemical and biological means receive primary emphasis. Water pollution, fertilization and feeding of fish will be studied as they affect water quality and fish production. Identification of sport fishes, pond construction, and management practices are observed in the laboratory.

WB 809 WILDLIFE BIOLOGY SEMINAR I 1 cr. (1 and 0)

WB 810 WILDLIFE BIOLOGY SEMINAR II 1 cr. (1 and 0)

WB 815 PRINCIPLES OF WILDLIFE BIOLOGY 3 cr. (2 and 3)

WB 816 APPLIED WILDLIFE BIOLOGY 3 cr. (2 and 3)

WB 863 SPECIAL PROBLEMS 1-6 cr.

WB 891 RESEARCH. Credit to be arranged.

Zoology

Professor: H. S. Min, *Head*

Associate Professors: G. W. Anderson, A. S. Tombes, W. K. Willard

Assistant Professors: W. E. Bachop, E. D. Brodie, Jr., S. A. Gauthreaux, Jr., Ruth L. Hays, B. R. Ingram, H. A. Loyacano, Jr., Ruby G. Pittman, R. F. Walker

ZOOL 100   THE BIOLOGY OF HUMAN SURVIVAL   1 cr. (1 and 0)

A biological overview of those aspects of contemporary life which constitute threats to the individual and the social welfare of man now and in the future; rampant reproduction, venereal disease, illegitimacy, sterility, crowding, famine, death control, genetic engineering, and hallucinogenic drugs.

ZOOL 101   ANIMAL BIOLOGY   3 cr. (3 and 0)

Fundamentals and recent discoveries in animal biology with emphasis on ecology and behavior, evolution and genetics, functional and developmental morphology, as exemplified by the animal kingdom.

ZOOL 103   ANIMAL BIOLOGY LABORATORY   1 cr. (0 and 2)

Demonstration and dissection of selected members of the major animal phyla designed to elucidate the principles presented in Zool 101.

ZOOL 110   INTEGRATED BASIC SCIENCE AS RELATED TO MAN I   4 cr. (3 and 2)

A general course surveying basic biological principles, chemistry, microbiology, genetics, human anatomy, and physiology, emphasizing the chemical and physical bases for physiology.

ZOOL 111   INTEGRATED BASIC SCIENCE AS RELATED TO MAN II   4 cr. (3 and 2)

A continuation of Zool 110.

ZOOL 201   INVERTEBRATE ZOOLOGY   4 cr. (3 and 3)

A survey of the phyla of invertebrate animals, including their taxonomy, morphology, development, and evolution. *Prerequisite:* Zool 101, 103.

ZOOL 202   VERTEBRATE ZOOLOGY   4 cr. (3 and 3)

A study of vertebrates with an emphasis on systematic relationships and evolutionary advances. Laboratory will be concerned with basic morphological traits of each group as well as the ecology, life history, and identification of local forms. *Prerequisite:* Zool 101, 103.

ZOOL 220   HUMAN ANATOMY AND PHYSIOLOGY I   4 cr. (3 and 3)

A basic and systematic study of anatomy and physiological processes of mammals, with particular emphasis being placed on the human. Designed for Nursing students and other non-Zoology majors only. Skeletal, muscular, and nervous systems will be covered. *Prerequisite:* Zool 101.

ZOOL 221   HUMAN ANATOMY AND PHYSIOLOGY II   4 cr. (3 and 3)

A continuation of Zool 220. Circulatory, lymphatic, respiratory, digestive, urinary, endocrine, and reproductive systems will be covered. *Prerequisite:* Zool 220 or permission of instructor.

ZOOL 301   COMPARATIVE VERTEBRATE ANATOMY   3 cr. (2 and 3)

Advanced training in zoological principles, physiology, and comparative vertebrate anatomy. *Prerequisite:* Zool 101, 103.

ZOOL 302, H302   VERTEBRATE EMBRYOLOGY   3 cr. (2 and 3)

Fundamentals of developmental anatomy of the organ systems as illustrated by the chick and pig. Students prepare histological sections and mounts to acquire practice in laboratory procedures and knowledge of vertebrate microscopic anatomy. Identification of the various tissues is stressed. Admission to HONORS section by invitation. *Prerequisite:* Zool 101, 103.

ZOOL 307   ANIMAL ANATOMY AND PHYSIOLOGY   3 cr. (2 and 3)

Anatomy, and physiological processes of ingestion, secretion, excretion, respiration, circulation, reproduction, and metabolism of warm-blooded animals. This course is designed for students majoring in Pre-veterinary, Medical Technology, Animal Science, Dairy Science, and Poultry Science. *Prerequisite:* Zool 101, 103.

ZOOL 310   EVOLUTION   2 cr. (2 and 0)

An introduction to the fundamentals of evolutionary concepts including historical and contemporary aspects. *Prerequisite:* Zool 202.

ZOOL 403, H403, 603   PROTOZOOLOGY   3 cr. (2 and 3)

Taxonomy of the subkingdom protozoa with special reference to the parasitic forms directly affecting man. Representative types of free-living forms are surveyed with emphasis on their morphology, physiology and distribution. Admission to HONORS section by invitation. *Prerequisite:* Zool 101, 103, or 201.

ZOOL 404, 604   ANIMAL PATHOLOGY   3 cr. (2 and 3)

Designed to inform students in the causes, treatments, and prevention of animal diseases. Those transmissible to man are considered in detail. Emphasis is placed on hygiene and care of the sick.

ZOOL 405, 605   ANIMAL HISTOLOGY   3 cr. (2 and 3)

Microscopic structures of tissues and organs of the animal body. This course is for students in Pre-veterinary and the Animal Science courses. *Prerequisite:* Zool 202.

ZOOL 410, H410, 610   LIMNOLOGY   3 cr. (2 and 3)

This course is designed to familiarize the student with interrelationships between fresh-water organisms and their abiotic environment. Admission to HONORS section by invitation. *Prerequisite:* Zool 201, 411, general chemistry.

ZOOL 411, H411, 611   ANIMAL ECOLOGY   3 cr. (2 and 3)

A fundamental approach to basic ecological principles underlying the interrelationships of organisms with their abiotic environment. A variety of aquatic and terrestrial ecosytems will be studied both in the field and in the laboratory. Admission to HONORS section by invitation. *Prerequisite:* Zool 202.

ZOOL 421, 621   ADVANCED INVERTEBRATE ZOOLOGY   4 cr. (3 and 3)

A detailed survey of the invertebrate phyla with emphasis on taxonomy, morphology, evolution, and ecology, but with some reference to development and physiology. Laboratories will emphasize structure and identification. Field trips (two to three) will acquaint the student with the major taxa in their habitats and with methods for the analysis of aquatic and terrestrial invertebrate communities. *Prerequisite:* Zool 201 or equivalent, 411, general chemistry, or permission of instructor.

ZOOL 456   PARASITOLOGY   4 cr. (3 and 3)

An introduction to the phenomenon of parasitism in the animal kingdom with emphasis on basic principles. Classical and experimental approaches to the study of parasitism are examined in reference to the protozoa, helminths and arthropods. *Prerequisite:* Zool 202.

ZOOL 458, H458, 658   CELL PHYSIOLOGY   3 cr. (2 and 3)

An introduction to the fundamental processes of physiology as exemplified by the cell. Dynamic cellular environment, organelles, respiration, metabolism, protein synthesis, and basic thermodynamics as it applies to the cell, will be covered. Laboratory will include an introduction to techniques in study of cellular physiology. Admission to HONORS section by invitation. *Prerequisite:* Organic chemistry, Zool 202.

ZOOL 460, 660   GENERAL PHYSIOLOGY   3 cr. (2 and 3)

Systematic study of the physiology of nervous activity, hormonal control, neuro-hormonal interrelations, circulation, respiration, digestion, renal control, muscular activity and reproduction. Effort in the laboratory will be concentrated toward acquainting the student with methods of obtaining information about these systems. *Prerequisite:* Zool 202 and organic chemistry

ZOOL 461, 661   ANATOMY   3 cr. (3 and 0)

Those aspects of anatomy related to the skeletal, circulatory, muscular, nervous, endocrine, respiratory, digestive, and excretory systems will be covered. Emphasis will be placed on gross anatomy with some work in micro-anatomy. *Prerequisite:* Zool 202 or permission of instructor

ZOOL 462, 662   HERPETOLOGY   3 cr. (2 and 3)

Systematics, life history, distribution, ecology, and current literature of amphibians and reptiles. Laboratory study of morphology and identification of world families, and U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Zool 202 or permission of instructor.

ZOOL 463, 663   ICHTHYOLOGY   3 cr. (2 and 3)

Systematics, life history, distribution, ecology, and current literature of fish. Laboratory study of morphology and identification of U. S. genera, as well as all southeastern species. Field trips will be required. *Prerequisite:* Zool 202 or permission of instructor.

ZOOL 464, 664   MAMMALOGY   3 cr. (2 and 3)

Origin, evolution, distribution, structure, and function of mammals, with laboratory emphasis on the mammals of South Carolina. Field collection required. *Prerequisite:* Zool 202 or permission of instructor.

ZOOL 465, 665   ORNITHOLOGY   3 cr. (2 and 3)

The identification, life history and ecology of birds. Field trips, work with bird specimens and correlated reading will give the student a working knowledge of at least 100 species of the common birds. *Prerequisite:* Zool 202 or permission of instructor.

ZOOL 470, 670   ANIMAL BEHAVIOR   3 cr. (2 and 3)

Classical and current concepts and controversies regarding animal behavior; individual and social behavioral patterns. *Prerequisite:* Zool 202 or permission of instructor.

ZOOL 474, 674 INVERTEBRATE ENDOCRINOLOGY 3 cr. (2 and 3)

An introduction to the hormonal mechanisms which control certain physiological systems of invertebrates from cnidaria to arthropoda and including enchinodermata.

ZOOL 475, 675 GENERAL ENDOCRINOLOGY 3 cr. (2 and 3)

This course is an introduction to the basic principles of chemical integration via hormones found throughout the animal kingdom. Morphology and function of various endocrine tissues, hormone chemistry and modes of action will receive major consideration. *Prerequisite:* Zool 202, organic chemistry.

ZOOL 491 SPECIAL PROBLEMS IN ZOOLOGY 1-4 cr.

Research problems in selected biological disciplines to provide initiation to research planning and techniques for biological science majors. *Prerequisite:* Senior standing and permission of the head of the department.

ZOOL 700 MODERN DEVELOPMENTS IN ZOOLOGY FOR HIGH SCHOOL TEACHERS 3 cr. (3 and 0)

ZOOL 701 MAN'S IMPACT ON ECOLOGY 3 cr. (3 and 0)

ZOOL 702 FIELD METHODS IN ZOOLOGY FOR HIGH SCHOOL TEACHERS 3 cr. (2 and 3)

ZOOL 801 ANIMAL HISTOLOGY 3 cr. (2 and 3)

ZOOL 802 HISTOLOGICAL TECHNIQUES 3 cr. (1 and 6)

ZOOL 803 POPULATION DYNAMICS 4 cr. (2 and 6)

ZOOL 805 ANIMAL PATHOLOGY 3 cr. (2 and 3)

ZOOL 807 USE OF RADIOISOTOPES IN BIOLOGICAL RESEARCH 3 cr. (2 and 3)

ZOOL 808 RADIOBIOLOGY 3 cr. (2 and 3)

ZOOL 812 SEMINAR 1 cr. (1 and 0)

ZOOL 813 EVOLUTION 3 cr. (3 and 0)

ZOOL 830 HISTOCHEMISTRY-CYTOCHEMISTRY 3 cr. (2 and 3)

ZOOL 840 COMPARATIVE ANIMAL PHYSIOLOGY I 4 cr. (3 and 3)

ZOOL 841 COMPARATIVE ANIMAL PHYSIOLOGY II 4 cr. (3 and 3)

ZOOL 845 ADVANCED CELL PHYSIOLOGY 4 cr. (3 and 3)

ZOOL 852 PRINCIPLES AND METHODS OF SYSTEMATIC ZOOLOGY 2 cr. (2 and 0)

ZOOL 863 SPECIAL PROBLEMS 1-4 cr.

ZOOL 891 RESEARCH. Credit to be arranged.

ZOOL 991 DOCTORAL RESEARCH. Credit to be arranged.

Public Service Activity

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Office of Educational Services

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Herbert B. Tyler, Ph.D.
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William E. West, Ph.D.
Robert H. White, Ph.D.
Jean Williams, Ed.S.
Paul B. Wood, Ph.D.

The College of Education offered off-campus courses through the Office of Educational Services for school districts and other agencies in South Carolina. The following is an official record of the courses offered from the spring semester, 1971, through the fall semester, 1972, inclusive.

Abbeville School District 60

1971	Spring	Ed 634	Problems in Teaching Reading*
1972	Spring	Ed 632	Elem. Health and Physical Education*
		Ed 632	Meth. and Materials in Elem. Reading*
	Summer	Ed 698	Teaching Secondary School Reading
	Fall	Ed 660	Curriculum Devel. in the Elem. School

* Special Institute Course.

Anderson County District 1

1971	Summer	Ed 634	Reading Diagnosis and Remediation*
	Fall	Ed 635	Problems in Teaching Reading*
1972	Summer	Ed 632	Organization and Supervision of Reading Programs*
	Fall	Ed 662	Reading Diagnosis and Remediation

Anderson County District 2

1971	Spring	Ed 634	Problems in Teaching Reading*
		Ed 672	Psychology of Mental Retardation
	Fall	Ed 636	Organization and Supervision of Reading Programs*
1972	Spring	Ed 634	Reading in Content Areas*

Anderson County District 3

1972	Spring	Ed 632	Child Growth and Development*
	Summer	Ed 671	The Exceptional Child
		Ed 673	Teaching the Mentally Retarded

Anderson County District 4

1971	Spring	Ed 634	Tests and Measurements*
	Fall	Ed 634	Problems in Teaching Mathematics*
1972	Spring	Ed 632	Child Growth and Development*
	Fall	Ed 632	Methods and Materials in Reading*

Anderson County District 5

1971	Summer	Ed 632	Art for the Elementary Teacher*
		Ed 632	Linguistics Approach to Teaching Reading in the Elementary School*
		Ed 632	Mathematics for the Elem. Teacher*
		Ed 632	Teaching Social Studies Units in the Elementary School*
		Ed 634	Environmental Science*
		Ed 635	Practicum in Teaching English to Slow Learners*
		Ed 636	Public School Finance*
1972	Spring	Ed 633	Black Studies*
		Ed 633	A Student-Centered Approach to Human Relations*
		Ed 634	Psycho-Educ. Evaluation Internship*
	Fall	Ed 634	Behav. Mod. and Prescriptive Teaching*
		Ed 634	Individual Testing I*

Associated General Contractors

| 1971 | Summer | Ed 435, 635 | Curriculum in Industrial Arts* |

* Special Institute Course.

Chesterfield County Schools

1972   Summer   Ed 634   Diagnosis of Student Educ. Problems*

Colleton County Schools

1971   Summer   Ed 636   Introduction to Supervision*
1972   Summer   Ed 632   Teaching Math. in the Elem. School*
                Ed 632   Teaching Reading in the Elem. School*
                Ed 635   Curriculum*

Commission on Higher Education

1971   Spring   Ed 734   Interaction Analysis*
       Summer   Ed 636   Supv. and Admin. Problems in Investigation in the Field of Student Teaching*
                Ed 734   Education of the Disadvantaged Child*

Greenville County Schools

1971   Spring   Ed 633   Electricity for Industrial Arts*
                Ed 633   Practicum in Guidance*
                Ed 660   Curriculum Devel. in the Elem. School
                Ed 671   The Exceptional Child
       Fall   Ed 605   Principles of Guidance
                Ed 633   Metalworking*
                Ed 636   Counseling*
                Ed 671   The Exceptional Child
                Ed 672   Psychology of Mental Retardation
1972   Spring   Ed 433, 633   Woodworking Tech. for Teachers*
                Ed 633   Vocational and Educational Information*
       Summer   Ed 634   Clinical Research in Reading*
       Fall   Ed 660   Curriculum Devel. in the Elem. School
                Ed 665   Secondary School Curriculum
                Ed 694   School and Community Relationships

Greenville Technical Education Center

1971   Summer   In Ed   310   Methods of Trade Teaching
                In Ed   405   Course Organization and Evaluation
                In Ed   416   Design and Operation of Industrial Education Laboratories

Lancaster (ESEA Region V)

1971   Fall   Ed 634   Implem. of Career Devel. Programs*
                Ed 635   Curric. Activ. in Career Development*

Oconee County Schools

1971   Spring   Ed 634   Individual Testing I*
       Summer   Ed 636   Problems in School Administration*
       Fall   Ed 435, 635   Curric. for Individ. Instruction*

* Special Institute Course.

1972	Spring	Ed 435, 635	Curriculum for Individualized Instruction II*
		Ed 634	Behavior Modification and Prescriptive Teaching*
	Fall	Ed 631	Curric. for Early Childhood Education*
		Ed 634	Individualizing the School Program*
		Ed 634	Psycho-Educational Eval. Internship*

Pee Dee Regional Supplementary Education Center

| 1972 | Summer | Ed 432 | Practicum in Speech Pathology* |
| | | Ed 434 | Disorders in Articulation* |

Pickens County Schools

1971	Spring	Ed 660	Curric. Development in the Elem. School
	Summer	Ed 632	Child Growth and Development*
		Ed 634	Teaching the Disadvantaged*
		Math 617	Teaching Math. in the Elem. School*
1972	Summer	Ed 432, 632	Children's Literature*
		Ed 432, 632	Mathematics for Elem. Teachers*

Piedmont Technical Education Center

1971	Spring	Ed 697	Audio-Visual Aids in Education
	Summer	Ed 633	Linguistic Approach to the Teaching of Language Arts*
		Ed 634	Abnormal Psychology*
	Fall	Ed 605	Principles of Guidance
		Ed 694	School and Community Relationships
		Ed 698	Teaching Secondary School Reading
1972	Spring	Ed 634	Educational Tests and Measurements*
		Ed 634	Social Psychology*
		Ed 636	School Finance*
		Ed 665	Secondary School Curriculum
	Summer	Ed 432, 632	Music for the Elementary Child*
		Ed 632	Psychology of the Mentally Retarded*
		Ed 634	Analysis of the Individual*
		Ed 634	Educational Tests and Measurements*
		Ed 634	Human Growth and Development*
		Ed 634	Psychology of Learning*
		Ed 634	Techniques of Counseling*
		Ed 660	Curric. Development in the Elem. School
		Ed 662	Reading Diagnosis and Remediation
		Ed 694	School and Community Relationships

* Special Institute Course.

Degree Program
Piedmont Technical Education Center

1972 Fall   Ed 605   Principles of Guidance
                Ed 660   Curric. Development in Elem. School
                Ed 665   Secondary School Curriculum
                Ed 803   Advanced Methods of Teaching in the
                         Secondary School
                Ed 804   Advanced Methods of Teaching in the
                         Elementary Grades
                Ed 813   Educational and Vocational Information
                         Services and Placement
                Ed 830   Tech. of Supv. in Public Schools
                Ed 831   Eval. of Secondary School Instruction
                Ed 832   Eval. of Instruction in the Elem. Schools
                Ed 861   Organ. and Adm. of Reading Programs

Richland County School District 1

1972 Summer In Ed 410, 610 World of Construction*

Richland County School District 2

1972 Fall   Ed 634   Curric. Develop. in Career Education*

Spartanburg County School District 5

1972 Summer   Ed 634   Prin. and Prac. of Career Education*
                Ed 635   Curriculum in Career Education*
      Fall   Ed 634   Practicum in Career Education*

Tri-County Technical Education Center

1972 Summer   In Ed 310   Methods of Trade Teaching
                In Ed 405, 605   Course Organ. and Evaluation
                In Ed 416, 616   Design and Operation of
                                 Industrial Education Laboratories

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* Special Institute Course.

Student Register

GRADUATES OF 1972
ASSOCIATE AND BACHELORS' DEGREES CONFERRED MAY 5, 1972

COLLEGE OF AGRICULTURAL SCIENCES

Jess Willard Jones, Acting Dean

BACHELOR OF SCIENCE

Agricultural Economics

John Michael Alexander _____ Central
Archie Michael Barnhill _____ Galivants Ferry
Vincent George Caggiano III _____ Gaffney
Cary Daniel Chamblee _____ Anderson
Roy William Copelan _____ Orangeburg
Albert Dwayne Droege _____ Charlotte, N. C.
James Edgar Fender _____ Reevesville
Lloyd Bernard Floyd, Jr. _____ Olanta

*Michael Jeffery Hucks _____ Aynor
John Evans Keller _____ Elloree
Robert Louis Layne, Jr. _____ Spartanburg
Craig Franklin O'Dell _____ Laurens
Wylie Tracy Owens _____ Lake View
Garvin Smith Page _____ Lake View
Robert Lee Scarborough, Jr. _____ Eastover
Thomas Allen Thompson _____ Kingstree

Agronomy

Herbert Hayne Haigler III _____ Cameron
*Harold Daniel Hunnicutt _____ Pendleton
Charles Harold Matthews _____ Scranton
William McRee Maxwell _____ Quincy, Fla.

*John Timothy Tyler _____ Estill
Gary Michael Watkins _____ Lamar
Lawrence Landrum Weathers _____ Bowman

Animal Science

Arthur Quinn Black _____ York
William Gerald Bonnette _____ Wagoner
Norman Foster Bozard, Jr. _____ Orangeburg
James Wilkins Brown _____ Gaffney

Woodrow William Culp _____ Fort Mill
Terrell Thomas Leeke _____ Simpsonville
*John Robert Scoggins, Jr. _____ Smyrna
Jasper William Shuler _____ Holly Hill

Biology

Keith Hayne Griffith _____ Batesburg

Dairy Science

*Tom Vincent Hammond _____ Modoc

Steve A. Mills _____ Saluda

Food Science

Larry Thomas Cook _____ Raleigh, N. C.
George Raymond Jameson _____ Easley
**Teresa Marie Jones _____ Spartanburg
Stephen Thomas Moore _____ Greenville

*Robert Walter Quattlebaum
_____ Woodstown, N. J.
Barbara Dieglio Torr ____ North Randall, Ohio

Horticulture

*David Michael Dunn _____ Greenville
***Ellis Leslie Jourdain _____ Elloree
Gene Powell Lucius _____ Columbia
*Ronald Nelson Oliver _____ Florence

*Donald Neal Ross _____ Taylors
Julius Grant Scott, Jr. _____ Hollywood
Ronald William Turpin _____ Ridgeland

Poultry Science

Hunter Henry Moorhead _____ Blacksburg

COLLEGE OF ARCHITECTURE

Harlan Ewart McClure, Dean

BACHELOR OF ARTS

Pre-Architecture

*Peter Lamont Bardwell ____ Wrentham, Mass.
*William Hunter Bethune ____ Charlotte, N. C.
Robert Charles Cashion _____ Slater
Verd Anna Craig _____ Columbia
Donald Allen Deal _____ Newark, Del.
Alexander Colclough James _____ Columbia
Wesley John Kavanagh
_____ New York City, N. Y.
Richard Loring King _____ Yalesville, Conn.
Richard Dale Osment _____ Mt. Pleasant
Frazer Stanley Pajak ____ New Windsor, N. Y.

*Thompson Edward Penney _____ Charleston
Clark Monroe Pierce _____ Jamestown, N. C.
Sara Leigh Raby _____ Hickory, N. C.
*Allen Weightman Reed __ Glen Ridge, N. J.
Harriet Lynn Ross _____ Columbia
Gary R. Schechtman __ Franklin Square, N. Y.
David Monroe Simpson _____ Simpsonville
**Wayne Francis Timmer ____ Bethlehem, Pa.
Thomas Wurtz _____ Wantagh, N .Y.
Otto James Young, Jr. _____ Greenwood

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Building Construction

Larry Britton Courtney _____ Lake City
Glenn Maurice Eby _____ Allentown, Pa.
Richard Bruce Fillyaw _____ Columbia
Donald Henry Hamilton _____ Easley
*Michael Edward Hill _____ Sumter
James Murphy Ivey _____ Oakville, Ontario

Charles Farnham Line _____ Narberth, Pa.
William Martin _____ Ocean Gate, N. J.
John Davis Mullen _____ Greenville
Charles Randolph Oliver __ Hagerstown, Md.
Frank Joseph Shelley _____ Rockville, Md.
James Michael Simpson _____ Williamston

BACHELOR OF ARCHITECTURE

Robert Eugene Oliver III __ Jacksonville, Fla.

COLLEGE OF EDUCATION

Harold Fochone Landrith, Dean

BACHELOR OF ARTS

Early Childhood Education

Sharon Robinett Agee _____ Aiken
*Deborah Louise Blackwood ____ Spartanburg

Bonnie Belle Cameron _____ Marmora, N. J.
Sherry Helen Wright _____ Gastonia, N. C.

Elementary Education

Rhonda Gay Beiers _____ Duncan
Janis Irene Brewer _____ Easley
*Vivian Gail Brewer _____ Cayce
***Annie Bailes Brown _____ Walhalla
Betty Sue Buchanan _____ Seneca
*Debra Faye Buzhardt _____ Greenwood
**Linda Ann Capell Carman _____ Easley
*Kathryn Joy Collins _____ Westminster
**Barbara Carol Copeland _____ Clemson
***Deborah Dean Cox _____ Greenwood
Debbie Elaine Elliott _____ Greenville
**Barbara Gayle Ellis _____ Anderson
Julia Hall Evans _____ Piedmont
**Barbara Ann Field _____ Seneca
*Geraldine Jo Freeman _____ Simpsonville
**Betsy Martin George _____ Pendleton
*Gilda Newsom Howard _____ Greenville
*Norma Anne Hudnall _____ Spartanburg

*Janice Lynn Kirby _____ Clinton
Carris Kaye McLane _____ Seneca
Carolyn Bruce Miles _____ Greenville
*Donna Gail Mills _____ Greenville
**Dianne Ashley Moss _____ Greenville
*Mary Dollar Myers _____ Greenville
**Frances Gayle Patterson _____ Anderson
Brenda Hinton Reece _____ Greenville
Kathryn Harris Rogers _____ Westminster
*Rebecca Baker Ross _____ Anderson
*Penny Elizabeth Ryan _____ Greenville
Barbara Ann SanMiguel _____ Spartanburg
Laura Gregg Saverance ____ Annandale, Va.
Connie Smith _____ Greenwood
Linda Jean Smith _____ Bishopville
*Carolyn Marsh White _____ Travelers Rest
Nancy Arvilla Woodson _____ Liberty

Secondary Education

Sharon Lee Anderson _____ Lexington
Hubert Murchison Bedenbaugh, Jr.
_____ Prosperity
Susan McCoy Black _____ Charleston
*Donna Claire Browning _____ Greer
Eddie Latimer Burton _____ Ware Shoals
**Mary Alwilda Butler _____ Anderson
Susan Elaine Carroll _____ Townville
Robert Leslie Cook _____ Dalzell
*Catherine Lee Cox _____ Naperville, Ill.
David Roy Farnham _____ Travelers Rest
William Columbus Faulkner, Jr. ___ Greenville
Margaret Garrison _____ Johnston
*Stephen Griffin Glenn _____ Starr
Phillip Victory Hawkins III ____ Mt. Pleasant
Mary Ashley Henderson _____ Greenville
Jack Nelson Hendrick, Jr. _____ Chesterfield
*Susan Nelson Hutto _____ Charleston
*Ann Barrett Ingram _____ Greenville
Michael Lee Jones _____ Greenville
*Ruby Bessie Luen Ying Kwan
_____ Kowloon, Hong Kong
*Michael Joe Lesley _____ Easley
*James Gnann Long _____ Newberry

Marsha Ruby McCleskey _____ Greenville
*Carol Milford _____ Anderson
Marilyn Marie Morrison _____ Mauldin
**Bobby Wayne Owen _____ Greenville
Patricia Kathleen Pickens ____ West Columbia
Jackie Hill Porter _____ Piedmont
Maxine Elizabeth Poston _____ Florence
James Edward Prater _____ Columbia
*Angela Fowler Prince _____ Spartanburg
*Anne Marie Prohaska _____ Charleston
Edward Clark Reed _____ Charlotte, N. C.
Kathleen Shelley Rule _____ Sheldon
David Richard Schwab ____ Birchrunville, Pa.
Victoria Susan Sheriff _____ Seneca
*Jane Vincent Singley _____ Charleston
Linda Elaine Skelton _____ Greenville
*Cheryl Tindal Steele _____ Charleston
James Michael Sterling _____ Newberry
James William Thompson _____ Rock Hill
Wanda Louise Tripp _____ Travelers Rest
**Eddie Earl Vickery _____ Anderson
Kenneth Carroll Vinson _____ Camden
Stephen Leigh Welsh _____ Walhalla
Pamela Anne Wood _____ Mt. Pleasant

BACHELOR OF SCIENCE

Agricultural Education

(Agricultural Education is jointly administered by the College of
Agricultural Sciences and the College of Education.)

James Edward Brazell _____ Richmond, Va.
Michael Thorne Brogdon _____ Sumter
*Sandy Edge _____ Conway
Steve Allen Edwards _____ Saluda
Joseph Pledger Hodges, Jr. ____ Bennettsville
*Donald Christopher Lovette
_____ Fair Bluff, N. C.
Bobby Darrell McGee _____ Batesburg
Paul Augustus McKie _____ North Augusta

Jerry Cannon Pace _____ Gresham
Daniel Franklin Parker _____ Abbeville
Tilden Fredrick Riley III _____ Orangeburg
**William Frank Sandifer _____ York
Donald Carter Saylor _____ Swansea
Marion Gray Swink _____ Effingham
James Liston Wells _____ Murrells Inlet
William Wesley Williams _____ Clinton

Industrial Education

Ira Lee Adams, Jr. _____ Cordele, Ga.
Robert Leon Anderson, Jr. _____ Taylors
William Clinton Barker _____ Westminster
James Edward Barnette _____ Pendleton
Charles Wayne Caldwell _____ Roanoke, Ala.
Alvin Sanders Chandler __ Greensboro, N. C.
Rodney Andrew Chapman __ Little Mountain
Ralph Wayne Coats _____ Sandy Springs
Clarence Grant Cox _____ Loris
James Donnon Culbertson _____ Ware Shoals
Edward Russell Donaldson _____ Hollywood
Kenneth Robert Flint _____ Charlotte, N. C.
Tommy Byrnes Fulmer _____ Leesville
Charles Bryan Gainey _____ Darlington
*John Byron Gatch _____ Charleston
Harry Dewitt George _____ Central
Charles Lee Haltiwanger ____ West Columbia

Kendall Amick Haltiwanger __ Little Mountain
Carl Wilson Hawkins, Jr. ____ West Columbia
John Travis Hill _____ Laurens
Wilson Augustus Latham _____ Abbeville
Larry Morris McElrath _____ Greer
Charles Albert Mayer _____ Little Mountain
Johnny David Mixon _____ Beaufort
Raymond Gary Patterson _____ Norris
*Barney Franklin Pepper II _____ Walhalla
Barry William Russell _____ West Columbia
Daniel Boone Scott _____ Hollywood
Randolph Gregory Shaw _____ Atlanta, Ga.
Bruce Cantrell Smith _____ Anderson
Frank Wilson Stanley, Jr. _____ Lodge
James William Vaughn _____ Anderson
James Howell Williams, Jr. __ West Columbia

Science Teaching

James Randall Collins __ Hendersonville, N. C.
Theodore Stephen Dennis ___ Monterey, Tenn.

Richard Lee Gunnarson _____ Duxbury, Mass.
Joseph Antoni Rukat, Jr. _____ Pittsburgh, Pa.

COLLEGE OF ENGINEERING

Linvil Gene Rich, Dean

BACHELOR OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College of
Agricultural Sciences and the College of Engineering.)

*William David Terry ـــــــــــــــــ Central

Ceramic Engineering

Alvin Lamar Campbell, Jr. ـــــــــ Anderson
**John Wallace Gibson ـــــ North Augusta
Grant McComb Laird ـــــــــ Paris, Tenn.
**Thomas Lewis McKinney ـــــــــ Easley
*Donald Hollis Miller ـــــــ North Augusta

Chemical Engineering

*Robert Allen Adler ـــــــــــ Spartanburg
Charles Ted Carson, Jr. ـــــــــــ Easley
**Kin Cheung Chu ـــــ Kowloon, Hong Kong
**Joseph Butler Corpening ـــــ Lenoir, N. C.
George Michael Daugherty ـــــ Greenville
*Henry Dyson IV ـــــــــــ Walterboro
Randy Eric Easley ـــــــــــ Greenwood
William Porter Gilchrist ـــــــــ Rock Hill
Larry Nichols Goff ـــــــــــ Winnsboro
**Lynn James Groome ـــــ Opa-Locka, Fla.
***Robert Franklin Hawthorne, Jr.
ـــــــــــــــــــــــــــــــ Greenwood
Paul Joseph Higgins ـــــــــــ Greenville
Michael Anthony Hodge ـــــــــ Sumter
Dia Fouad Kammoun ـــــ Tripoli, Lebanon
***John Monroe Little, Jr. ـــــــ Rock Hill
*Kenneth Findley McLaurin ـــــ Bamberg
*Robert Eugene Meadors ـــــــــ Clinton
Edwin Nisbet Moore ـــــــــ Van Wyck
Henry Basil Munn, Jr. ـــــــ Rock Hill
Roland Ladson Powell ـــــــــــ Greer
Dwight David Redick ـــــــــ Bishopville
James Thomas Reed ـــــ Flowery Branch, Ga.
*Morgan Murray Stokely ـــ Kingsport, Tenn.

Civil Engineering

David Eugene Brown, Jr. ـــــــ Darlington
*Henry Sinclair Dangerfield, Jr. ـــ Charleston
Tommy Lonnie Dutton ـــــــ Griffin, Ga.
Roger Neale Elliott ـــــــــ Decatur, Ga.
*Rick Rollins Evans ـــــــــ Lake City
*Slade Forrest Exley ـــــــ Covington, Ga.
Roby Wallace Grubbs ـــــــــ Denmark
Hayden Garrett Hale ـ Lighthouse Point, Fla.
David Wilson Harrison ـــ Harrisonburg, Va.
Charles McLois Joye II ـــــــ Columbia
*George Raymond Kreigsman ـــ Eustis, Fla.
*Edward Michael Lamar ـــــــ Easley
Joseph Stanley Lloyd ـــــــ Darlington
Charles Nelson Lord ـــــــ Potsdam, N. Y.
Arthur Jackson McKinney III ـــــ Mauldin
Gary John Matthews ـــــ Burlington, Vt.
**Thomas Caswell Moose ـــــ Newberry
Kenneth Wade Myers ـــــــ Rock Hill
Eric David Newton ـــــــ Asheboro, N. C.
Gary Seymour Shorb ـــــ Hyattsville, Md.
Frank Shaw Waesche III ـــ Baltimore, Md.
Ralph Erwin Whitesell ـــــــ Rock Hill
Carl Henry Zipf III ـــــــ Bryn Mawr, Pa.

Electrical Engineering

Salvatore Paul Accomando ___ Inwood, N. Y.
Michael Warren Agee _____ Aiken
Jones Henry Columbus All, Jr. ____ Allendale
Samuel David Alley _____ Atlanta, Ga.
William Pittman Austell, Jr. _____ Taylors
Marion Cain Boyd, Jr. _____ Anderson
Wallace Nathaniel Cantrell _____ Easley
***James Earl Carpenter _____ Clemson
***Alan Edward Cowart _____ Charleston
*Stephen Mark Cunningham _____ Aiken
*Marion Jack Duncan, Jr. _____ Taylors
*Gary Pierce Fellers _____ Anderson
Nabil Elias Ghattas _____ Jerusalem, Israel
John Walker Glenn _____ Waxhaw, N. C.
†**Blaine Edward Gray, Jr.
_____ Winston-Salem, N. C.
*John Edward Hadstate _____ Summerville
**John Claudius Heinemann, Jr.
_____ Georgetown
Victor Ralph Hickman, Jr. _____ Columbia
Anthony Roy Hilton _____ Hapeville, Ga.
Frank Hamilton Ingle _____ Jacksonville, Fla.
Casey Bartlett Jones _____ Great Falls

Ronald Lee Jones _____ New Carrollton, Md.
Richard Herman Ledford
_____ Aberdeen Proving Ground, Md.
John Paul Lombardi _____ Mission Viejo, Cal.
Robert Francis McNab III _____ Charleston
John Edward Meade ___ Williston Park, N. Y.
*John Walter Mellars ____ Lindenhurst, N. Y.
***Harry Malone Miller, Jr. _____ Fort Mill
*Robert Leroy Money _____ Bethesda, Md.
Robert Johnston Moore _____ Spartanburg
*Gerard Karl Nass _____ Midland Park, N. J.
Bernie Victor Parent _____ Greenville
*Gary Michael Parsons _____ Newberry
William Lamar Porter, Jr. _____ Central
Donald Chester Slaughter
_____ Charleston Heights
Herbert Eugene Stuckey _____ Nesmith
*James Ritter Thomas _____ Easley
Michael Leroy Turner _____ Seneca
*Kenneth Spencer Vaughn _____ Greenville
James Henry Wackwitz
_____ New Providence, N. J.
**Gary Dean Youell ___ Hendersonville, N. C.

Engineering Analysis

Hyman Karesh _____ Burton

Jimmy Lee Moore _____ North Charleston

Mechanical Engineering

John Wayne Altoonian _____ North Augusta
Robert Jennings Baker, Jr. _____ Charleston
Eugene Slade Best _____ Rock Hill
**James Telford Craig, Jr. _____ Pickens
John Michael Forrest _____ Rock Hill
Lowell McCree Hallman _____ Gilbert
Ronald Gene Himmel _____ Greenville
Elmer Carlton Klebe, Jr. _____ Baltimore, Md.
Albert Francis Lareau _____ Sumter
Robert Erwin Lide _____ Augusta, Ga.

*William Thomas Maness _____ Honea Path
Alyn James Mills _____ Hancock, N. Y.
*Brent Clark Moore _____ Spartanburg
Edgar Gray Munday _____ Anderson
Frank David Myers _____ Charleston Heights
*Samuel Oliver Ricard _____ Leesville
***Donnie Ray Sorenson _____ Travelers Rest
**Richard Carl Strauss _____ Hellertown, Pa.
Frank Eberly Strehle, Jr. _____ Denbigh, Va.

Metallurgical Engineering

Michael Gregory Geronimos ___ Arcadia, Cal.

Richard Oeland Wood _____ Lake City

Technical Operations

Johnny Arthur Adams _____ Saluda
***Hampton Pierce Conley __ High Shoals, Ga.
Andrew Copes Gramling III _____ Williston

Larry Milton Robinson _____ Gaffney
Adger Lee Turner, Jr. _____ Greenville
James Earnest Waldrep, Jr. _____ Greenville

COLLEGE OF FOREST AND RECREATION RESOURCES

William Henry Davis McGregor, Dean

BACHELOR OF SCIENCE

Forestry

*Harold Dean Brady _____ Rock Hill
David Eugene Castle _____ York
**Malcolm Kent Cleaveland _____ Clemson
Samuel Reaves Coker _____ Greenville
Michael Harold Dodd ____ West Orange, N. J.
Mark Dariel Gibson _____ McLean, Va.
Archibald Bruce Hall, Jr. ____ Pawleys Island

Joel David Hart _____ Newark, N. J.
Richard William Miller _____ Lebanon, Pa.
Steven Clark Moore _____ Darlington
Joseph Richard Rochester _____ Barnwell
John Mason Sims _____ Central
Douglas Duane Taylor _____ Walhalla
*Henry Daniel Welch, Jr. _____ Society Hill

Recreation and Park Administration

Jack Edward Anderson _____ Travelers Rest
Charles Harris Arrington _____ Oakland, Fla.
William Allen Britt _____ Cordesville
James Michael Crawford _____ Pelzer
Ronald Stanley Crooks _____ Seneca
*Francis Tanner Darby _____ Duncan
Leroy Springs Davidson III _____ Chester
*Mary Lawrence Dion _____ Summerville
***Mary Heyward Douglass _____ Columbia
Larry Wayne Duncan _____ Easley
Edwin Wilson Estridge, Jr. _____ Bethune
Joseph Timothy Eubanks _____ Orangeburg
Frank Weston Garrison III ____ Simpsonville
Walter Timothy Grant _____ Chester
Louie William Harrelson ____ Greenville, Ala.
William Hartman Hasskamp ____ Bennettsville
Jack Louis Holeman _____ Greenville
Paul Michael Holzshu _____ Pitcairn, Pa.

Winton Walker Hunter, Jr. _____ Orangeburg
Jenny Louise Hurley _____ Chickamauga, Ga.
Donald Frank Jackson, Jr. _____ Greer
*Barry Houston Johnson _____ Aiken
Larry Redford Knight _____ Holly Hill
William Thomas McDaniel III _____ Leesville
Barry Wayne Mauldin _____ Clinton
Danny Arthur Mize _____ Belton
Robert Johnson Moseley II _____ Clemson
Robert Tommy Norris _____ Clemson
Mir Sarfaraz Rahim __ Lahore, West Pakistan
John Samuel Rhodes _____ Pickens
*Gloria Donly Schwab _____ Villa Ridge, Mo.
*Dorothy Graham Skardon _____ Walterboro
Thomas Whitmire Suber, Jr. _____ Whitmire
Al McCurry Towery _____ Sumter
Julian Stephen Waldrep, Jr. _____ Greenwood

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

Wallace Dabney Trevillian, Dean

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Arts and Sciences

*Douglas DeWitt Agnew _____ Charlotte, N.C.
*James Bascom All, Jr. _____ Allendale
Thomas Archibald Argyris, Jr.
_____ Meadowbrook, Pa.
Robert Weedon Armfield
_____ Newport News, Va.
Earle Rowland Bagnal _____ Sumter
Randall Edward Berkland _____ Clinton
Gary Paul Berube _____ Dalton, Mass.
Joel Branham Bolt _____ Anderson
Arthur Emerson Brantley, Jr. ____ Orangeburg
Robert Bruce Brooks, Jr. ____ Stamford, Conn.
Marion Lee Crolley _____ Camden
James Wayne Evatt _____ Greenville
Stephen Ernest Floyd _____ Joanna
*Paul Eugene Gault, Jr. _____ Fountain Inn
Thomas Frank Gentry, Jr. _____ Easley
Alan Stewart Gill _____ Greenville
Michael Kelly Gilreath _____ Piedmont
William Jody Griffith _____ Saluda
John Frank Guest _____ Greenville
Kenneth John Gutshaw
_____ Port Washington, N. Y.
James Craig Hardin _____ Clemson

Ernest Dexter Hatfield, Jr. _____ Sumter
Richard Jimmy Hines _____ Walterboro
Lennox Kugley Jones _____ Anderson
Leonard Robinson Jordan, Jr. _____ Columbia
Walter Thomas Kelly _____ Alexandria, Va.
Charles John Kreidler _____ Moorestown, N. J.
Suzanne Lesesne _____ Spartanburg
Salvatore Anthony Lucia ____ Stamford, Conn.
*James Jefferson McDowell, Jr. ____ Kershaw
Brian Charles McGinnis _____ Sumter
Ernest Daniel Merck _____ Greenville
Gary Mark Mitchell _____ Columbia
*Scott Knox Mitchell _____ Clemson
Benjamin Finch Peirce __ Ft. Lauderdale, Fla.
*David Cannon Prince ____ Hawkinsville, Ga.
Stephen Greggory Roberson _____ Greenville
Thomas Benjamin Roller __ Moorestown, N. J.
Willie Clarence Shelley, Jr. _____ Conway
*Elizabeth Shealy Smith _____ Leesville
Walter Harold Smith, Jr. _____ Fountain Inn
Clark Kipp Stecher, Jr. _____ Camp Hill, Pa.
David Terrell Tallon _____ Dillon
Timothy Warren Turner _____ Spartanburg

BACHELOR OF SCIENCE

Accounting

Richard Owen Cannon _____ Greenville
Gary Michael McCombs _____ Greenville
David Huston Payne _____ La France
William Donaldson Pectol __ Kingsport, Tenn.
Barry Monroe Reynolds _____ Sumter

John Edward Rogerson III _____ Sumter
**John Michael Waters _____ Spartanburg
James Beauchamp Winn, Jr.
_____ Morristown, Tenn.

Administrative Management

John Walden Creel _____ Conway
Carl Ray Gardner _____ Lake View
John Michael Kapp _____ Columbia
Robert Samuel McCants III _____ Orangeburg

Cecil Randolph McClure, Jr. _____ Anderson
Lisbeth Ann Morris _____ Timmonsville
*Ansel Darwyn Orander, Jr. _____ Easley
Allen Long Teague _____ Columbia

Financial Management
Melvin David Fort _____ Sumter

Industrial Management

**John David Attaway III _____ Anderson
James William Bounds _____ Lancaster, Pa.
William Blount Briggs, Jr. _____ Atlanta, Ga.
Danny McCoy Carter _____ Walterboro
Terry Bryan Carter _____ Greenville
*Thomas Douglas Leavitt Collins
_____ Columbus, Ga.
Cecil Wayne Comer _____ Union
Michael Harby Cornwell _____ Spartanburg
James Alan Darby _____ Pelzer
Richard Corbett Davis __ Charleston Heights
James Edward Drake _____ Anderson
*Russell Eugene Evans _____ Six Mile
David Michael Fagg _____ Anderson
Robert Wylie Gist, Jr. _____ Union
William Eddie Gordon _____ Charleston
Robert Hassell _____ Highland Park, N. J.
Wayne Lee Hayes _____ Wellford

*Robert Royall Jay, Jr. _____ Greenwood
Robert Vaughn Killion _____ Aiken
Ben Field King _____ Greenville
Donnie Eugene Looney _____ Anderson
William Edward Mabry _____ Carlisle
Peter William Pappas _____ Rock Hill
Douglas Franklin Patrick _____ Orangeburg
Allen Boyd Puckett III _____ Columbus, Miss.
McKinney Hurt Ramsey III _____ Anderson
George McCall Rogers III _____ Orangeburg
John Larry Rollison _____ Greenwood
Robert Bruce Singletary _____ Charleston
Wesley Alexander Stoddard ____ Spartanburg
*Gill Dunovant Timpson _____ Edgefield
Albert Creswell Todd III _____ Greenwood
Robert Randal Troup _____ Atlanta, Ga.
Ronald David Twitty _____ Charlotte, N. C.

Textile Chemistry

William Alexander Archie V ____ Greenwood
Howard Matthew Brink _____ Campobello
Jeffrey Todd Langley _____ Charlotte, N. C.

Kevin Lloyd Murray _____ Berlin, Md.
John Martin Smith _____ Wisacky

Textile Science

**DeVon Revell Belcher _____ Greer
Gregory Phillip Edwards _____ Inman

Henry Stephen Leslie _____ Abbeville

COLLEGE OF LIBERAL ARTS

Headley Morris Cox, Dean

BACHELOR OF ARTS

Marilou Aldridge _____ Greenville
Joyce Earline Alexander _____ Anderson
***Joseph Fletcher Anderson, Jr. __ Edgefield
George Basil Antonakos _____ Baltimore, Md.
Stephan Copeland Barton _____ Greer
John Henry Bevis III _____ Clemson
Christopher Adam Black
_____ Santurce, Puerto Rico
Marshall LaRay Black _____ Greenville
**Marc R. Bonenfant _____ Epsom, N. H.
*Robert Gene Brazier _____ Pickens
Barry Michael Brown _____ Pacolet
Stephen Neal Brust _____ Bethesda, Md.
*Robert Hardin Bull _____ Abbeville
Donald Lee Campbell _____ Honea Path
Ralph Dale Chandler _____ Pelzer
Linda Pitts Collins _____ Pelzer
Deborah Hunter Coursey
_____ Miami Springs, Fla.
Darlene Cheryl Davenport _____ Columbia
**Thomas Hamilton Davis III _____ Sumter
*Roy Allen DeLauder, Jr. __ Silver Spring, Md.
Robert Alan Denny _____ Windsor, N. Y.
Danny Lee Dukes III _____ Falls Church, Va.
*William Eugene DuRant, Jr. _____ Sumter
Frampton Wyman Durban, Jr. _____ Aiken
Robert Michael Eddy _____ Greenville
Emil Hamilton Emanuel, Jr. _____ Lancaster
Sue Erlenkotter _____ San Rafael, Cal.
*Arnold Rinehart Fleek _____ Rock Hill
Robert Harold Forester _____ Taylors
James Joseph Forth, Jr. __ Schenectady, N. Y.
John Stephen Foster _____ Anderson
*Larry Edward Freeman _____ Williamston
James Douglas Gamble _____ Lancaster
June Yvonne Gilstrap _____ Pickens
Ben Earl Griffith, Jr. _____ Taylors
Cecile Ann Guerry _____ Moncks Corner
**Shirley Leach Haley _____ Sumter
Jonathan Robert Hendrix _____ Chester
*John Robert Hester _____ Greenville
Jesse Chappell Hiers, Jr. _____ Gaffney
*Andrew Hampton Hines III
_____ St. Petersburg, Fla.
James Glenn Holbrook, Jr. __ Greensboro, N. C.
Vicki Holcomb _____ McLean, Va.
*Sandra Hash Holeman _____ Greenville
*Gerald Brian Hough _____ Annapolis, Md.
Jonathan Frederick Houston _____ Easley
Herbert Michel Hucks III _____ Columbia
Mary Frances Ivester _____ Greenville

Lawrence Francis Janarella, Jr.
_____ Nanuet, N. Y.
Carol Anne Julian _____ Piedmont
Walter Alonzo Julian _____ Greenville
Floyd Adelbert Keith III _____ Dillon
Paul Quinn Krueger _____ Charleston AFB
Jennifer Lay Largey
_____ North Palm Beach, Fla.
Tommy Julian Lattimore, Jr. _____ Charleston
Stephen Edward Laurie _____ Eustis, Fla.
Winston Alven Lawton, Jr. _____ Estill
Susan Wallace Lile _____ Cleveland, Tenn.
Donna Sue Lisenby _____ Tucker, Ga.
Margaret Perry Lombardi _____ Clemson
Carol Rainwater McClintock _____ Ora
Robert Lee McDavid _____ Piedmont
*Peter Anthony McGuire _____ Santa Ana, Cal.
Aase Marie Nilssen McTamney
_____ St. James, N. Y.
John Thomas Mansmann _____ Trenton, N. J.
Edward Michael Markowich __ Cranford, N. J.
**John Donald Marshall _____ Spartanburg
*John Wayne Martin _____ Woodbridge, N. J.
Timothy Clyde Merrell _____ Rock Hill
Bette Jane Meyerriecks __ Ormond Beach, Fla.
Robert Patterson Mills _____ Greenville
Richard Lamar Morrell _____ Ware Shoals
Van Stephen Moss _____ Blacksburg
Frank Jack Murphy ____ Canandaigua, N. Y.
William Howard Ostendorff, Jr. __ Charleston
William Russell Poole III _____ Gaffney
**Daniel Greene Porter _____ Duncan
*Fairey Lee Prickett, Jr. _____ St. Matthews
*Louisa McGee Rice _____ Anderson
Flora Helen Martin Riley _____ Westminster
Thomas Louis Robinson _____ McDonald, Pa.
David Victor Saitta _____ Doraville, Ga.
Norman Keith Smith _____ Belton
*Joseph David Standeffer _____ Anderson
**Barbara Robinson Strack
_____ Arkadelphia, Ark.
*William David Taylor _____ Columbia
Terry Register Thomas _____ Darlington
Charlotte Elizabeth Vaughn _____ Greenville
Frederick Franklin Vollherbst
_____ Springfield, N. J.
*Patrick Robert Watts _____ Camden
Sanders Jackson Watts _____ Greenville
*Charles William Whetstone, Jr.
_____ St. Matthews
Douglas Gary Wilkerson __ North Charleston

COLLEGE OF NURSING

Geraldine Labecki, Dean

ASSOCIATE IN ARTS
Nursing

**Debra Ann Cribb _____ Florence
Patty Lynn Ellis _____ Spartanburg
Deborah Whitney Hammett _____ Anderson
Pamela Margaret Jones _____ Clemson

*Rebecca Dianne Rogers _____ Kershaw
Mary Goodwin Snelling _____ Columbia
***Barbara Mathewson Wheeler
_____ Laconia, N. H.

BACHELOR OF SCIENCE
Nursing

Mary Kathryn Kirk Douglass _____ Lancaster
Sandrea Pratt Finley _____ Clemson

Frances Elizabeth Leonard _____ Greenville

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

Henry Elliott Vogel, Dean

BACHELOR OF ARTS
Arts and Sciences

Philip Bennett DuBose _____ Sumter
Cordelia Cole Dyer _____ Greenville
Edwin DuBose Huff _____ Columbia

Grady Harrison James _____ Greenwood
Emily Peek Parsons _____ Columbia
Vera Ann Scott _____ Greenwood

BACHELOR OF SCIENCE
Botany

Winnie Barbare Gilreath _____ Travelers Rest

John Hasford Rodgers, Jr. _____ Clemson

Chemistry

James Robert Brooks _____ Greenville
John Dennis Graham _____ Charleston
Timothy Lloyd Gray _____ Manassas, Va.
*Eugene Rawson Griffin III __ North Augusta
*Bradford Lee Hair _____ Anderson

Lawrence Osborne Harper __ Charlotte, N. C.
*Cheryl Lynn Harris _____ Atlanta, Ga.
**Mark Michael Hemeyer _____ Columbia
*Jeffrey Michael Weston _____ Union

Geology

Fay Alexander Cannon _____ Greenville
*Stanley Royce Lewis _____ Aiken

David Hoke Petree _____ Tobaccoville, N. C.

Mathematics

*William Austin Alwood II _____ Sumter
**Becky Ford Brazier _____ Pickens
Patricia Anne Brown _____ Kingsport, Tenn.
*Larry William Byars _____ Gaffney
Neal Stephen Drucker _____ Charleston
James LeRoy Elsey _____ Charleston
**Steven Epps, Jr. _____ Chester
Gerald Keith Fennell _____ Greenville

Gordon Richard Grant _____ Greenville
*Max Philip Gregory _____ Spartanburg
James Harold Gully _____ Sterling, Va.
George O'Neal Hayes _____ Anderson
***Jean Marie Kuna _____ Columbia
*Edward Chester Matthews II ____ Blackville
*Michael Craig Moody _____ Dillon
Gerald Hall Robinson _____ Callison

Medical Technology

***Sandra Corley Davenport ____ Greenwood
Mary Frances Mullen _____ Greenville

**Barbara Anne Welborn _____ Pickens

Microbiology

William Allen Burke _____ Charlotte, N. C.
Julius Rance Mack _____ Walterboro

David DeKalb Parker, Jr. _____ Camden
David Wayne Russ _____ Florence

Physics

Dana R. Clarke _____ Pickens
Robert Eborn Cutting _____ Greenville
Steven Maxwell Hobson _____ Spartanburg

*John Michael Klinck II _____ Columbia
†***George Bradford Sherwood ____ Columbia

Pre-Medicine

*Stoney Alton Abercrombie _____ Six Mile
Joseph Edmund Aiton, Jr. _____ Ninety Six
William Earnest Altman _____ Florence
John Tyron Barker _____ Charleston
*Amin Bredan _____ Tripoli, Libya
*William James Brown _____ Florence
Jack Wade Brunson, Jr. _____ Columbia
*Joseph Oscar Burroughs, Jr. _____ Conway
*Robert Grady Cash _____ Lyman
Charles Milton Clark _____ Chesterfield
*Julian Spencer Dixon III _____ Lake City
Steven Thomas Epton _____ Campobello
Dean Allen Floyd _____ Loris
William Minott Gaillard III _____ Holly Hill
Robert Riddick Gatling, Jr. ____ Jackson, Miss.
Richard Hunter Gilstrap _____ Easley
*Samuel Michael Hazel _____ Hampton
**Grover Cleveland Henderson III
_____ Greenwood
**William Howard Holl III _____ Columbia
Freeman Edward Huskey, Jr.
_____ West Columbia
**George Daniel Jacobs _____ Gastonia, N. C.
*Lake Hugh Jameson, Jr. _____ Clemson
David Glenn Jennings _____ Abbeville
James Michael Johnson _____ Walhalla

*Jeffrey Don Kelley _____ Greenville
Edwin James Krejci _____ Pickens
Walter Mansfield Lonergan II
_____ Portsmouth, Va.
Thomas Earl Lynn _____ Winnsboro
**Rhett Cotesworth McCraw, Jr. ____ Gaffney
Edward Lawson McCready __ Pittsburgh, Pa.
**David George Monjot ___ Rocky River, Ohio
*Michael Lee Myers _____ Clemson
Thomas James O'Mahony
_____ Howard Beach, N. Y.
Gregory Paul Poudevigne _____ Dallas, Tex.
Jerry Charles Queen _____ Greenville
**John William Richards, Jr. _____ Kershaw
*Thomas Bradford Scott, Jr. _____ Lake View
Carroll Lewis Sexton, Jr. _____ Greenwood
*Charles Craig Stafford ____ Lexington, N. C.
*Philip Carlton Thompson _____ Pendleton
*John Hampton Warner _____ Greenwood
*William Reece Warner _____ Greenwood
*Henry Michael Webb _____ Hartsville
*Julius Warren Welborn III
_____ Jamestown, N. C.
***Jerome Colvin Wells _____ Orangeburg
*Robert Terrell Wilkins _____ Greenville

Zoology

*Samuel Broughton Baker, Jr. _____ Estill
Charles Alan Berkovich __ Washington, D. C.
Robert Anthony Bessent _____ Baltimore, Md.
***Clifford Stuart Bristol ___ Tallahassee, Fla.
Murray Fred Brown, Jr. _____ Greenville
**Janet Rae Cantrell _____ Seneca
Frederick Emmett Ducey III _____ Ridgeland
Robert Edward Duncan _____ Orangeburg
*Herbert Galen Grantham __ North Charleston
Frank Russell Graybeal, Jr. _____ Sumter
**Nancy Chloe Greene _____ Central
**William Manchester Hudson __ Spartanburg
Dawn Caroline Jones _____ Aiken
Willie James Kelley, Jr. _____ Olanta
Ronald William Kinney _____ Charleston

*Gerald Vance Lundy ____ Rocky Mount, N. C.
Thomas Arthur Malone ____ Ocean City, N. J.
Carter Eaves Montgomery _____ Columbia
Robert Edward Moore, Jr. _____ Bishopville
*Lewis Gerald Moss _____ Greenville
Joe Crawford Neely _____ Rock Hill
William Rufus O'Daniel _____ Carlisle
James Morrison Poole _____ Raleigh, N. C.
**Rupert Lanice Poston, Jr. _____ Lake City
Glenn Edward Price _____ Abbeville
Joan Honore Rapp _____ Hampton
Richard Thomas Renfrow III _____ Columbia
*Robert Holland Smith _____ Atlanta, Ga.
*Edgar Leland Talbert _____ McCormick
**Thomas Oliver Young _____ Brunson

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*With honor
**With high honor
***With highest honor
†With departmental honors

MASTERS' DEGREES CONFERRED MAY 5, 1972

Arnold Edward Schwartz, Dean, Graduate School

COLLEGE OF AGRICULTURAL SCIENCES

MASTER OF AGRICULTURE

Rowland Poole Alston _____ Rembert

George Morrell _____ Matawan, N. J.

William Pierce Yates _____ Sumter

MASTER OF SCIENCE

Agricultural Economics

Richard Gaines Dobbins _____ Townville

Charles Russell Holland _____ Clinton

William Joseph Steele _____ Arlington, Va.

Agronomy

Marion Aaron Langston _____ Dillon

Animal Science

Larry Neal Atkinson _____ Jefferson

Clark Edwin Woods _____ Fountain Inn

Entomology

David Craig Sheppard __ Winston-Salem, N. C.

Horticulture

Stephen Floyd Angley _____ Lenoir, N. C.

John Alex Floyd, Jr. _____ Selma, Ala.

Louis Bernard Lynn _____ Darlington

COLLEGE OF ARCHITECTURE

MASTER OF ARCHITECTURE

Robert Lester Chartier _____ Shelby, N. C.

MASTER OF CITY AND REGIONAL PLANNING

Phillip Calhoun Goff _____ Blythewood

David Vernon Plaisted _____ Decatur, Ga.

Timothy Hammond Powell __ Garrett Park, Md.

COLLEGE OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION

(Agricultural Education is jointly administered by the College of
Agricultural Sciences and the College of Education.)

Fred Simmons Wilkins, Jr. _____ Blacksburg

MASTER OF EDUCATION

Brenda Bryant Barton _____ Anderson
George Clarence Bedenbaugh ____ Newberry
Carolyn Huguley Borders ___ Charlotte, N. C.
Vicki Phillips Calhoun _____ West Union
Margaret Atkin Cole _____ Belton
DeWitt Creveling _____ Dunwoody, Ga.
Evelyn Black Edgar _____ Seneca
Elwood Lovell Fairbrother, Jr.
_____ Worcester, Mass.
Helen Christine Fowler _____ Greenville
Grady Truman Gambrell _____ Donalds
Dixie Smith Ham _____ Madison
Patrick Bradley Harris, Jr. _____ Anderson
Mary Barnes Hayes _____ Greer
Jane Elizabeth Huggin _____ Gaffney
Walter Jennings Johnson, Jr. _____ Columbia
Suzanne Camille Keller _____ Monroe, La.
Richard David Klein _____ Hollywood, Fla.
Alice Lowe McCoy _____ Belton
George Henry McKinney _____ Hodges
George Kameil Maertens _____ Seneca
Sybil Campbell Martin _____ Anderson
Ernest Glenn Padgett _____ Branchville
Ronald William Parker _____ Anderson
Joyce White Pearson _____ Piedmont
George Davis Philips _____ Sumter
Paulette Butler Powell _____ Anderson
Floyd Thomas Rogers _____ Liberty
John Wylie Ross _____ Taylors
Donald Glen Singletary _____ Miami, Fla.
Mendel Harold Stewart _____ Liberty
Sam Edward Strauss, Jr. _____ Due West
Robert Eugene Strum _____ Greenville
Goodwin Grove Thomas, Jr. _____ Rock Hill
John Fletcher Townsend, Jr. ____ Bennettsville
James Lanier Wannamaker, Jr. __ St. Matthews
Donna Lynne Wilson _____ Taylors
Charles Arthur Wooten _____ Greenville

MASTER OF INDUSTRIAL EDUCATION

Kirk Morgan McCloskey __ Washington, D. C.
Robert Earle Templeton _____ Ninety Six

COLLEGE OF ENGINEERING

MASTER OF ENGINEERING

Wayne Franklin Brimer ___ College Park, Ga.
Anantapakdi Chotimongkol
_____ Bangkok, Thailand
John Clifton Hawkins _____ High Point, N. C.

MASTER OF SCIENCE

Bioengineering

Joel Robert Matthews _____ Ft. Myers, Fla.

Ceramic Engineering

Joseph Allen Carroll _____ Chester

Chemical Engineering

Harold Ciremba Amick, Jr. _____ Orangeburg
William Barkley Begg _____ Spartanburg
Charles Harold Gooding _____ Hampton
Earle Dendy Sloan, Jr. _____ Columbia

Civil Engineering

Arthur Bancroft de Laski __ Bay Village, Ohio
Norris Keenon Hook, Jr. _____ Seneca
Hodgdon Christian Nuckols, Jr. ____ Columbia
David Earl Yount _____ Spartanburg

Electrical Engineering

William Lawrence Calkins _____ Winnsboro
Glen Edwin Singletary _____ Miami, Fla.

Engineering Mechanics

George Farquhar Miller, Jr. _____ Greenville

Environmental Systems Engineering

George William Fletcher _____ Seminole, Fla.
Perry Dean Holcombe _____ Spartanburg
James Madison Longshore _____ Newberry

Mechanical Engineering

Prashant Prabhakar Mulay __ Bombay, India
Mark Harris Tennant _____ North Augusta

COLLEGE OF FOREST AND RECREATION RESOURCES

MASTER OF SCIENCE
Forestry

William Rutledge Thomas _____ Carlisle

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF ARTS
Economics

William David Mulkey _____ Weogufka, Ala.

MASTER OF SCIENCE
Management

John Oliver Avinger _____ Orangeburg
Wilhelm Andreas Haberkorn
_____ Neuburg, Germany

John Gordon Hammond, Jr. ____ Sandy Springs
John Erwin Waskow _____ Two Rivers, Wis.
Boliver Heyward Wilhite _____ Walhalla

Textile Chemistry

Robert William Millar _____ Pickens

Textile Science

John William Gambrell _____ Great Falls
Kenneth Bruce Hayes _____ Pickens

Kenneth Benjamin Higgins __ Dahlonega, Ga.

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS
English

Beatrice Shillito Ward _____ Greenville

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE
Chemistry

David Everett Dalsis _____ Miami, Fla.
Norma Gayle Golden _____ Aiken

Tzun-Ming Michael Hsu _____ Taipei, Taiwan
Joseph Eugene Sabaitis, Jr. _____ Carlisle, Pa.

Mathematics

Bruce Robert Auerbach _____ Maywood, N. J.
Robert Lester Clyde _____ Nuremberg, Pa.
Douglas Edwin Huffman _____ Malvern, Ark.
James Garvis Hulsey, Jr. _____ Amite, La.
Daniel Albert Kliamovich __ Hunlick Creek, Pa.

Frances Lynn Laurey _____ Charleston
Michele Colonel Lopez _____ Dallas, Tex.
Kathrine Anne Poston _____ Lake City
John Elwood Seeger, Jr. _____ Metaire, La.
Camilla Diane Turner _____ Minden, La.

Zoology

Stephen Richard Burns _____ Kingsport, Tenn.

Joan Blaney Chadbourn ___ Maxville, Ontario

DOCTORS' DEGREES CONFERRED MAY 5, 1972

Arnold Edward Schwartz, Dean, Graduate School

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

Stephen Paul Graef _____ Louisville, Ky.
B.S., Valparaiso University; M.S., University of Cincinnati
Dissertation: Dynamics and Control Strategies for Anaerobic Digester (Field of Specialization: Environmental Systems Engineering)

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY

Engineering Management

David Raymond Gentry _____ Greenville
B.S., Clemson College; M.S., Institute of Textile Technology
Dissertation: An Evaluation of Selected Models for Analyzing the Economic Aspects of Industrial Research

Howard Thomas Jones _____ East Flat Rock, N. C.
B.S., Western Carolina College
Dissertation: Forecasting Technological Change in the Lighting Fixture Industry

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY

Chemistry

James Edward Bostic, Jr. _____ Bennettsville
B. S., Clemson University
Dissertation: The Effects of Triphenylphosphine Oxide on the Thermal Decomposition and Combustion of Poly (ethylene terephthalate)

Leon Thomas Holst _____ Charleston
B.S., College of Charleston; M.S., Clemson University
Dissertation: Mechanistic Studies on the Rearrangement of 2-Bromobicyclo (3;1·0) Hexane-3-one

Arthur James Pendleton, O.S.B. _____ Belmont, N. C.
B.S., Rhode Island School of Design; M.S., Institute of Textile Technology; M.S., University of Notre Dame
Dissertation: A Thermodynamic Study of Basic Dye Sorption on Chemically Modified Cotton

Zoology

Harry Michael Langley _____ New Braunfels, Tex.
B.S., Texas Lutheran College; M.S., Clemson University
Dissertation: The Effect of Various Exteroceptive Stimuli on Reproductive Maturation of the Female Granary Weevil, **Sitophilus granarius**

CLEMSON AND FURMAN

MASTER'S DEGREE CONFERRED MAY 7, 1972

MASTER OF BUSINESS ADMINISTRATION

Guy Pierre Canavaggio...Republic of Panama
Barry Howard Draisen ....Greenville, S. C.
Kenneth Halstone Galloway...Greenville, S. C.
Michael Robert Hoffman ....Spartanburg, S. C.
Virgil Padgett McCormick ....Anderson, S. C.
James Marshall Roberts ....Taylors, S. C.
William Francis Welsh, II ....Hendersonville, N. C.

ASSOCIATE AND BACHELORS' DEGREES CONFERRED AUGUST 5, 1972

COLLEGE OF AGRICULTURAL SCIENCES

Luther Perdee Anderson, Dean

BACHELOR OF SCIENCE
Agricultural Economics

Jones Robert Dempsey, Jr. _____ Barnwell
William Norris Edwards _____ Mullins
James Ira Kinard _____ Newberry

John Marshall Scott _____ Lakeview
William Patrick Williamson _____ York

Animal Science

Henry Flynn DeVore _____ Reddick, Fla.
Jesse Claude Eargle _____ Jackson
Russell Edward Francis _____ Neptune, N. J.

Thomas Eugene Martin _____ Anderson
Ronald Norris Spangler ____ Lawndale, N. C.

Biology

Stanley Hammond Childers _____ Great Falls

Dairy Science

Gordon Michael Blanton _____ Charleston

Food Science

*Herbert Sanford Davis _____ Clemson

Horticulture

Robert Mundy Wilkinson III _____ Walterboro

COLLEGE OF ARCHITECTURE

Harlan Ewart McClure, Dean

BACHELOR OF ARTS
Pre-Architecture

George Walther Black III ___ Baltimore, Md.
Wayne Hargrave Camas __ Hempstead, N. Y.
Charles Henry Clinchard
_____ Guayama, Puerto Rico

William Charles DuBois ____ Bridgeton, N. J.
Helen Adair Massey _____ Charlotte, N. C.
Salvatore Carl Papa _____ Bethpage, N. Y.
Lawrence Stuart Watts __ Morris Plains, N. J.

BACHELOR OF SCIENCE
Building Construction

Jesse William Myers ____ Chattanooga, Tenn.
William Heyward Neely, Jr. _____ Rock Hill
John Everette Peake _____ Pauline

Frederick George Rehm III _____ Camden
Nathaniel Spells _____ Columbia
Stephen Griffin Wray _____ Gaffney

Pre-Architecture

Charles Murry Compton _____ Lexington

BACHELOR OF ARCHITECTURE

Carlton Gary Fleetwood _____ Aiken
James Andrew Henderson __ Kingsport, Tenn.

Charles Harold Owens _____ Clemson

COLLEGE OF EDUCATION

Harold Fochone Landrith, Dean

BACHELOR OF ARTS
Early Childhood Education

*Harriet Jeter Rice _____ Ware Shoals

Rebecca Thomason Rouse _____ Fountain Inn

Elementary Education

Sybil Elizabeth Ausburn _____ Greenville
*Patricia Shedd Baughman _____ Barnwell
*Carolyn Welborn Bigger
_____ Murfreesboro, Tenn.
Martha Carol Blakely _____ Simpsonville
Sallie Frances Blomquist _____ Greenwood
Courtney Suzanne Patrick Burns __ Charleston
**Rachel Ann Burns _____ Taylors
Debrah Green Cockcroft _____ Travelers Rest

Robin Jane DeVaux _____ Anderson
Robin Hadden Gregg _____ Columbia
Ruth Flow Lake _____ Greenville
Georgia Frances Montgomery ____ Greenville
Jean Peters Perry _____ Cleveland, Ohio
Sandra Manley Poole _____ Clemson
Celia Gibbs Rogers _____ Savannah, Ga.
*Joanne Dail Warner _____ Clemson

Secondary Education

Mary Louise Bradford _____ Kingstree
Manuel Halbert Burdette _____ Seneca
Ernest Crawford Hughes _____ Winnsboro
Vicki Lee Lesley _____ Easley
*Kathy Jean McDonald _____ Greenville
Jacqueline Hammond Morris
_____ Altamonte Springs, Fla.
Nancy Diane Muirhead _____ Greenville

Roger Harris Mullikin _____ Starr
Sammie Julian Norris _____ Timmonsville
Harriet Evelyn Quattlebaum _____ Columbia
Dorothy Deines Richardson _____ Eastover
John Burton Romansky, Jr __ Pennsville, N. J.
Toy Tompie Sizemore, Jr. _____ Greenville
Beverley Grace Watson _____ Easley
Douglas Craig Wilson _____ Chipley, Fla.

BACHELOR OF SCIENCE
Agricultural Education

(Agricultural Education is jointly administered by the College of
Agricultural Sciences and the College of Education.)

Bobby Ray Anderson _____ Manning
Robert Lee Bowie _____ Due West
Keith Randy Cain _____ Saluda

Lyman Bruce Puette, Jr. _____ Jackson
George Daniel Wheeler _____ Saluda

Industrial Education

Robert Donnie Ashworth _____ Hampton
John Van Barker, Jr. _____ Simpsonville
James Carl Coleman _____ Abbeville
James David Hall _____ North Augusta
George Harold Nelson _____ Central

David Dantzler Page, Jr. ____ Moncks Corner
Johnny Riley Ray _____ Olar
Michael Rudolph Simmons _____ Liberty
David Robert Smith _____ Spartanburg
William Grady Snipes _____ West Pelzer

Science Teaching

Stuart Jay Bennett _____ Columbia
Graham Talbot Douglass, Jr.
_____ Southern Pines, N. C.

Richard Albert Furst _____ Warwick, N. Y.
Carol Patricia Robinson _____ Lancaster

COLLEGE OF ENGINEERING

Linvil Gene Rich, Dean

BACHELOR OF SCIENCE
Agricultural Engineering

(Agricultural Engineering is jointly administered by the College
of Agricultural Sciences and the College of Engineering.)

Foster DesPortes Coleman _____ Hopkins

Ceramic Engineering

Charles Branch Davison ____ Asheville, N. C.
William Thomas Drennan _____ Rock Hill

George Taylor Newell _____ Moncks Corner

Chemical Engineering

Taylor Dean Feaster _____ West Columbia
Raymond Rodney Kimmitt _____ Liberty

Patrick Lee Koppel _____ Pittsburgh, Pa.
*Jerome Weston Massie IV ____ Parlin, N. J.

Civil Engineering

Stephen Danner Alexander _____ Iva
Joe Henry Baird _____ Clover
Gary Randall Baumgarner _____ West Union
Donnie Everette Browning, Jr. __ Leland, N. C.
Ronald Eugene Caldwell _____ Charleston
Steven Allen Groover _____ East Point, Ga.
Stephen Thomas Hasty _____ Camden

*Robert Patrick Hirsch _____ Myrtle Beach
Charlie Lamar Hunnicutt _____ Pendleton
William Brewster Reid, Jr. _____ Piedmont
*Michael Ralph Sanders _____ Walhalla
Irving Eugene Scaffe _____ Charleston
Jose Luis Tomas Velarde Santa Maria
_____ Lima, Peru

Electrical Engineering

Robert Stanton Hudson _____ Anderson
David Edward Lake _____ Athens, Pa.
*James Furman Poole _____ Sumter

*Donald Ray Rogers _____ Walhalla
George Gregory Smith _____ Clover
Philip Bickerton Winston ____ Jonesboro, Ga.

Mechanical Engineering

Michael Jackson Cromer _____ Greenville
Thomas Edward Fewell _____ Beaufort
Robert Patrick Goehle _____ Walhalla

Harry Vern Hall _____ Albuquerque, N. M.
John Wilson Mathews _____ Roanoke, Va.
Joseph Steven Shearer _____ Belton

Technical Operations

Edward Gene Geddings _____ Sumter

COLLEGE OF FOREST AND RECREATION RESOURCES

William Henry Davis McGregor, Dean

BACHELOR OF SCIENCE

Forestry

Dennis Donald Chandler _____ Towaco, N. J.

Robert Eugene Forbes _____ Dayton, Ohio

Recreation and Park Administration

William Thomas Bell, Jr. _____ Piedmont
Bruce Oliver Brown _____ Ware Shoals
Dana Andrew Carver _____ Ft. Knox, Ky.
Lynn Marie Catoe _____ Lugoff
Noah Bryant Cooper, Jr. _____ Mullins
Ralph Wray Daniel _____ Lavonia, Ga.
Avery Smith Dickson _____ York
James Walton Dorn _____ Charleston
Thomas Nathaniel Eaton
_____ Charlottesville, Va.
James Michael Fisher _____ Easley
Casondra Jean Frady _____ Wellford
Peter Lynn Goebel _____ Lancaster
Dale Ronald Henry ___ Maggie Valley, N. C.
Leland Arthur Jackson _____ Batesburg

Robert Joseph Jones _____ Greenville
Ronald Lyn Joyner _____ Charleston
Rodney Myron Langley _____ Darlington
Charles Michael LeGrand _____ Winnsboro
Steven Thomas Parker _____ Rock Hill
Charlie Kenneth Poole _____ Chester
Ronald Linwood Ridgeway ____ St. Matthews
Edwin Bruce Rogers _____ Clemson
Frances Ann Simon _____ Clemson
John Erston Sparks _____ Columbus, Ga.
Billy David Westmoreland _____ Greer
Mary Kathleen Wiggins
_____ Pt. Pleasant, W. Va.
John Wilbert Wood III _____ Great Falls
Betty Zane Wright _____ Holly Hill

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

Wallace Dabney Trevillian, Dean

BACHELOR OF ARTS
Arts and Sciences

Ernest Drake Curry, Jr. _____ Greenville
Robert Edward DeVaux ____ Stamford, Conn.
Laurens Prince Fouche _____ Columbia
*Boyce Fred Gregory, Jr. _____ Greenville
Thomas Caldwell Humphries __ Spartanburg
William Alvin King II _____ Greenville

Robert Eugene Long _____ Savannah, Ga.
Charles Stowe Martin, Jr. _____ Greenville
Robert Exley McCormick _____ Orangeburg
Richard Dana Richardson _____ Sumter
William Gantt Williams, Jr. _____ Sumter
Glenn Alan Woerner _____ Edison, N. J.

BACHELOR OF SCIENCE
Administrative Management

William Elmore Allison, Jr.
_____ St. Petersburg, Fla.
Ronald Patrick Brooks ____ North Charleston
Donald Walker Gibson _____ Beaufort

John Garvin McMakin _____ Tucker, Ga.
David Lee Morrow _____ Spartanburg
John Edward Norris III _____ Vance
William Buford Porterfield III ___ Greenville

Financial Management

Joe Parker League _____ Easley

Industrial Management

Richard Joseph Butler _____ Greenville
Charles Raymond Carter _____ Seneca
Bruce Cecil Cole _____ Warrenville
Lawrence Everette Davis _____ Laurens
Dominick Ralph Lombardo __ Stamford, Conn.
Robert Boyd Orr, Jr. _____ Gaffney

Benson Clayton Parrish, Jr. _____ Easley
Benjamin Lawrence Scott __ North Charleston
James Hamilton Spencer, Jr. __ Monroe, N. C.
Michael David Stroble _____ Aiken
Joseph Prevost Watson, Jr. _____ Anderson
Daniel Sheeley Wiggers _____ Pomaria

Textile Science

Pablo Tahtagian ___ Buenos Aires, Argentina

COLLEGE OF LIBERAL ARTS

Headley Morris Cox, Dean

BACHELOR OF ARTS

John Silas Bailey _____ Greenville
***Sarah Rives Barnhill _____ Clemson
David Allen Bishop _____ Greenville
Shirley Anne Bishop _____ Myrtle Beach
***Linda Annette Julian Bowie __ Greenville
Robert McPherson Burdette ____ Simpsonville
George Thomas Campbell _____ Liberty
Stephen Dean Carpenter _____ Anderson
Robert Ray DuRant _____ Myrtle Beach
William Bland Edwards _____ Johnston
Jenny Louise Evatt _____ Belton
Frederick William Faircloth III
_____ Greenville, Ala.
Mary Louise Garren _____ Clemson
Nicholas Earle Gossett _____ Greenville
Otto William Haug 'II _____ Potomac, Md.
Jonathan Marcus Hehn _____ Anderson

Edward Elden Jones _____ Salley
George Sheldon Jones, Jr. ____ Moncks Corner
William Franklin Jordan _____ Greenville
Larry Ronald Knox _____ Anderson
Paul Kenneth Krig _____ Montgomery, Ala.
Melissa Ann Masters _____ San Antonio, Tex.
Mitchell Merritt _____ Conway
David Michael Parham _____ Greenville
Jon Peter Popowski _____ Arlington, Va.
Ernest McKenzie Riley _____ Seneca
*Charlotte Richey Sams _____ Anderson
Thomas Dee Skidmore _____ Roselle, N. J.
Linda Allen Smith _____ Greenville
Richard Keels Smith _____ Walterboro
Charlotte Louise Sottile _____ Isle of Palms
John Thomas Vogler, Jr. ____ Charlotte, N. C.
Janice Louise Williams _____ Greenville

COLLEGE OF NURSING

Geraldine Labecki, Dean

ASSOCIATE IN ARTS
Nursing

Cynthia Evatt _____ Bennettsville
Carol Arnette Griffith _____ Dillon

Mary Shannon Lewis Miner _____ Allendale
Patricia Kay Timmons ____ Albemarle, N. C.

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

Henry Elliott Vogel, Dean

BACHELOR OF ARTS
Arts and Sciences

*Blanche Elizabeth Coleman _____ Florence
Alan Darryl Griffin _____ Lima, Peru

Michael Gordon Lee _____ College Park, Ga.

BACHELOR OF SCIENCE
Chemistry

James Lawson Templeton
_____ West Palm Beach, Fla.

Geology

William Dean Crandell _____ Oxon Hill, Md.   Michael Prince Harris _____ Pelzer

Medical Technology

*Suzan Grace Blessing _____ Kingsport, Tenn.

Microbiology

*Christian Claussen Patrick _____ Charleston

Physics

Joseph Gemmell Pritchard ____ Ware Shoals

Pre-Medicine

Charles Herman Andrews III _____ Sumter
Willie Edward Davis _____ Spartanburg

Howard Tawney Gilchrist, Jr. ____ Williston
Tommy Yoas Neal _____ Greenville

Zoology

Richard Terry Caldwell _____ Inman
Samuel Augustus Cheatham ____ Orangeburg
Francis Bratton deLoach, Jr. ___ Spartanburg
Steven Leslie Morgan _____ Anderson
John Denman Prince, Jr. _____ Sumter
*Beverly Jeanne Rauch _____ Columbia

Patricia Lynn Rostron _____ Clemson
William Hale Sherard III _____ West Pelzer
Pierce Lindstrom Whatley _____ Columbia
Stephen Dale Wilson _____ Anderson
O'dell Claude Zachary _____ Greenville

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*With honor
**With high honor
***With highest honor

MASTERS' DEGREES CONFERRED AUGUST 5, 1972

Arnold Edward Schwartz, Dean, Graduate School

COLLEGE OF AGRICULTURAL SCIENCES

MASTER OF AGRICULTURE

James Cleo Miller, Jr. _____ Orangeburg

Donald Lee Skelton _____ Clemson

Freddie Clinton Waltz _____ Ruffin

MASTER OF SCIENCE

Agricultural Economics

Stafford Michael Mishoe _____ Loris

Animal Science

Wayne Elwood Billon ____ New Orleans, La.

Joseph Howard Porter _____ Loris

Nutrition

Nancy Lynn Bailey _____ Wagener

COLLEGE OF EDUCATION

MASTER OF AGRICULTURAL EDUCATION

(Agricultural Education is jointly administered by the College of
Agricultural Sciences and the College of Education.)

Donald Fred Austin _____ Asheville, N. C.

Harris Lewis Beach _____ St. George

Grady Lamar Fincher _____ Sumter

James Carlisle Foster, Jr. ____ Travelers Rest

Charles Gilmore, Jr. _____ Seneca

Calbreth Hucks _____ Aynor

Phillip Wayne Malphrus _____ Ridgeland

Drewry Narvin Simpson _____ Clemson

Lucher Kenneth Snider _____ Pendleton

MASTER OF EDUCATION

Judith Thomas Alewine _____ Mt. Pleasant

Miriam Elizabeth Aston _____ Greer

Larry Dean Bagwell _____ Easley

Brenda Sue Bailey _____ Starr

Kathryn Algary Ballard _____ Greenville

Evangeline Black Blackwell _____ Greenville

Margaret Hooper Blaskowitz ____ Greenville

Edna Delores Bolling _____ Greenville

Christina Elizabeth Bost ____ Salisbury, N. C.

Shirley Tucker Campbell _____ Greenville

Thomas Vivian Campbell _____ Honea Path

Jane Bratton Camper _____ Clemson

Katherine Woodall Cartee _____ Westminster

Luther Tracy Carter, Jr. _____ Latta

Robert Bernard Cherry _____ Sumter

Frances Elizabeth Childers _____ Easley

Doris Cobb Childress _____ Walhalla

Jerry Sanders Chitty _____ Bamberg

Alfred Randolph Clarke _____ Greer

James Harrison Cleveland _____ Seneca

Eunice Genevieve Coakley _____ Greenville

Carol Brumbelow Cochran _____ Anderson

Flora Jayne Coffee _____ Anderson

Melba Blackmon Cooper _____ Piedmont

Wanda Ellen Cottingham _____ Lynchburg

David Kenneth Cox _____ Easley

Margaret Vaughan Cox _____ Anderson

Matthew Crayton _____ Belton

Barbara Elam Daniel _____ Greenville

Don Davis _____ Toccoa, Ga.

Shereford Lee Davis, Jr. _____ Union

Lawrence Joseph Delaney, Jr.

_____ Islamorada, Fla.

Alton Craig Drennon _____ Iva

Patricia Thompson Drew _____ Anderson

Bessie Louise Durham _____ Piedmont

John William Eaves _____ Belton

Mary Couturier Ellis _____ Cross

Debra Monts Fesperman _____ Clinton

Albert Nelson Friend

_____ Woodbury Heights, N. J.

Cynthia Elaine Gaffney ____ Franklin, Mass.

Alphonzo Delaney Gaines _____ Seneca

Jean Ethridge Gantt _____ Anderson

Terry Gilmore Gardner _____ Lancaster

Carolyn Lancaster Garland _____ Pauline

Dorothy Ducworth Garrison _____ Anderson

Linda Wigington Gettys _____ Due West

Ralph Cedric Gilliam _____ Travelers Rest

Donald Max Glymph _____ Westminster

Myra Harris Goforth _____ Blacksburg

Ray Alton Grant _____ Anderson

Elizabeth King Griffith _____ Williamston

Ann Felkel Haigler _____ Elloree

Michael Edward Hall _____ Honea Path

George Lucian Harrelson _____ Greenville

MASTER OF EDUCATION (Continued)

Mary Jane Hawkins _____ Central
Clovie Julia Etta Heaton _____ Easley
Dwight Hettinger _____ Plymouth, Pa.
Glenn Gary Holliday _____ Greenville
John Banner Horton _____ Vilas, N. C.
James Billy Houston _____ Easley
Christine Clark Hucks _____ Aynor
Esta Sarvis Johnson _____ Loris
Robert McCollum Johnson _____ York
Geary Cecil Jolley _____ Campobello
Nancy Roberson Jones _____ Greenville
Ian Bradley Kamen _____ Baldwin, N. Y.
Kathryn Aull Kellett _____ Columbia
Julius Kilgore _____ Greenville
William David Kimmel _____ Easley
Jo Jewell King _____ Piedmont
Martin R. Koldyke, Jr. _____ Marion, Ind.
Curtis Allen Landrum _____ Simpsonville
Stephen Parker Liberty _____ Clemson
Gail Jones Loftin _____ Taylors
Ellen Lewis Macfie _____ Greenville
Lana G. Machen _____ Taylors
Dorothy Habben Mainous _____ Greer
Luther Eugene Marlar _____ Simpsonville
Douglas Christopher Martin __ Marietta, Ga.
Frank Boulware Matthews, Jr. __ Greenwood
Walter Alexander Mayfield, Jr. ____ Anderson
Louise Callaham McCall _____ Westminster
Enoch Newton McCarter III _____ Laurens
Frederick McSwain McConnell ____ Clemson
Elizabeth Pettigrew McCord _____ Hodges
Toni Norton McCullough _____ Taylors
Larry Franklin McIntyre _____ Marion
James Lee McLeskey _____ Anderson
Betty Morgan McWhite _____ Piedmont
Kathryn Lewek Mikulak _____ Anderson
Esther Day Moore _____ Easley
Nelle Marie Mulligan _____ Greenville
Ralph Cannon Myers, Jr. _____ Scranton
Judith Babb Neuwirth _____ Greenville
Thomas Dean Owens, Jr. _____ Duncan
Robert Chandler Palmer, Jr. __ Elberton, Ga.
Charles Carroll Parnell, Jr. _____ Abbeville
Denver Wallace Patterson _____ Anderson

Wilton Earle Pearson _____ Piedmont
Mary Frances Pendergrass _____ Greenville
James Roland Perryman _____ Central
Robert Eugene Pettigrew _____ Anderson
Kenneth Terry Price _____ Gaffney
Cary Gayle Prickett _____ Greenville
Bernice Elizabeth Quarles _____ Seneca
Lenzy Sheppard Randall _____ Clinton
Stephen Charles Rausch __ Marysville, Ohio
Jerry Erskine Reagan _____ Augusta, Ga.
Eleanor Mizer Reynolds __ Coral Gables, Fla.
Florence Richbourg Roberson _____ Belton
Danny Joe Rogers _____ Westminster
Mary Jane Oliver Rowley ____ Clermont, Ga.
Georgann Schmalz _____ Niles, Ill.
Carl James Sexton _____ Simpsonville
Roger Dale Shaw _____ Williamston
William David Shirley _____ Williamston
Larry Edgar Shoaf _____ Norfolk, Va.
Carolyn Beasley Shortt _____ Laurens
Claude Sherard Simpson, Jr.
_____ Forest Park, Ga.
Walter Frank Skilton _____ Andalusia, Pa.
Edward Gerald Smith _____ Greenville
Francis Marion Smith _____ Greenville
Shirley Diane Rogers Smith _____ Seneca
Betty Whitaker Spencer _____ Greenville
John Ralph Strawhorn, Jr. _____ Greenville
Dyann Seymour Stuart _____ Anderson
Patrick Le Grande Sudduth _____ Greer
James Walter Sutherland _____ Easley
Eric Paul Thiess _____ Meadville, Pa.
Sandra Erelene Tinsley _____ Anderson
Joseph Earl Toney _____ Seneca
Kathryn Mims VanOsdell _____ Summerton
John Leon Wade _____ Central
Gary Lee Wandel _____ Greenville
Mary Lee Watson _____ Camden
Jeanette Sims Winchester _____ Liberty
Judith Wright Wolfe _____ Jonesville, N. C.
Ernest Pete Yatrelis _____ Summerville
Frances C. Young _____ Anderson
Ann Marie Ziegler _____ Chicago, Ill.

MASTER OF INDUSTRIAL EDUCATION

Randolph Chambers _____ Seneca
Jack Elbrow Ferguson _____ Sumter
Daniel Lawrence Fry _____ Kingstree
Shirley Ann Gunter _____ Fairfax, Va.
Cleveland Adger Huey _____ Anderson
Vernon Earl Jones _____ Seneca

Bruce Bill Moore _____ Laurens
Robert Rives Mullen ___ Virginia Beach, Va.
Ronald Wayne Newton _____ Clemson
Thomas Edward Pinelli _____ Pamplin, Va.
Benjamin Landis Smith ____ Zephyrhills, Fla.

COLLEGE OF ENGINEERING

MASTER OF ENGINEERING

Robert Earl Malpass _____ Cayce
Laurens M. Pitts _____ Seneca

Robert Norman Watson _____ Greenville

MASTER OF SCIENCE

Agricultural Engineering

(Agricultural Engineering is jointly administered by the College
of Agricultural Sciences and the College of Engineering.)

Richard Allen Wesley ____ Greenville, Miss.

Ceramic Engineering

Vernon Winfred Moore, Jr. _____ Andrews

Civil Engineering

William Mason Shepherd _____ Orangeburg

Electrical Engineering

James Louie Coleman, Jr. _____ Ridgeway
William Campbell Hammond, Jr. __ Piedmont
Charles Irving Houston, Jr. _____ Charleston

Cary Barksdale Miller _____ North Augusta
Filiz Ongay _____ Burdur, Turkey

Environmental Systems Engineering

Cary Arthur Counts _____ Mullins
Harold Richard Davis _____ Orangeburg
Edwin Eugene Ott _____ Laurens

Marvin Barry Rubin _____ Cumberland, Md.
Michael Knudson Stenstrom
_____ Hendersonville, N. C.

Systems Engineering

Richard Albert Schmalz, Jr. _____ Southington, Conn.

Water Resources Engineering

Richard Charles Warner _____ Chicago, Ill.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF SCIENCE
Management

William Leroy Grayson _____ Shreveport, La.
David Thomas Pitts, Jr. _____ Clinton

Arnold Elliott Willen _____ Miami, Fla.

Textile Chemistry

Harvey Steven Koenig _____ Miami, Fla.

Thomas John Reardon ____ Philadelphia, Pa.

Textile Science

Jefferson Davis Bargeron III ____ Sardis, Ga.

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS
English

Martha Grant Ruble _____ Due West

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE
Mathematics

Kathleen Ann Hall __ West Palm Beach, Fla.

Sandra Rebecca Sherriff __ Kernersville, N. C.

Microbiology

Robert Noah Moore _____ Lexington

Physics

Elisha R. Baker IV _____ Crestview, Fla.
Gary Jesse Howard Chandler ____ Fyffe, Ala.
Gordon Heyward Dechman _____ Macon, Ga.

Richard James DePuy ____ Waynesboro, Va.
Robert Frederick Preller __ New Haven, Conn.

Zoology

Richard Lemont Dales _____ Columbia

DOCTORS' DEGREES CONFERRED AUGUST 5, 1972

Arnold Edward Schwartz, Dean, Graduate School

COLLEGE OF AGRICULTURAL SCIENCES

DOCTOR OF PHILOSOPHY
Agricultural Economics

Clayton Grant _____ Dawsonville, Ga.
B.S., North Georgia College; M.S., Clemson University
Dissertation: The Charleston Area in the National Economy: An Interregional Input-Output
Study

Agronomy

William Isaac Segars _____ Commerce, Ga.
B.S., M.S., University of Georgia
Dissertation: Evaluation of the Zinc Fertility Status of Soils Using Soil and Plant Analyses

Nutrition

Charles Durham Humphrey _____ Shannon, N. C.
B.S., Pembroke State College; M.S., Clemson Univeristy
Dissertation: A Comparison of Uninfected and Protozoan Parasitized Chick Intestinal
Epithelium by Light and Electron Microscopy

Plant Physiology

Brother Elmer Brummer _____ Visalia, Cal.
B.S., University of Notre Dame; M.S., New Mexico Highlands University
Dissertation: Comprehensive Analysis of the Immune Response to DNP Conjugates of
Homologous and Autologous Serum Proteins in Rabbits

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY
Engineering

William Jackson Barnett _____ Ridgeway
B.S., Clemson University; M.S., Rutgers University
Dissertation: An Automatic System for Scoring Sleep Electroencephalograms Based on
Modified Haar Coefficients (Field of Specialization: Electrical Engineering)

James Orr Bryant, Jr. _____ Clemson
B.S., Clemson University; M.S., Rice University
Dissertation: Real-Time Simulation of the Conventional Activated Sludge Process
(Field of Specialization: Environmental Systems Engineering)

Hsin-Ih Chien _____ Taoyuan, Taiwan
B.S., National Taiwan University; M.S., University of Houston
Dissertation: A Stochastic Model for the Occurrence of Moisture in Vadose Media
(Field of Specialization: Water Resources Engineering)

Colin George Grieves _____ Stockton-on-Tees, England
B.S., University of Newcastle Upon Tyne; M.S., Clemson University
Dissertation: Dynamic and Steady State Models for the Rotating Biological Disc Reactor
(Field of Specialization: Environmental Systems Engineering)

Thomas Leiper Kane _____ Largo, Fla.
B.E.E., M.E.E., University of Florida
Dissertation: The Design of a Digital Abridged Spectrophotometer
(Field of Specialization: Electrical Engineering)

William Larry Vick _____ Camden, Tenn.
B.S., University of Tennessee; M.S., Clemson Univeristy
Dissertation: A Digital Simulation Model for Evaluating the Performance of a Mechanical
Okra Harvester (Field of Specialization: Agricultural Engineering)

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

DOCTOR OF PHILOSOPHY
Engineering Management

Juan Carlos Hernandez _____ Miami Beach, Fla.
B.S., University of Miami; M.S., Florida Institute of Technology
Dissertation; An Industrial Dynamics Analysis of Labor Turnover in a Textile Firm

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY
Mathematics

Gordon Lee Bailes, Jr. _____ Greenwood
B.S., M.S., Clemson University
Dissertation: Right Inverse Semigroups

John Alexander Bond _____ Louisburg, Mo.
B.S., Texas Technological College; M.S., Louisiana State University
Dissertation: Separation Axioms and Condensations of Topological Spaces

William Lawrence Golightly, Jr. _____ Ruston, La.
B.S., Louisiana Polytechnic Institute; M.S., Agricultural and Mechanical College of Texas
Dissertation: Linearization of Volterra Integral Equations

Carl Vinson Hinkle, Jr. _____ Staunton, Va.
B.S., Virginia Military Institute; M.S., Clemson University
Dissertation: Generalized Semigroups of Quotients

Physics

Wayne Eugene Moore _____ Trenton, Tenn.
B.S., Southwestern at Memphis; M.A., Wake Forest University
Dissertation: On the Motion of Participles in General Relativity

Zoology

Nadine Maynard Brown _____ Azusa, Cal.
B.S., Pasadena College
Dissertation: The Effects of Two Organotin Compounds on C3H Strain Mice

Henry Franklin Percival _____ Columbia
B.S., University of South Carolina; M.S., Clemson University
Dissertation: Concentrations of Selected Chlorinated Hydrocarbons in Bobwhite Quail and
Natural Quail Foods with Notes of Effects on Reproduction

ASSOCIATE AND BACHELORS' DEGREES CONFERRED
DECEMBER 21, 1972
COLLEGE OF AGRICULTURAL SCIENCES

Luther Perdee Anderson, Dean

BACHELOR OF SCIENCE
Agricultural Economics

William Shipp Daniel, Jr. _____ Nichols
Harry Lee Foy, Jr. _____ Barnwell
Samuel Edwin Grady _____ Columbia
Calvert Whitehead Huffines
_____ Southern Pines, N. C.
Howard Martin Jones _____ Garnett
Ronald Erwin Jones _____ Pickens

Agronomy

Alexander Drummond Close _____
_____ Greenwich, Conn.

Animal Science

William James Watkins _____ Batesburg
Edward Monroe Younginer III ____ Columbia

Biology

Nancy Elizabeth Harrington
_____ Canal Point, Fla.
John Thomas Walker III _____ Columbia

Dairy Science

James Chandler Yeaman ____ Durham, N. C.

Food Science

*Charles Edward Schuster _____ Hanahan

Horticulture

Gerald Brian Beaman _____ Garner, N. C.
Matthew Bernard Benjamin _____ Bowman
William Thomas Edens __ North Myrtle Beach
John Knox Jennings _____ Sumter
James Russell Kingman _____ Clemson
**Paula Ruth Monroe _____ High Point, N. C.
Thomas Leonard Senn _____ Clemson

COLLEGE OF ARCHITECTURE

Harlan Ewart McClure, Dean

BACHELOR OF ARTS
Pre-Architecture

Warren James Eng _____ New York, N. Y.

BACHELOR OF SCIENCE
Building Construction

Larry Ulmer Clark _____ Hampton
Wilbur Nelson Dulin, Jr. _____ Columbia
Floyd Douglas Hazelrigs ____ Covington, Ga.
Elliott Huger Lynam III _____ Sumter
Robert Lewis McGill, Jr. _____ Pelzer
William Frank Montgomery, Jr. _____ Boykin
James Carey O'Cain __ Hendersonville, N. C.

BACHELOR OF ARCHITECTURE

Glenn Luther Bellamy _____ Myrtle Beach
Curtis Michael Derrick _____ Woodruff
John Macdowell Graham _____ Columbia
John Thomas Suber, Jr. _____ Columbia
Thomas Trent Weinbrenner ____ Stockton, Cal.

COLLEGE OF EDUCATION

Harold Fochone Landrith, Dean

BACHELOR OF ARTS
Early Childhood Education

*Debra Carolyn Roberts _____ Lexington
**Ella Ledbetter Wyatt _____ Seneca

Elementary Education

Martha Ellen Cleveland _____ Marietta
*Jeannette Johnson Dukes _____ Easley
Mary Elizabeth Gaillard _____ Easley
**Brenda Holbrook Garner __ Bowersville, Ga.
Rebecca Hunnicutt Graham _____ Seneca
*Katherine Warren Holcombe _____ Easley
*Denise Elizabeth Johanson
_____ North Caldwell, N. J.

Susan Lynell Mixon _____ Langley
*Debra Martin Penney _____ Charleston
Jane Allred Saverance _____ Annandale, Va.
Donna Kay Shuler _____ West Columbia
*Nanette Claire Sloan _____ Union
*Belinda Polson Walker _____ Greer

Secondary Education

William Joseph Orvin Barnard
_____ Guthrie, Okla.
Carlott Ussery Beddingfield __ Asheville, N. C.
**Jane Louise Biediger _____ Greenville
*Nancy Carolyn Blakely _____ Ora
Reba Dianne Boiter _____ Piedmont
Jane Towery Chandler _____ Sumter
Dorothy Savage Drake _____ Anderson
Robert Francis Fasinski __ Green Brook, N. J.
*Phyllis Danenhower Fowler _____ Pendleton
Norman Botsford Hamilton
_____ Newport News, Va.
Stanley Phillip Hopkins _____ Royston, Ga.
Fred Randall Huffman _____ Greenville

**Jane Brown Hunnicutt _____ Seneca
*Jane Marie Lanahan _____ Greenville
*Jane Bowers Martin _____ Tallahassee, Fla.
*Thomas Edward Quinn _____ Greenville
Louise Showalter Rambo _____ Anderson
Judith Annette Ridlehoover _____ Piedmont
**Carlotta Kornahrens Rutter ___ Summerville
Nancy Anna Shugart _____ West Union
James Edwin Shute _____ Fort Mill
Harold Tappey Squires _____ Greenwood
Barry Edward Toney _____ Spartanburg
*Debra Lee Willliams _____ Greenville
Andrew Fabian Witko _____ Alexandria, Va.

BACHELOR OF SCIENCE
Agricultural Education

(Agricultural Education is jointly administered by the College of
Agricultural Sciences and the College of Education.)

David Alfonzo Abney _____ Monetta
James William Abrams _____ Ware Shoals
James Benjamin Anderson _____ Effingham
Thomas Wesley Carter _____ Chester
Coleman Walter Dangerfield, Jr.
_____ Moncks Corner

Harold Fulton Paxton _____ Brevard, N. C.
Clarence Michael Payne _____ Kershaw
*Michael Ernest Pitts _____ Greenville
Edward Peter Rodelsperger _____ Newberry
*James Randall Young _____ Kershaw

Industrial Education

Wilbur Carlyle Ardis, Jr. _____ Manning
Laurence Rhoderic Blackhurst III
_____ Buckingham Court House, Va.
Donnie Jerry Edwards _____ Greenville
Thomas Lockwood Gleaton ____ Mt. Pleasant
David Keith King _____ Taylors

Francis Harold Lanford _____ Walhalla
Randall Watson Moon _____ Anderson
Joseph Shuler Reid III _____ Woodruff
Judd Keith Scott ___ __ _____ Anderson
**Jerry Arnold Whitmire _____ Pendleton

Science Teaching

Milton Martin Epstein, Jr. _____ Atlanta, Ga.
Michael Houston Farmer _____ Taylors

Jay Milton Fleming _____ Charlotte, N. C.
Jerry McDonald Thornton _____ Pauline

COLLEGE OF ENGINEERING

James Leon Edwards, Acting Dean

BACHELOR OF SCIENCE
Agricultural Engineering

(Agricultural Engineering is jointly administered by the College
of Agricultural Sciences and the College of Engineering.)

Richard Alfred Coleman _____ Saluda

*Thomas William Plumblee __ ___ Newberry

Chemical Engineering

Michael Neal Freeland _____ Greenville
Robert Ashley Lindstedt _____ Tifton, Ga.

James Dyson Warren, Jr. ___ Charleston Heights

Civil Engineering

John Samuel Cox _____ Greenville
Millard Wilson Dowd, Jr.
_____ Burlington, N. C.
Kenneth Everette Hines _____ Macon, Ga.
William Boyleston House ___ Little Mountain
Jerry Lamar Kirkland _____ Hodges
Robert Shelley Long _____ Charleston

Melvin Samuel Merck _____ Central
James Rodney Readling _____ Florence
**William Hugh Seymour _____ Sumter
Herbert Pressley Tompkins, Jr. ___ Summerville
*Henry Madison Walters _____ Anderson
Don Alan Worley _____ Newberry

Electrical Engineering

William Barrett Alston _____ Bristol, Tenn.
Michel Archambault _____ Clinton
*Thomas Leroy Billings _____ Hanahan
William Clayton Brasington _____ Gaffney
Clifton Yates Bumgardner, Jr. ____ Lancaster
John Lamar Callaway III ____ Covington, Ga.
Bruce Edward Carter _____ Charleston
Man-Chung Joseph Chan _____ Hong Kong
*Wah Shan Chiu _____ Hong Kong
Talbert Kenneth Coker _____ Turbeville
Phil Stanley Collins _____ Branchville
Robert Allen Dickard _____ Pickens
Murrell Jay Eichelberger ___ Mount Dora, Fla.

Carlisle Edward Evans, Jr. _____ Orangeburg
Zarvis Thomas Ford, Jr. _____ Florence
Robert Shaw Garrett _____ Mountville
William Dexter Holley _____ Augusta, Ga.
Naresh Chander Jain _____ New Delhi, India
Ernest Burns Johnston, Jr. _____ Belton
Frank Charles Phelps III _____ Easley
**Carl Miller Poe _____ Clemmons, N. C.
Jerry Wayne Shaw _____ Ware Shoals
Jack Augustus Stinson, Jr. _____ Charleston
Frank Randolph Vaughn _____ Taylors
Richard Lee Wiley _____ Anderson

Engineering Analysis

Donald Bruce Fore _____ Georgetown
Shellie McRoy Sauls _____ Mullins

Raymon Philip Spreen _____ Lincoln, Mass.
Lee Edward Wheatley _____ Augusta, Ga.

Mechanical Engineering

Edwin Lee Blackwell _____ Hanahan
William Arthur Campbell III _____ Hull, Ga.
Michael Paramore Keys _____ Walhalla
Andrew William Lucot III __ Edgewood, Md.
John Michael McConnell _____ Anderson

Raymond Keast Piatt _____ Durham, N. C.
Riggie Claydale Smith _____ Greenville
Raymond Ruebush Whitt, Jr. _____ Easley
Sidney Earl Windham _____ Lamar
Deward Boyce Woolbright III __ Spartanburg

Technical Operations

Thomas Blackburn ___ Morehead City, N. C.
Wilson Blackburn ____ Morehead City, N. C.
John Barry Greene _____ Greenville
Tony Warren Parker _____ Bamberg

Alvin Everett Saunders, Jr. _____ Orangeburg
Michael Floyd Watson _____ Easley
John Nicholas Whalen _____ Greenville

COLLEGE OF FOREST AND RECREATION RESOURCES

William Henry Davis McGregor, Dean

BACHELOR OF SCIENCE
Recreation and Park Administration

Jimmy Michael Arflin _____ Anderson
John David Brunjes, Jr. _____ Savannah, Ga.
Frank William Chandler III _____ Sumter
John Joseph Criscione, Jr. _____ Chester
Peter John Galuska _____ Rochester, Minn.
William Daniel Grogan _____ Liberty
Willard Harley Hayes _____ Gaffney
Michael Lee Henderson _____ Clemson
Richard Wilkie Ploof _____ Greenville
Thomas Marion Robinson _____ Clover

Richard deCastrique Rusher _____ Columbia
Michael Francis Scanlan III
_____ Texarkana, Tex.
Steven Randolph Sholl _____ Crofton, Md.
Bernard Craig Thomas _____ Rock Hill
Richard Ashton Traynham _____ Greenville
Thomas Miles White, Jr. _____ Sumter
Keith Maxwell Wilson _____ Atlanta, Ga.
George Dennis Zatezalo _ ___ Aliquippa, Pa.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

Wallace Dabney Trevillian, Dean

BACHELOR OF ARTS
Arts and Sciences

James Wilson Bigby _____ Greenville
*Catherine Jean Conover __ Tallahassee, Fla.
Thomas Keith Ford _____ Fairforest
Robert Douglas Goshorn _____ Summerville

David Denniston Peake __ Pt. Pleasant, N. J.
Jay Stanley Phillips _____ Rockville, Md.
Richard Carroll Power _____ Laurens
Steven Kelton Quattlebaum _____ Manning

BACHELOR OF SCIENCE
Administrative Management

Jimmy Dale Ballard _____ Greenville
Charles Benson Duncan, Jr. _____ Greenville
Harold Michael Gainey _____ Hartsville
John Daniel Garrison _____ Piedmont
George Martin Gilchrist _____ Orangeburg
Dale Alan Hampton _____ Easley

Joseph Edwin Harper _____ Greenville
Albert Lawrence Hunt __ Orchard Lake, Mich.
Robert Terry Levine _____ Allentown, Pa.
Arthur Lee Linhart _____ Pittsburgh, Pa.
Robert Edward Sink, Jr. _____ Charleston
Thomas Burwell Smith _____ Laurens

Financial Management

Billy Ross Caton, Jr. _____ Anderson
Don Ramsey Holder _____ Greer

George Arthur Pappas _____ Charleston
David Lee Singleton _____ Greenville

Industrial Management

Michael Harry Barnhart _____ Cheraw
Richard Glenn Bolt _____ Greenwood
William Ross Brewer _____ Allendale
George White Copeland _____ Clinton
Robert James Fairey _____ Orangeburg
Charles Henry Herron ____ Charleston Heights
Joseph Steven Holcombe _____ Greenville
*James Graham Jackson _____ Hampton
Ernest Franklin Livingston _____ North

Carl Smith Matheny, Jr. _____ Greenville
Dennis Ray Moore _____ Greenville
Eric Charles Randall _____ Aiken
Joseph William Reynolds _____ Hanahan
Samuel Edward Smith, Jr. _____ Lake City
William Robert Thomas _____ Charleston
William David Thrailkill _____ Greenville
Lawrence Lee Unger _____ Greenville
Russell Stuart Williams _____ Greenville

Textile Science
Thomas Wickliffe Allgood ____ Elberton, Ga.

COLLEGE OF LIBERAL ARTS

Headley Morris Cox, Dean

BACHELOR OF ARTS

Joseph Michael Agusiewicz __ Annandale, Va.
***Michal Lucile Baird _____ Darlington
Randy Lee Beckwith _____ Fairfield, N. J.
Rebecca Roy Benfield _____ Brevard, N. C.
**Alice Margaret Bridges _____ Greenville
William Lide Bryant _____ Bishopville
*Deborah Ann Burnette ____ Cleveland, Tenn.
*Virginia Filling Clinchard _ New Bern, N. C.
***Carolyn Harrison Constantin __ Largo, Fla.
Judith Marquis DeHoff ____ Manhasset, N. Y.
William Dale Gilbert _____ Florence
Cheree Gillespie _____ Carlisle Barracks, Pa.
*Ronald William Grant _____ Pickens
*Sally Henry _____ Spartanburg
Junius Stephen Hopper _____ Anderson
Thomas Martin King _____ Travelers Rest
**Charles Edward Latimer _____ Bishopville

Steven Jay Lewter ____ Stone Mountain, Ga.
Lynn Williams Lindstedt _____ Anderson
*Beverly Ann Lusk _____ Pendleton
Henry Mahone Moody, Jr. _____ Cayce
Daniel William Raymond Moore
_____ North Myrtle Beach
Charlie Stephen Oliver _____ Duncan
James Edwin Porter III _____ Lexington
Bruce Walker Price, Jr. _____ Anderson
Edwin Page Rogers, Jr. _____ Mullins
*Gail Marie Roup _____ Waynesboro, Va.
Claude Wilson Southard, Jr. __ North Augusta
Karen Ellis Stuart _____ Greenwood
Murray Redmon Todd _____ Norfolk, Va.
Fran Williams _____ Charleston
Melinda Harrelson Zipf _____ Greenville

COLLEGE OF NURSING

Geraldine Labecki, Dean

ASSOCIATE IN ARTS
Nursing

Debra Ailene Webb _____ Hartsville

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES
Henry Elliott Vogel, Dean

BACHELOR OF ARTS
Arts and Sciences

Patricia Lynn Shaw _____ Gastonia, N. C.   *Patricia Bailey Wayne ____ Magnolia, Mass.

BACHELOR OF SCIENCE
Chemistry

*Danae Georges _____ Clearwater, Fla.   Kenneth Wayne Putman _____ Blacksburg

Mathematics

*Robert Willimon Leonard, Jr. __ Spartanburg   **Patricia Ann Smith _____ Summerville
John Phillip Martin _____ Seneca   Thomas Klugh Turner III _____ Greenville

Medical Technology

Yan Ellen Chiu _____ Hong Kong

Microbiology

John Caswell Barron _____ Columbia   Carol Ann Holder _____ Columbus, Ga.
Terry Quinton Hiers _____ Henderson, Tex.   *Mary Frances Noel _____ Hopkinsville, Ky.

Physics

Milton Lamar Fulghum, Jr. __ North Augusta

Pre-Medicine

Andrew Steven Avant _____ Hampton   Dennis Hill Edwards, Jr. _____ Greenville
*George Louie Chandler _____ Belton   Gregory David Laur _____ Summerville
James Daniel Coke _____ Six Mile   James Patrick Shealy III _____ Rock Hill
Willard Wayne Cooper _____ Greenville   Richard Edward Sillivant, Jr. _____ Charleston

Zoology

**James Liguori Brannen ____ Bellevue, Nebr.   Peter Steven Mowlajko _____ Barnwell
**Karen Wolff Dozier _____ Mystic, Conn.   Carlton Douglas Ouzts ____ Monroeville, Pa.
Francis Simons Hane _____ Ft. Motte   Sallie Ann Sturgis _____ Rock Hill
Palmer Eric Krantz III _____ Columbia   Terry Wayne Taylor _____ Greenville

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*With honor
**With high honor
***With highest honor

MASTERS' DEGREES CONFERRED DECEMBER 21, 1972

Arnold Edward Schwartz, Dean, Graduate School

COLLEGE OF AGRICULTURAL SCIENCES

MASTER OF AGRICULTURE

Gerald Ray Burkett _____ Cayce
Joseph Eugene Cely _____ Easley
Edward Benson Earle, Jr. _____ McBee
Ellen Johnson Hall _____ Aiken

Darrel Hunt _____ Kimper, Ky.
Roger William Mudd _____ Bennettsville
Charlene Nash Youngblood _____ Columbia

MASTER OF SCIENCE

Animal Science

Charles McHenry Banks _____ Chester

William Rogers Boone _____ Clemson

Horticulture

Harry Max DuBose _____ Myrtle Beach

Plant Pathology

William Kenneth Glenn, Jr. _____ Starr

Poultry Science

David Michael Holbrook ____ Asheville, N. C.

Wilbur Kearse Milhous _____ Olar

Wildlife Biology

Bruce Donald Snyder _____ Columbia

COLLEGE OF ARCHITECTURE

MASTER OF ARCHITECTURE

Paul Byron McClanahan _____ Erwin, N. C.

COLLEGE OF EDUCATION

MASTER OF EDUCATION

Catharine Thomas Abbott _____ Central
Fred Girardeau Auld III _____ Columbia
Linda King Banks _____ Live Oak, Cal.
Kathleen Wood Brown _____ Anderson
Elizabeth Martin Cornwell _____ Anderson
Betty McCallum Fort _____ Greenville
Mary Ann Franklin _____ Greenwood
Cherry Summers Garrison _____ Pendleton
Linda DeLooper Garvin _____ Tampa, Fla.
James Ambros Gilstrap, Jr. __ Travelers Rest
Beverly Wallace Harris _____ Anderson
Amos Hykes _____ Greencastle, Pa.
Andrew Patrick Inabinet _____ Orangeburg
Eddie Jones, Jr. _____ Greenville
James Edward Keller _____ St. Matthews
Paul Michael Kelly _____ Anderson
George Hilliard Knight _____ North Augusta
Benjamin Levi Knighton, Jr. _____ Woodruff

Jimmye McFarland Laycock __ Hamilton, Va.
Jack William Littlefield _____ Greer
William Duane Loftis _____ Anderson
Martha Linda Lusk _____ Central
Susan Elaine McFall _____ Greenwood
Vivian Whitten Owens _____ Walhalla
Claude Aubrey Parks III ____ Charlotte, N. C.
Charles William Patterson, Jr. ____ Greenville
Jean Kennerly Pendergrass _ Gainesville, Ga.
Melvin Harrison Poore _____ Anderson
John Sanders Reeves, Jr. _____ Pendleton
Clinton Audis Richardson _____ Seneca
Byrd Smith _____ Belton
Joanne Mater Thomas _____ Simpsonville
Carol Marilyn Walker ____ Englishtown, N. J.
Rose Alethia Walker _____ Taylors
Nancy Smith Wilkinson _____ Pendleton
William Herbert Woolbright _____ Abbeville

MASTER OF INDUSTRIAL EDUCATION

Richard Himes Bellflower _____ Easley

J. P. Camp _____ Winnsboro

COLLEGE OF ENGINEERING

MASTER OF SCIENCE
Agricultural Engineering

(Agricultural Engineering is jointly administered by the College
of Agricultural Sciences and the College of Engineering.)

William Armstrong Balk _____ Augusta, Ga.   Andrew Gilbert Jordan _____ Louisville, Ga.

Bioengineering

Thomas Lee Broadwell ____ Forest Park, Ga.   Michael Gene Waldon ____ Terre Haute, Ind.
Mao-yao Huang _____ Ching Shui, Taiwan

Ceramic Engineering

Fisk Outwater _____ Jacksonville, Ark.

Civil Engineering

Joseph Oscar Conn _____ Charlotte, N. C.

Electrical Engineering

John Drayton Bullock, Jr. __ Clearwater, Fla.

Environmental Systems Engineering

William Wade Clarkson _____ Columbia   Paul Edward White, Jr. __ Silver Spring, Md.
William Charles Hiatt _____ Walkerton, Ind.

Materials Engineering

Coimbatore Venkateswaran Iswaran _____ New Delhi, India

Mechanical Engineering

Jerry Lynn Cooper _____ Rock Hill   Daniel Lawrence Ferguson
_____ Charleston Heights

Water Resources Engineering

Thomas Gilbert King   David Michael Koss _____ Amawalk, N. Y.
_____ Maidstone, Kent, England   Forrest Monroe Whittington _____ Loris

COLLEGE OF FOREST AND RECREATION RESOURCES

MASTER OF SCIENCE
Forestry

Kenneth Albert Sterling ____ Pittsfield, Mass.

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

MASTER OF SCIENCE
Management

Michael Freed Archer _____ Aberdeen, Md.   William Cone Peters _____ Charleston
James Franklin Cox III _____ Charleston   Dan Milton Earl Rogers _____ Williamston
Michael Eugene Evans _____ Timmonsville   Robert Forrest Skoog _____ Baton Rouge, La.
Jackson Edward McCann, Jr. _____ Abbeville

Textile Chemistry

Donna Dae Dowdy _____ Richmond, Va.

Textile Science

William Francis Nolan __ Willow Grove, Pa.

COLLEGE OF LIBERAL ARTS

MASTER OF ARTS
English

Dianne Grainger Butler _____ Aynor

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

MASTER OF SCIENCE
Chemistry

Howard Allen Suddeth _____ Spartanburg   Tsu-Chieh Eddy Wang ____ Keelung, Taiwan

Mathematics

Gerard Joseph Tassin _____ Vacherie, La.   Richard Carl Vaughan _____ Greenville
Carolyn Virginia Taylor _____ Greenville

Microbiology

JeMin Charles Hsu _____ Hsin-Chu, Taiwan   Sheryl Ann Lindsey _____ Maitland, Fla.

Physics

Donald Lee Foster _____ Marysville, Mich.   Jack David Heneisen _____ Memphis, Tenn.
Brian Paul-Michael Gaffney
    _____ Brockton, Mass.

DOCTORS' DEGREES CONFERRED DECEMBER 21, 1972

Arnold Edward Schwartz, Dean, Graduate School

COLLEGE OF AGRICULTURAL SCIENCES

DOCTOR OF PHILOSOPHY

Agricultural Economics

William Woodward Hall, Jr. _____ York
A.B., Presbyterian College; M.S., Clemson University
Dissertation: The Demand for Environmental Quality: Theory and Measurement

Animal Physiology

Howard David Guthrie II _____ Kellogg, Iowa
B.A., Simpson College; M.S., Clemson University
Dissertation: Superovulation in the Pig with Pregnant Mare's Serum Gonadotropin: Effect on
Plasma Hormone Concentrations and Fertility

Robert James Wordinger _____ Philadelphia, Pa.
B.S., Pennsylvania State University; M.S., Clemson University
Dissertation: Effect of Melengestrol Acetate and Undernutrition on the Bovine: I. Carbohydrate
Histochemistry of the Ampulla, Endometrium and Cervix   II. Cytophysiology of the Pars
Distalis

Entomology

Douglas Michael Gaydon _____ Powder Springs, Ga.
B.S., Presbyterian College; M.S., Clemson University
Dissertation: Studies on Behavior of the Plum Curculio, [**Conotrachelus nenuphar** (Herbst)] in South
Carolina

Nutrition

Robert Graham Bursey _____ Leominster, Mass.
B.S., North Georgia College; M.S., Medical College of Georgia
Dissertation: Effects of Maternal Ethanol Consumption During Gestation and Lactation on the
Development and Learning Performance of the Offspring

Plant Physiology

Robert Newton Ferebee _____ Denton, Tex.
B.S., McMurray College; M.S., North Texas State University
Dissertation: The Effects of Selected Herbicides on Bacterial Populations in an Aquatic Environment

COLLEGE OF ENGINEERING

DOCTOR OF PHILOSOPHY

Engineering

Kingsley Ellis Forry _____ Gahanna, Ohio
B.S., Capital University; M.S., Brevard Engineering College
Dissertation: A General Monte Carlo Simulation Model for Estimating Large Scale System Relia-
bility and Availability (Field of Specialization: Electrical Engineering)

Elton Eugene Mitchell, Jr. _____ Okmulgee, Okla.
B. S., University of Tulsa; M.S., Clemson University
Dissertation: Active Control of Machine Tools for Chatter and Surface Finish (Field of Specializa-
tion: Mechanical Engineering)

Jerald Paul Peterson _____ Syracuse, Ind.
B.S., Indiana Institute of Technology; M.S., Clemson University
Dissertation: Increase Turbulent Dispersion in Dilute High Polymer Drag Reducing Open Channel
Flow (Field of Specialization: Chemical Engineering)

Daniel Charles Stanzione _____ Hartsville
    B.S., M.S., Clemson University
Dissertation: Instructional Software in a Multimedia Classroom Environment (Field of Specialization: Electrical Engineering)

James Robert Tucker _____ Babson Park, Fla.
    B.S., M.S., University of Florida
Dissertation: The Reduction of Nitric Oxide on Activated Carbon at Elevated Temperatures
    (Field of Specialization: Chemical Engineering)

Walter Alfred Weers _____ Minneapolis, Minn.
    B.S., M.S., University of Minnesota
Dissertation: The Effect of Contacting Patterns on the Transient Response of Activated Sludge
    Systems (Field of Specialization: Environmental Systems Engineering)

COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

DOCTOR OF PHILOSOPHY
Chemistry

William Thomas Hendrix, Jr. _____ Spartanburg
    B.S., Wofford College; M.S., Clemson University
Dissertation: Reactions of Metal Carbonyls with Olefins: A Mechanistic Study

Shiva Naik Singh _____ Jaunpur, India
    B.S., Agra University; M.S., Benares Hindu University; M.S., Emory University
Dissertation: Synthetic Approaches to Ring-E of Veratramine

Mathematics

Richard Bryan Evans _____ Ridgewood, N. J.
    A.B., Catawba College; M. S., Clemson University
Dissertation: Asympototic Behavior of Perturbed Linear Functional Differential Equations

Henry Arthur Pellerin _____ Lafayette, La.
    B.S., University of Southwestern Louisiana
Dissertation: Characterization Problems in Graph Theory

Physics

William Alfred Lindstrom _____ Wetumpka, Ala.
    B.S., Auburn University; M.S., Clemson University
Dissertation: Fluxon Coupling in Superconducting DC Transformers

DEGREES AWARDED IN 1971-72 BY MAJOR COURSES

ASSOCIATE DEGREES AWARDED IN 1971-72

COLLEGE OF NURSING ... 12
Nursing ... 12

TOTAL ASSOCIATE DEGREES AWARDED IN 1971-72 ... 12

BACHELORS' DEGREES AWARDED IN 1971-72

COLLEGE OF AGRICULTURAL SCIENCES ... 79
Agricultural Economics ... 28
Agronomy ... 7
Animal Science ... 18
Biology ... 2
Dairy Science ... 3
Food Science ... 8
Horticulture ... 12
Poultry Science ... 1

COLLEGE OF ARCHITECTURE ... 64
Architecture ... 5
Building Construction ... 26
Pre-architecture ... 33

COLLEGE OF EDUCATION ... 274
Agricultural Education ... 27
Early Childhood Education ... 6
Elementary Education ... 75
Industrial Education ... 66
Science Teaching ... 15
Secondary Education ... 85

COLLEGE OF ENGINEERING ... 212
Agricultural Engineering ... 4
Ceramic Engineering ... 11
Chemical Engineering ... 31
Civil Engineering ... 54
Electrical Engineering ... 61
Engineering Analysis ... 2
Mechanical Engineering ... 37
Metallurgical Engineering ... 2
Technical Operations ... 10

COLLEGE OF FOREST AND RECREATION RESOURCES ... 99
Forestry ... 19
Recreation and Park Administration ... 80

COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE ... 172
Accounting ... 9
Administrative Management ... 19
Arts and Sciences ... 66

Financial Management 2
Industrial Management 66
Textile Chemistry 5
Textile Science 5

COLLEGE OF LIBERAL ARTS 160
Arts and Sciences 160

COLLEGE OF NURSING 3
Nursing 3

COLLEGE OF PHYSICAL, MATHEMATICAL AND
BIOLOGICAL SCIENCES 177
Arts and Sciences 13
Biology 16
Botany 2
Chemistry 11
Geology 6
Mathematics 17
Medical Technology 4
Microbiology 5
Physics 7
Pre-medicine 55
Zoology 41

TOTAL BACHELORS' DEGREES AWARDED IN 1971-72 1,240

MASTERS' DEGREES AWARDED IN 1971-72

COLLEGE OF AGRICULTURAL SCIENCES 26
Agricultural Economics 4
Agriculture 7
Agronomy 3
Animal Science 4
Entomology 2
Horticulture 3
Nutrition 2
Poultry Science 1

COLLEGE OF ARCHITECTURE 5
Architecture 2
City and Regional Planning 3

COLLEGE OF EDUCATION 229
Agricultural Education 13
Education 203
Industrial Education 13

COLLEGE OF ENGINEERING 69
Agricultural Engineering 1
Bioengineering 3
Ceramic Engineering 4
Chemical Engineering 5
Civil Engineering 9
Electrical Engineering 11
Engineering 7

DOCTORS' DEGREES AWARDED IN 1971-72

Physics 5
Zoology 3

TOTAL DOCTORS' DEGREES AWARDED IN 1971-72 40

TOTAL NUMBER DEGREES AWARDED IN 1971-72 1,679

TOTAL DEGREES AWARDED BY MAJOR COURSES, 1896-1972

Major Course

ASSOCIATE

Nursing 110

BACHELORS'

Accounting 14
Administrative Management 20
Agricultural Chemistry 102
Agricultural Economics 393
Agricultural Education 514
Agricultural Engineering 484
Agriculture 244
Agriculture and Animal Industry 80
Agriculture and Chemistry 69
Agronomy 802
Animal Science 837
Applied Mathematics 34
Architectural Engineering 118
Architecture 688
Arts and Sciences 2,078
Bachelor of Science 3
Biology 296
Botany 14
Building Construction 97
Ceramic Engineering 255
Chemical Engineering 500
Chemistry 424
Chemistry-Engineering 43
Chemistry and Geology 11
Civil Engineering 1,575
Dairy Science 410
Early Childhood Education 6
Education 242
Electrical Engineering 1,921
Elementary Education 174
Engineering Analysis 4
Engineering Industrial Education 70
Entomology 166
Financial Management 2
Food Science 23
Forestry 251
General Science 359
Geology 31
Horticulture 509
Industrial Education 505
Industrial Engineering 138

Major Course

Industrial Management	1,327
Industrial Physics	56
Mathematics	153
Mechanical and Electrical Engineering	489
Mechanical Engineering	1,650
Medical Technology	29
Metallurgical Engineering	20
Microbiology	5
Nursing	3
Physics	109
Poultry Science	54
Pre-architecture	73
Pre-medicine	632
Recreation and Park Administration	281
Science Teaching	73
Secondary Education	257
Soils	9
Technical Operations	10
Textile Chemistry	336
Textile Engineering	1,060
Textile Industrial Education	85
Textile Management	306
Textile Manufacturing	1,045
Textile Science	47
Textiles	34
Veterinary Science	16
Vocational Agricultural Education	729
Weaving and Design	42
Zoology	41

Double Majors

Agricultural Chemistry and Arts and Sciences	1
Agricultural Chemistry and General Science	1
Agricultural Economics and Animal Husbandry	1
Agricultural Economics and Vocational Agricultural Education	1
Agricultural Engineering and Civil Engineering	2
Agricultural Engineering and Electrical Engineering	1
Agricultural Engineering and Mechanical Engineering	1
Agronomy and Agricultural Education	1
Agronomy and Vocational Agricultural Education	4
Animal Husbandry and Agricultural Education	3
Animal Husbandry and Ceramic Engineering	1
Animal Husbandry and Dairy	2
Animal Husbandry and Industrial Management	1
Animal Husbandry and Vocational Agricultural Education	5
Architectural Engineering and Architecture, five-year	1
Architecture and Architectural Engineering	11
Architecture and Civil Engineering	1
Architecture, four-year, and Architecture, five-year	18
Architecture, four-year, and Mechanical Engineering	1
Arts and Sciences and Agricultural Economics	1
Chemical Engineering and Chemistry and Chemistry-Engineering	3
Chemical Engineering and Chemistry-Engineering	1
Chemistry and Agricultural Chemistry	1

Major Course

Chemistry and Chemical Engineering	1
Chemistry and Chemistry-Engineering	1
Chemistry and General Science	1
Chemistry and Industrial Physics	1
Civil Engineering and Architecture	1
Civil Engineering and Chemistry and Geology	2
Civil Engineering and Electrical Engineering	1
Civil Engineering and Industrial Physics	1
Civil Engineering and Mechanical Engineering	1
Electrical Engineering and Applied Mathematics	1
Electrical Engineering and Industrial Physics	1
Electrical Engineering and Mechanical Engineering	17
Electrical Engineering and Textile Engineering	1
Entomology and Architecture, five-year	1
Entomology and Pre-medicine	1
General Science and Ceramic Engineering	1
General Science and Education	1
General Science and Electrical Engineering	1
Horticulture and Agronomy	1
Horticulture and Architectural Engineering	1
Horticulture and Civil Engineering	1
Industrial Education and Architecture	1
Industrial Education and Electrical Engineering	1
Industrial Education and Forestry	1
Industrial Engineering and Mechanical Engineering	1
Mechanical Engineering and Textile Engineering	4
Poultry and Vocational Agricultural Education	1
Pre-medicine and Arts and Sciences	1
Pre-medicine and Textile Chemistry	2
Textile Chemistry and Civil Engineering	1
Textile Chemistry and Textile Manufacturing	1
Textile Engineering and Civil Engineering	1
Textile Engineering and Mechanical and Electrical Engineering	1
Textile Engineering and Textile Industrial Education	1
Textile Engineering and Textile Manufacturing	1
Textile Engineering and Weaving and Designing	1
Textile Manufacturing and Mechanical Engineering	1

MASTERS'

Agricultural Economics	86
Agricultural Education	102
Agricultural Engineering	41
Agriculture	7
Agronomy	32
Animal Science	33
Architecture	8
Bacteriology	6
Biochemistry	1
Bioengineering	9
Botany	4
Business Administration	7
Ceramic Engineering	68
Chemical Engineering	58
Chemistry	104

Major Course

DOCTORS'

Major Course

Physics	37
Plant Pathology	8
Plant Physiology	1
Water Resources Engineering	1
Zoology	6

TOTAL DEGREES AWARDED 1896-1972 26,140

ENROLLMENT BY COURSES AND ACADEMIC CLASSIFICATION

Fall Semester, 1972-73

Major Course	Freshman (Semester) 1st	2nd	Sophomore (Semester) 1st	2nd	Junior (Semester) 1st	2nd	Senior (Semester) 1st	2nd	Total
Agricultural Economics . . .	6	4	5	2	9	4	11	7	48
Agricultural Engineering . .	12	1	5	1	3	0	1	4	27
Agriculture	2	1	0	0	0	0	0	0	3
Agronomy	10	2	9	2	7	3	6	2	41
Animal Industries	1	0	0	0	0	0	0	0	1
Animal Science	9	8	6	6	11	3	15	5	63
Dairy Science	2	3	5	0	1	3	2	1	17
Entomology	0	0	0	2	1	1	2	3	9
Food Science	12	0	2	0	1	2	1	1	19
Horticulture	5	5	4	4	11	3	18	10	60
Plant Science	1	0	0	0	0	0	0	0	1
Poultry Science	0	1	1	0	2	0	0	1	5
Pre-veterinary	50	24	15	11	19	1	1	0	121
Sub-Total	110	49	52	28	65	20	57	34	415
Architecture	1	0	0	1	1	0	0	4°	7
Building Construction	11	13	23	7	16	4	10	15†	99
Pre-architecture (B.A.)	63	25	31	9	44	8	25	5	210
Pre-architecture (B.S.)	31	1	1	1	0	0	0	0	34
Sub-Total	106	39	55	18	61	12	35	24	350
Agricultural Education . . .	13	6	8	1	4	4	11	15	62
Early Childhood Education	58	11	21	9	20	8	15	2	144
Elementary Education . . .	116	31	63	28	76	17	58	22	411
Industrial Education	18	14	12	10	23	12	39	19	147
Science Teaching	8	2	6	4	11	3	13	7	54
Secondary Education	57	16	54	19	82	33	54	37	352
Sub-Total	270	80	164	71	216	77	190	102	1,170
Ceramic Engineering	17	5	9	2	8	3	16	2	62
Chemical Engineering	28	7	37	1	17	7	22	13	132
Civil Engineering	68	17	29	12	34	14	31	19	224
Electrical Engineering . . .	71	31	44	12	42	13	39	34	286
Engineering	21	1	0	0	0	0	0	0	22
Engineering Analysis	7	5	3	0	5	4	6	8	38
Mechanical Engineering . . .	46	11	28	13	25	18	28	20	189
Technical Operations	3	3	3	10	11	15	21	12	78
Sub-Total	261	80	153	50	142	74	163	108	1,031
Forestry	64	22	29	12	19	11	8	16	181
Recreation and Park Adm.	78	44	41	35	58	29	48	26	359
Sub-Total	142	66	70	47	77	40	56	42	540

† Includes one in the first semester of the fifth year.
° Includes four in the second semester of the fifth year.

Major Course	Freshman (Semester) 1st	2nd	Sophomore (Semester) 1st	2nd	Junior (Semester) 1st	2nd	Senior (Semester) 1st	2nd	Total
Accounting	26	11	18	10	23	10	9	3	110
Administrative Management	104	88	61	48	84	42	38	20	485
Economics	11	3	6	4	14	8	16	14	76
Financial Management	62	19	31	17	24	10	12	7	182
Industrial Management	39	8	14	10	29	23	50	34	207
Textile Chemistry	10	1	3	0	5	2	4	0	25
Textile Science	4	1	2	0	4	1	2	3	17
Sub-Total	256	131	135	89	183	96	131	81	1,102
English	47	12	35	12	32	18	11	13	180
French	1	2	3	2	0	0	3	0	11
German	1	1	1	0	2	1	0	0	6
History	49	11	19	6	9	11	11	6	122
Liberal Arts (Undeclared)	22	11	13	1	2	0	0	0	49
Political Science	69	25	34	13	40	14	22	9	226
Psychology	73	24	40	16	44	19	33	12	261
Sociology	53	13	13	13	16	6	17	4	135
Spanish	9	2	1	1	4	4	2	0	23
Sub-Total	324	101	159	64	149	73	99	44	1,013
Nursing (A.A.)	23	16	31	6	3	1	0	1	81
Nursing (B.S.)	90	21	51	6	26	5	13	2	214
Sub-Total	113	37	82	12	29	6	13	3	295
Biology	9	9	5	6	9	5	4	0	47
Botany	5	1	1	1	0	2	1	1	12
Chemistry (B.A.)	0	0	1	1	2	0	3	1	8
Chemistry (B.S.)	15	5	10	1	8	1	8	3	51
Geology (B.A.)	0	0	1	1	1	0	0	0	3
Geology (B.S.)	6	0	4	0	3	1	2	1	17
Mathematics (B.A.)	18	4	10	1	11	4	1	2	51
Mathematics (B.S.)	40	8	19	5	28	6	17	8	131
Medical Technology	55	9	17	3	11	0	2	0	97
Microbiology	33	17	23	10	17	6	11	7	124
Physics (B.A.)	1	0	0	0	0	0	0	0	1
Physics (B.S.)	9	0	5	2	9	2	4	3	34
Pre-dentistry	45	12	9	4	15	3	11	5	104
Pre-medicine	136	14	26	13	34	4	25	6	258
Pre-pharmacy	27	8	6	2	1	0	0	0	44
Zoology	46	24	37	16	43	12	29	14	221
Sub-Total	445	111	174	66	192	46	118	51	1,203
Nondegree	5	2	0	0	0	0	0	1	8
Sub-Total	5	2	0	0	0	0	0	1	8
Campus Total	2,032	696	1,044	445	1,114	444	862	490	7,127

Graduate—Master's Level	1,206
Graduate—Ph.D. Level	212
Nondegree Students	9
Postgraduates	30
Total	1,457
Campus Total	8,584
Clemson-Furman MBA	146
Greenville Campus	310
Off-Campus Institutes	468
Sumter Campus	249
Off-Campus Total	1,173
Grand Total	9,757

ENROLLMENT BY COUNTIES AND STATES

Fall Semester, 1972-73

County	
Abbeville	60
Aiken	169
Allendale	17
Anderson	649
Bamberg	29
Barnwell	38
Beaufort	32
Berkeley	67
Calhoun	26
Charleston	363
Cherokee	64
Chester	47
Chesterfield	56
Clarendon	56
Colleton	57
Darlington	117
Dillon	46
Dorchester	102
Edgefield	32
Fairfield	35
Florence	184
Georgetown	31
Greenville	1,086
Greenwood	223
Hampton	43
Horry	101
Jasper	13
Kershaw	91
Lancaster	58
Laurens	141
Lee	32
Lexington	150
McCormick	44
Marion	35
Marlboro	16
Newberry	77
Oconee	284
Orangeburg	172
Pickens	727
Richland	326
Saluda	50

County	
Spartanburg	341
Sumter	175
Union	25
Williamsburg	34
York	191
S. C. TOTAL	**6,712**

State or Country	
Alabama	28
Alaska	1
Argentina	1
Arkansas	5
California	7
Canal Zone	4
Chile	2
China	1
Colorado	4
Connecticut	47
Delaware	29
District of Columbia	14
Ecuador	2
El Salvador	2
England	3
Ethiopia	3
Florida	168
France	1
Georgia	248
Germany	1
Ghana	1
Guatemala	1
Guyana	1
Hawaii	2
Hong Kong	4
Illinois	14
India	15
Indiana	8
Iowa	4
Iran	1
Japan	1
Kentucky	17

State or Country	
Lebanon	2
Louisiana	15
Maine	3
Maryland	169
Massachusetts	29
Michigan	6
Minnesota	2
Mississippi	3
Missouri	5
Nebraska	1
New Jersey	247
New Mexico	5
New York	144
Nicaragua	1
North Carolina	216
North Dakota	1
Ohio	43
Oklahoma	4
Panama	1
Pennsylvania	130
Peru	3
Puerto Rico	5
Rhode Island	6
Sierra Leone	1
South Carolina	6,712
South Vietnam	1
Switzerland	1
Taiwan	14
Tennessee	40
Texas	8
Thailand	1
Turkey	1
Venezuela	1
Virginia	104
Washington	2
West Pakistan	3
West Virginia	7
Wisconsin	6
Wyoming	1
GRAND TOTAL	**8,584**

ENROLLMENT BY COUNTIES (GREENVILLE AND SUMTER CAMPUSES), Fall Semester, 1972-73

County	Greenville	Sumter	Total
Aiken	1	–	1
Anderson	9	–	9
Barnwell	–	1	1
Berkeley	–	2	2
Chesterfield	–	2	2
Clarendon	–	18	18
Darlington	–	3	3
Florence	–	1	1
Georgetown	–	1	1
Greenville	278	–	278
Greenwood	1	–	1
Kershaw	–	8	8
Laurens	2	–	2
Lee	–	8	8
Lexington	–	1	1
McCormick	–	4	4
Oconee	1	–	1
Orangeburg	1	–	1
Pickens	13	–	13
Richland	1	6	7
Saluda	1	–	1
Spartanburg	2	–	2
Sumter	–	193	193
Williamsburg	–	1	1
TOTAL	**310**	**249**	
SOUTH CAROLINA TOTAL			**559**

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