

# CLEMSON UNIVERSITY

## ANNOUNCEMENTS 1974-75



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

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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  
1974-75

**1973-74 RECORD—Eighty-first Year**

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South Carolina 29631.

## 1973

S	M	T	W	T	F	S
JANUARY	1	2	3	4	5	6
JULY	1	2	3	4	5	6
AUGUST	1	2	3	4	5	6
FEBRUARY	1	2	3	4	5	6
MARCH	1	2	3	4	5	6
APRIL	1	2	3	4	5	6
MAY	1	2	3	4	5	6
JUNE	1	2	3	4	5	6
SEPTEMBER	1	2	3	4	5	6
OCTOBER	1	2	3	4	5	6
NOVEMBER	1	2	3	4	5	6
DECEMBER	1	2	3	4	5	6

S	M	T	W	T	F	S
JANUARY	7	8	9	10	11	12
JULY	7	8	9	10	11	12
AUGUST	7	8	9	10	11	12
FEBRUARY	7	8	9	10	11	12
MARCH	7	8	9	10	11	12
APRIL	7	8	9	10	11	12
MAY	7	8	9	10	11	12
JUNE	7	8	9	10	11	12
SEPTEMBER	7	8	9	10	11	12
OCTOBER	7	8	9	10	11	12
NOVEMBER	7	8	9	10	11	12
DECEMBER	7	8	9	10	11	12

S	M	T	W	T	F	S
JANUARY	13	14	15	16	17	18
JULY	13	14	15	16	17	18
AUGUST	13	14	15	16	17	18
FEBRUARY	13	14	15	16	17	18
MARCH	13	14	15	16	17	18
APRIL	13	14	15	16	17	18
MAY	13	14	15	16	17	18
JUNE	13	14	15	16	17	18
SEPTEMBER	13	14	15	16	17	18
OCTOBER	13	14	15	16	17	18
NOVEMBER	13	14	15	16	17	18
DECEMBER	13	14	15	16	17	18

S	M	T	W	T	F	S
JANUARY	19	20	21	22	23	24
JULY	19	20	21	22	23	24
AUGUST	19	20	21	22	23	24
FEBRUARY	19	20	21	22	23	24
MARCH	19	20	21	22	23	24
APRIL	19	20	21	22	23	24
MAY	19	20	21	22	23	24
JUNE	19	20	21	22	23	24
SEPTEMBER	19	20	21	22	23	24
OCTOBER	19	20	21	22	23	24
NOVEMBER	19	20	21	22	23	24
DECEMBER	19	20	21	22	23	24

## 1974

S	M	T	W	T	F	S
JANUARY	6	7	8	9	10	11
JULY	6	7	8	9	10	11
AUGUST	6	7	8	9	10	11
FEBRUARY	6	7	8	9	10	11
MARCH	6	7	8	9	10	11
APRIL	6	7	8	9	10	11
MAY	6	7	8	9	10	11
JUNE	6	7	8	9	10	11
SEPTEMBER	6	7	8	9	10	11
OCTOBER	6	7	8	9	10	11
NOVEMBER	6	7	8	9	10	11
DECEMBER	6	7	8	9	10	11

S	M	T	W	T	F	S
JANUARY	12	13	14	15	16	17
JULY	12	13	14	15	16	17
AUGUST	12	13	14	15	16	17
FEBRUARY	12	13	14	15	16	17
MARCH	12	13	14	15	16	17
APRIL	12	13	14	15	16	17
MAY	12	13	14	15	16	17
JUNE	12	13	14	15	16	17
SEPTEMBER	12	13	14	15	16	17
OCTOBER	12	13	14	15	16	17
NOVEMBER	12	13	14	15	16	17
DECEMBER	12	13	14	15	16	17

S	M	T	W	T	F	S
JANUARY	18	19	20	21	22	23
JULY	18	19	20	21	22	23
AUGUST	18	19	20	21	22	23
FEBRUARY	18	19	20	21	22	23
MARCH	18	19	20	21	22	23
APRIL	18	19	20	21	22	23
MAY	18	19	20	21	22	23
JUNE	18	19	20	21	22	23
SEPTEMBER	18	19	20	21	22	23
OCTOBER	18	19	20	21	22	23
NOVEMBER	18	19	20	21	22	23
DECEMBER	18	19	20	21	22	23

S	M	T	W	T	F	S
JANUARY	24	25	26	27	28	29
JULY	24	25	26	27	28	29
AUGUST	24	25	26	27	28	29
FEBRUARY	24	25	26	27	28	29
MARCH	24	25	26	27	28	29
APRIL	24	25	26	27	28	29
MAY	24	25	26	27	28	29
JUNE	24	25	26	27	28	29
SEPTEMBER	24	25	26	27	28	29
OCTOBER	24	25	26	27	28	29
NOVEMBER	24	25	26	27	28	29
DECEMBER	24	25	26	27	28	29

## 1975

S	M	T	W	T	F	S
JANUARY	5	6	7	8	9	10
JULY	5	6	7	8	9	10
AUGUST	5	6	7	8	9	10
FEBRUARY	5	6	7	8	9	10
MARCH	5	6	7	8	9	10
APRIL	5	6	7	8	9	10
MAY	5	6	7	8	9	10
JUNE	5	6	7	8	9	10
SEPTEMBER	5	6	7	8	9	10
OCTOBER	5	6	7	8	9	10
NOVEMBER	5	6	7	8	9	10
DECEMBER	5	6	7	8	9	10

S	M	T	W	T	F	S
JANUARY	11	12	13	14	15	16
JULY	11	12	13	14	15	16
AUGUST	11	12	13	14	15	16
FEBRUARY	11	12	13	14	15	16
MARCH	11	12	13	14	15	16
APRIL	11	12	13	14	15	16
MAY	11	12	13	14	15	16
JUNE	11	12	13	14	15	16
SEPTEMBER	11	12	13	14	15	16
OCTOBER	11	12	13	14	15	16
NOVEMBER	11	12	13	14	15	16
DECEMBER	11	12	13	14	15	16

S	M	T	W	T	F	S
JANUARY	17	18	19	20	21	22
JULY	17	18	19	20	21	22
AUGUST	17	18	19	20	21	22
FEBRUARY	17	18	19	20	21	22
MARCH	17	18	19	20	21	22
APRIL	17	18	19	20	21	22
MAY	17	18	19	20	21	22
JUNE	17	18	19	20	21	22
SEPTEMBER	17	18	19	20	21	22
OCTOBER	17	18	19	20	21	22
NOVEMBER	17	18	19	20	21	22
DECEMBER	17	18	19	20	21	22

S	M	T	W	T	F	S
JANUARY	23	24	25	26	27	28
JULY	23	24	25	26	27	28
AUGUST	23	24	25	26	27	28
FEBRUARY	23	24	25	26	27	28
MARCH	23	24	25	26	27	28
APRIL	23	24	25	26	27	28
MAY	23	24	25	26	27	28
JUNE	23	24	25	26	27	28
SEPTEMBER	23	24	25	26	27	28
OCTOBER	23	24	25	26	27	28
NOVEMBER	23	24	25	26	27	28
DECEMBER	23	24	25	26	27	28

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# UNIVERSITY CALENDAR

## 1973 FIRST SUMMER SESSION

<i>May 21</i>	Registration
<i>May 22</i>	Classes begin
<i>June 27-28</i>	Examinations

## 1973 SECOND SUMMER SESSION

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

## 1973 FALL SEMESTER

<i>August 20-21</i>	Orientation, new students
<i>August 22</i>	Registration, all students
<i>August 23</i>	Late registration
<i>August 24</i>	Late registration fee applies
<i>August 24</i>	Classes begin regular schedule
<i>August 30</i>	Last day for registration
<i>August 30</i>	Last day to add a subject
<i>September 6</i>	Last day to order diploma for mid-year graduation
<i>September 20</i>	Last day to drop a subject without record of drop
<i>October 15</i>	Preliminary reports due
<i>November 12-16</i>	Preregistration
<i>November 14</i>	Last day to withdraw from the University without having grades recorded
<i>November 14</i>	Last day to drop a subject
<i>November 21</i>	Thanksgiving holidays begin after last class
<i>November 26</i>	Classes resume
<i>December 10</i>	Examinations begin
<i>December 20</i>	Mid-year graduation

## 1974 SPRING SEMESTER

<i>January 7</i>	Orientation, new students
<i>January 8</i>	Registration, all students
<i>January 9</i>	Late registration
<i>January 10</i>	Late registration fee applies
<i>January 10</i>	Classes begin regular schedule
<i>January 16</i>	Last day for registration
<i>January 16</i>	Last day to add a subject
<i>January 23</i>	Last day to order diploma for May graduation

<i>February 6</i>	Last day to drop a subject without record of drop
<i>March 4</i>	Preliminary reports due
<i>March 15</i>	Last day for undergraduates to withdraw from the University or to drop a subject without receiving final grades
<i>March 15</i>	Spring holidays begin after last class
<i>March 25</i>	Classes resume
<i>April 5</i>	Last day for graduate students to withdraw from the University or to drop a subject without receiving final grades
<i>April 10</i>	Honors and Awards Day; classes suspended at 12 noon
<i>April 15-19</i>	Preregistration
<i>April 29</i>	Examinations begin
<i>May 10</i>	Commencement

#### 1974 FIRST SUMMER SESSION

<i>May 20</i>	Registration
<i>May 21</i>	Classes begin
<i>June 26-27</i>	Examinations

#### 1974 SECOND SUMMER SESSION

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

#### 1974 FALL SEMESTER

<i>August 19-20</i>	Orientation, new students
<i>August 21</i>	Registration, all students
<i>August 22</i>	Late registration
<i>August 23</i>	Late registration fee applies
<i>August 23</i>	Classes begin regular schedule
<i>August 29</i>	Last day for registration
<i>August 29</i>	Last day to add a subject
<i>September 5</i>	Last day to order diploma for mid-year graduation
<i>September 19</i>	Last day to drop a subject without record of drop
<i>October 14</i>	Preliminary reports due
<i>October 30</i>	Last day to withdraw from the University or to drop a subject without receiving final grades
<i>November 11-15</i>	Preregistration
<i>November 27</i>	Thanksgiving holidays begin after last class

<i>December</i>	2	Classes resume
<i>December</i>	9	Examinations begin
<i>December</i>	19	Mid-year graduation

#### 1975 SPRING SEMESTER

<i>January</i>	6	Orientation, new students
<i>January</i>	7	Registration, all students
<i>January</i>	8	Late registration
<i>January</i>	9	Late registration fee applies
<i>January</i>	9	Classes begin regular schedule
<i>January</i>	15	Last day for registration
<i>January</i>	15	Last day to add a subject
<i>January</i>	22	Last day to order diploma for May graduation
<i>February</i>	5	Last day to drop a subject without record of drop
<i>March</i>	3	Preliminary reports due
<i>March</i>	14	Spring holidays begin after last class
<i>March</i>	14	Last day to withdraw from the University or to drop a subject without receiving final grades
<i>March</i>	24	Classes resume
<i>April</i>	9	Honors and Awards Day; classes suspended at 12 noon
<i>April</i>	14-18	Preregistration
<i>April</i>	28	Examinations begin
<i>May</i>	9	Commencement

#### 1975 FIRST SUMMER SESSION

<i>May</i>	19	Registration
<i>May</i>	20	Classes begin
<i>June</i>	25-26	Examinations

#### 1975 SECOND SUMMER SESSION

<i>June</i>	30	Orientation, new students
<i>July</i>	1	Registration
<i>July</i>	2	Classes begin
<i>August</i>	2	Classes meet
<i>August</i>	6-7	Examinations
<i>August</i>	9	Graduation

## BOARD OF TRUSTEES

### LIFE MEMBERS

EDGAR A. BROWN, *President of the Board*, Barnwell  
PATRICK N. CALHOUN, Charlotte, North Carolina  
ROBERT R. COKER, Hartsville  
FRANK J. JERVEY, Clemson  
PAUL W. McALISTER, Laurens  
JAMES C. SELF, Greenwood  
JAMES M. WADDELL, JR., Beaufort

### TERM EXPIRES 1976

T. KENNETH CRIBB, Spartanburg  
W. GORDON McCABE, JR., Greenville  
PAUL QUATTLEBAUM, JR., Charleston

### TERM EXPIRES 1978

LEWIS F. HOLMES, JR., Trenton  
E. OSWALD LIGHTSEY, Hampton  
D. LESLIE TINDAL, Pinewood  

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JOSEPH B. McDEVITT, *Secretary*, Clemson

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Comptroller*  
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University Counsel*  
WALTER THOMPSON COX, B.S., *Vice President for Student Affairs and  
Dean of Students*

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University Counsel*  
ELMER NEWTON TYNDALL, M.B.A., *Administrative Assistant to the  
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DOROTHY LEONORA ABBOTT, A.B., *Administrative Assistant and  
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ROBERT ALLEN BANISTER, M.S., *Director, Cooperative Education*

## Colleges

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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, College of Agricultural Sciences*

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*

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

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

\* 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.

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

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

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

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

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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*

GLENN ELMER VARENHORST, M.P.A., *Acting Head, Department of Planning Studies*

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

MORRIS AUDREY KING, Ed.D., *Head, Department of Elementary and Secondary Education*

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*

#### COLLEGE OF ENGINEERING

LYLE CHESTER WILCOX, Ph.D., *Dean, College of Engineering*

JAMES LEON EDWARDS, M.S., P.E., *Assistant to the Dean, College of Engineering*

BOBBY EUGENE GILLILAND, Ph.D., P.E., *Assistant to the Dean, College of Engineering*

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

\* On leave.

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

## 10 Administration

- 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 HENRY AUSTIN, Ph.D., P.E., *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, Continuing Engineering Education*

### COLLEGE OF FOREST AND RECREATION RESOURCES

- WILLIAM HENRY DAVIS MCGREGOR, Ph.D., *Dean, College of Forest and Recreation Resources*
- 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, College of Industrial Management and Textile Science; 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*

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- JOHN HARRISON BUTLER, Ed.D., *Head, Department of Music*
- CHARLES WYTHE DUNN, Ph.D., *Head, Department of Political Science and Sociology*
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### COLLEGE OF NURSING

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- LEON ROSWAL, M.S., *Director, Associate Degree Program in Nursing*

**COLLEGE OF PHYSICAL, MATHEMATICAL AND BIOLOGICAL  
SCIENCES**

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

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

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Microbiology*

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

\* On leave.



# 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

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, *Professor of Environmental Systems Engineering*

A.B., Lenoir-Rhyne College, 1953; M.S.P.H., 1959, Ph.D., 1963, University of North Carolina

ACKER, JAMES DAVID, *Visiting Instructor in Industrial Management*

B.S., University of South Carolina, 1958; M.Ed., Clemson University, 1965; Ed.D., North Carolina State University, 1971

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

AITKEN, JAMES BRUCE, *Associate Professor of Horticulture, Sandhill Experiment Station*

B.S., 1962, M.S., 1964, Clemson University; Ph.D., University of Florida, 1967

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, *Associate 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, MICHAEL REED, *Assistant Professor of Industrial Management*  
B.B.A., Auburn University, 1965; M.P.A., Georgia State University, 1969
- 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.
- ALPHIN, JOHN GILBERT, *Associate Professor of Agricultural Engineering, Pee Dee Experiment Station*  
B.S., 1960, M.S., 1962, Ph.D., 1965, North Carolina State University
- ALSTON, ROWLAND POOLE, *Instructor in Agronomy and Soils*  
B.S., 1970, M.Ag., 1972, Clemson University
- AMOSS, DONALD CURTIS, *Assistant Professor of Electrical and Computer Engineering*  
B.S., 1964, M.S., 1966, Ph.D., 1968, Drexel Institute of Technology
- ANAND, SUBHASH CHANDRA, *Associate Professor of Civil Engineering*  
B.S., Banaras Hindu University (India), 1955; M.S., 1965, Ph.D., 1968, Northwestern University; P.E.
- ANDERSON, LUTHER PERDEE, *Dean, College of Agricultural Sciences; Professor of Agronomy and Soils*  
B.S., 1949, M.S., 1962, Clemson University; Ph.D., University of Georgia, 1968
- ANDREWS, JOHN FRANK, *Professor of Environmental Systems Engineering*  
B.S.C.E., 1951, M.S., 1953, University of Arkansas; Ph.D., University of California, 1964; P.E.
- ANDRON, LILLIAN FREEMAN, *Part-time Instructor in Speech*  
B.S., 1969, M.A., 1972, New York University
- ANSON, EDWARD MADDEN, *Lecturer in History*  
B.A., Drake University, 1968; Ph.D., University of Virginia, 1973
- ARBENA, JOSEPH LUTHER, *Associate Professor of History*  
A.B., George Washington University, 1961; Ph.D., University of Virginia, 1970
- ARNETT, JAMES DELOS, JR., *Assistant Professor of Plant Pathology, Pee Dee Experiment Station*  
B.S., 1964, M.S., 1966, University of South Carolina; Ph.D., Clemson University, 1971
- ARNOLD, EDWIN PRATTE,<sup>o</sup> *Instructor in German*  
A.B., University of South Carolina, 1958; M.A., Kent State University, 1968
- ASHWORTH, RALPH PAGE, *Professor of Botany*  
B.S., Wake Forest University, 1939; M.A., 1945, Ph.D., 1960, University of North Carolina
- AUCOIN, CLAIRE RUSSELL, *Assistant Professor of Mathematical Sciences*  
A.B., Shorter College, 1951; M.S., Auburn University, 1954
- AUCOIN, CLAYTON VERL, *Professor of Mathematical Sciences and Industrial Management*  
B.A., Louisiana College, 1951; M.S., 1953, Ph.D., 1956, Auburn University; Post Doctorate, Stanford University, 1960-61
- AUSTIN, JOHN HENRY, *Head of Environmental Systems Engineering Department; Professor of Environmental Systems Engineering*  
B.C.E., Syracuse University, 1951; S.M., Massachusetts Institute of Technology, 1953; Ph.D., University of California, 1963; P.E.
- BAILEY, JAMES OSLER, *Lemon Professor of Literature*  
B.A., 1924, M.A., 1927, Ph.D., 1934, University of North Carolina
- BAILEY, ROY HORTON, JR., *Associate Professor of Chemistry*  
B.S., 1948, Ph.D., 1958, University of North Carolina

<sup>o</sup> On leave.

## 14 Faculty

- BAKER, DONALD NELSON, *Visiting Alumni Professor of Agriculture*  
B.S., Pennsylvania State University, 1956; M.S., 1959, Ph.D., 1962, Cornell University
- BAKER, GEORGE HOMER, *State 4-H and Youth Development Coordinator; Assistant Professor of Agronomy and Soils*  
B.S., Clemson University, 1950
- BALL, WALTER LEE, *Associate Professor of Electrical and Computer Engineering*  
B.E.E., 1949, M.E.E., 1955, Clemson University; P.E.
- BANISTER, ROBERT ALLEN, *Director of Cooperative Education; Associate Professor of Engineering Graphics*  
B.S., Clemson University, 1939; M.S., Bradley University, 1949
- BARFIELD, RAYFORD ELLIOTT, JR., *Assistant Professor of English*  
A.B., LaGrange College, 1961; M.A., University of Georgia, 1963; Ph.D., University of Tennessee, 1969
- BARKER, ROBERT HENRY, J. E. *Sirrine Associate Professor of Textile Chemistry*  
B.S., Clemson University, 1959; Ph.D., University of North Carolina, 1963
- BARLAGE, WILLIAM BERDELL, JR., *Professor of Chemical Engineering*  
B.S., Lehigh University, 1954; M.Ch.E., University of Virginia, 1955; Ph.D., North Carolina State University, 1960
- BARNETT, BOBBY DALE, *Head of Poultry Science Department; Professor of Poultry Science*  
B.S., 1950, M.S., 1954, University of Arkansas; Ph.D., University of Wisconsin, 1957
- BARNETT, ORTUS WEBB, *Assistant Professor of Microbiology, Plant Pathology and Physiology*  
B.S.A., 1961, M.S., 1965, University of Arkansas; Ph.D., University of Wisconsin, 1968; Post Doctorate, Scottish Horticultural Institute, 1968-69
- BARNHILL, JAMES WALLACE, *Assistant Professor of History*  
B.A., Presbyterian College, 1947; M.A., Northwestern University, 1949
- BARON, WILLIAM, *Associate Professor of Civil Engineering*  
B.S.C.E., City College of New York, 1960; M.S.C.E., 1963, Ph.D., 1966, Purdue University; P.E.
- BARTH, CLYDE LEWIS, *Associate Professor of Agricultural Engineering*  
B.S., University of Illinois, 1955; M.S., 1961, Ph.D., 1971, University of Wisconsin
- BARTMESS, EUGENIE VENTRE, *Instructor in Mathematical Sciences*  
B.S., 1945, M.S., 1949, Louisiana State University
- BARTON, ROBERT FREERS, *Assistant Professor of Speech*  
B.A., Western Michigan University, 1967; M.A., Bowling Green State University, 1968
- BAUKNIGHT, LEHMAN M., JR., *Professor of Agricultural Economics and Rural Sociology*  
B.S., 1935, M.S., 1949, Clemson University
- BAULD, NELSON ROBERT, JR., *Professor of Engineering Mechanics*  
B.S.M.E., 1958, M.S., 1960, West Virginia University; Ph.D., University of Illinois, 1963; P.E.
- BAUMGARDNER, REGINALD ANDREW, *Associate Professor of Horticulture*  
B.S., Clemson University, 1957; M.S., 1960, Ph.D., 1962, University of Maryland
- BAXTER, ANN WEBSTER, *Associate Professor of Microbiology*  
B.A., Rockford College, 1938; M.A.T., 1964, Ph.D., 1967, University of North Carolina
- BAXTER, LUTHER WILLIS, *Professor of Plant Pathology and Physiology*  
B.S., Eastern Kentucky State College, 1950; M.S., 1952, Ph.D., 1954, Louisiana State University
- BEARD, JOHN NELSON, JR., *Assistant Professor of Chemical Engineering*  
B.S., University of South Carolina, 1958; M.S., 1970, Ph.D., 1971, Louisiana State University
- BECKWITH, WILLIAM FREDERICK, *Associate Professor of Chemical Engineering*  
B.S., 1957, M.S., 1961, Ph.D., 1963, Iowa State University
- BELL, MARSHALL CORNETT, *Associate Professor of Mathematical Sciences*  
A.B., 1933, M.A., 1936, University of North Carolina

- BENNETT, JOHN EVERETT, *Associate Professor of Electrical and Computer Engineering*  
B.S.E.E., 1958, M.S.E.E., 1968, Ph.D., 1970, University of Tennessee
- BENSON, ROBERT TIDD, *Acting Director of Vocational Education Media Center; Associate Professor of Vocational Education*  
B.S., 1960, M.S., 1963, Cornell University; Ed.D., Pennsylvania State University, 1968
- BENTON, DON ALWIN, *Assistant Professor of Agronomy and Soils*  
B.S., Clemson University, 1941
- BERGER, LEONARD, *Assistant Professor of Psychology*  
A.B., 1968, M.A., 1969, Ph.D., 1972, Temple University
- BERNHARDT, JEANNETTE COMER, *Instructor in Nursing, Baccalaureate Program*  
B.S.N., 1970, M.S.N., 1972, University of Alabama
- BERRY, ELIZABETH BRUNSON, *Associate District Leader; Assistant Professor of Home Economics*  
B.S., Winthrop College, 1944
- BERRY, GERALD JUAN, *Assistant Professor of Military Science*  
Captain, Military Intelligence, United States Army; B.A., University of Maryland, 1965
- BEYERLEIN, ADOLPH LOUIS, *Associate Professor of Chemistry*  
B.S., Fort Hays Kansas State College, 1960; Ph.D., University of Kansas, 1966
- BIERER, BERT W., *Professor of Poultry Science*  
V.M.D., University of Pennsylvania, 1934
- BIRKHEAD, PAUL KENNETH, *Associate Professor of Geology*  
A.B., 1951, A.M., 1960, University of Missouri; Ph.D., University of North Carolina, 1965
- BISHOP, CARL BARNES, *Associate Professor of Chemistry*  
B.S., Clemson University, 1954; Ph.D., Michigan State University, 1959
- BISHOP, MURIEL BOYD, *Associate Professor of Chemistry; Director of Medical Technology Program*  
B.A., Huntingdon College, 1952; M.S., Emory University, 1955; Ph.D., Michigan State University, 1958; Post Doctorate, Yale University, 1958-59
- BLACK, JOSEPH WILLIAM, *Lecturer in Medical Technology; Co-director, School of Medical Technology, and Pathologist, Anderson Memorial Hospital*  
B.S., University of Kentucky, 1955; M.D., Bowman Gray School of Medicine, 1959
- BLACKMON, CYRIL WELLS, *Assistant Professor of Plant Pathology and Physiology, Edisto Experiment Station*  
B.S., Virginia Polytechnic Institute, 1949; M.S., Trinity University, 1953; Ph.D., Texas A&M University, 1961
- BLAIR, DUDLEY WAYNE, *Assistant Professor of Economics*  
B.S., Texas A&M University, 1970
- BLANTON, LLOYD HOUSTON, *Assistant Professor of Agricultural Education*  
B.S., 1961, M.Ag.Ed., 1968, Clemson University; Ph.D., Ohio State University, 1970
- BOATMAN, KENNETH WAYNE, *Assistant Professor of Military Science*  
Captain, Field Artillery, United States Army; B.S., Peru State College, 1966
- BOLAND, W. ROBERT, *Associate Professor of Mathematical Sciences*  
B.S., Davidson College, 1959; M.A., College of William and Mary, 1963; Ph.D., University of Colorado, 1968
- BOLEN, CLAUDE WALDRON, *Professor of History*  
A.B., Emory and Henry College, 1931; M.A., 1935, Ph.D., 1941, Duke University
- BOND, JOHN HOWARD, *Associate Professor of Microbiology*  
B.S., 1948, M.S., 1949, Louisiana State University
- BOOKMYER, BEVERLY BRANDON, *Associate Professor of Physics and Astronomy*  
A.B., Chestnut Hill College, 1946; M.S., 1961, Ph.D., 1964, University of Pennsylvania
- BOONE, MERRITT ANDERSON,\* *Professor of Poultry Science*  
B.S., University of Nebraska, 1941; M.S., Michigan State University, 1947; Ph.D., University of Georgia, 1962

\* On leave.

## 16 Faculty

- BORGMAN, ROBERT FREDERIC, *Professor of Food Science*  
D.V.M., 1947, M.S., 1949, Michigan State University; Ph.D., Kansas State University, 1959
- BOSDELL, FRANCIS ALVIN, *Assistant Professor of Industrial Education*  
B.S., 1949, M.In.Ed., 1966, Clemson University
- BOSE, ANIL KUMAR, *Associate Professor of Mathematical Sciences*  
B.S., 1948, M.S., 1956, Calcutta University; Ph.D., University of North Carolina, 1964
- BOYD, VIRLYN ALEXANDER, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S.A., Berry College, 1941; M.S.A., University of Kentucky, 1948
- BRADBURY, DOUGLAS WILSON, *Alumni Professor of Mechanical Engineering*  
B.M.E., Clemson University, 1940; M.S.E., University of Michigan, 1959; P.E.
- BRAINERD, CAROL FURRY, *Assistant Professor of Psychology*  
B.A., Washington College, 1969; M.A., 1971, Ph.D., 1973, West Virginia University
- BRAINERD, EDWIN GRENIER, JR., *Visiting Instructor in Psychology*  
B.A., Washington College, 1968; M.A., West Virginia University, 1971
- BRANDON, CRAIG ARNOLD, *Associate Professor of Mechanical Engineering*  
B.S.M.E., Duke University, 1959; M.S., Stanford University, 1960; Ph.D., University of Tennessee, 1968; P.E.
- BRANDT, GRAYDON WILLIAM, *Associate Professor of Dairy Science*  
B.S., Ohio State University, 1936; M.S., University of Nebraska, 1938; Ph.D., Ohio State University, 1958
- BRANNOCK, DURANT YORK, JR., *Assistant Professor of French*  
A.B., Elon College, 1954; A.M., Duke University, 1956
- BRANNON, CARROLL CLEVELAND, *Associate Professor of Dairy Science*  
B.S., Clemson University, 1934
- BRANTLEY, HERBERT, *Associate Dean, College of Forest and Recreation Resources; Head of Recreation and Park Administration Department; Professor of Recreation and Park Administration*  
A.B., 1956, M.A., 1958, Ph.D., 1966, University of North Carolina
- BRAWLEY, JOEL VINCENT, JR., *Professor of Mathematical Sciences*  
B.S., 1960, M.S., 1962, Ph.D., 1964, North Carolina State University
- BRISCOE, IDA CAROLYN, *Assistant Professor of Education*  
A.B., LaGrange College, 1957; M.Ed., 1961, S.Ed., 1967, Ed.D., 1970, University of Georgia
- BROCK, ALTON CARR, *Assistant Professor of Aerospace Studies*  
Major, United States Air Force; B.S., Piedmont College, 1963; M.S., Air Force Institute of Technology, 1966
- BRODIE, EDMUND D., JR., *Assistant Professor of Zoology*  
B.S., Oregon College of Education, 1963; M.S., 1967, Ph.D., 1969, Oregon State University
- BRONK, BURT V., *Associate Professor of Physics*  
B.S., Pennsylvania State University, 1956; Ph.D., Princeton University, 1965
- BROOKS, AFTON DeWAYNE, *Assistant Professor of Education*  
B.A., Carson-Newman College, 1963; M.Ed., Middle Tennessee State University, 1967; Ed.D., University of Georgia, 1972
- BROWN, FARRELL BLENN, *Assistant to the Dean, Graduate Studies and University Research; Professor of Chemistry*  
B.S., Lenoir-Rhyne College, 1957; M.S., 1960, Ph.D., 1962, University of Tennessee; Post Doctorate, Texas A&M University, 1962-63
- BROWN, LAMAR HAMILTON, *Associate Professor of Building Science*  
B.Arch., Auburn University, 1948
- BROWN, RALPH TRUMAN, JR., *Assistant Professor of Agricultural Economics and Rural Sociology*  
B.A., 1966, J.D., 1971, Washington and Lee University
- BROWN, ROBERT L., *Visiting Professor of Industrial Management*  
A.B., Samford University, 1947; M.A., University of Alabama, 1951; Ph.D., Purdue University, 1957
- BROWN, SUSAN HENRIETTA, *Associate Professor of Industrial Management*  
A.B., 1947, J.D., 1950, University of Georgia; LL.M., University of Pennsylvania, 1972



- BRUBECK, JEAN DALE, *Lecturer in English*  
B.A., College of William and Mary, 1970; M.A., Clemson University, 1973
- BRULEY, DUANE FREDERICK, *Professor of Chemical Engineering*  
B.S., University of Wisconsin, 1956; M.S., Stanford University, 1959; Ph.D., University of Tennessee, 1963; P.E.
- BRYAN, JOSEPH KENT, *Assistant Professor of Electrical and Computer Engineering*  
B.S.E.E., 1966, M.S.E.E., 1968, Ph.D., 1971, University of Missouri (Columbia)
- BRYANT, HALLMAN BELL, *Assistant Professor of English*  
B.A., Emory University, 1959; M.A., University of North Carolina, 1962; Ph.D., Vanderbilt University, 1967
- BUCKNER, SAM LEVI, *Associate Professor of Education*  
B.S., East Tennessee State University, 1960; M.A., Appalachian State University, 1966; Ed.D., Auburn University, 1970
- BURCH, ELMER EARL, JR., *Assistant Professor of Industrial Management*  
B.S., 1966, M.S., 1968, Ph.D., 1970, Clemson University
- BURKETT, BYRON VERNER, JR., *Associate Professor of Vocational Education*  
B.S., 1964, M.S., 1965, Clemson University
- BURSEY, ROBERT GRAHAM, *Assistant Professor of Food Science*  
B.S., North Georgia College, 1966; M.S., Medical College of Georgia, 1967; Ph.D., Clemson University, 1972
- BURT, PHILIP BARNES, *Professor of Physics*  
A.B., 1956, M.S., 1958, Ph.D., 1961, University of Tennessee
- BURTNER, FRANK ALAN, *Professor of Sociology*  
B.A., M.A., University of Texas, 1938; Ph.D., University of North Carolina, 1958
- BUSCHING, HERBERT WILLIAM, *Head of Civil Engineering Department; Associate Professor of Civil Engineering*  
B.A., B.S.C.E., Valparaiso University, 1958; M.S.C.E., 1963, Ph.D., 1967, Purdue University
- BUTLER, JOHN HARRISON, *Head of Music Department; Director of Bands; Professor of Music*  
B.M.E., West Texas State University, 1955; M.F.A., 1960, Ed.D., 1968, University of Georgia
- BYRD, WILBERT PRESTON, *Experiment Station Statistician; Professor of Experimental Statistics; Chairman, Experimental Statistics and Statistical Services*  
B.S., 1949, M.S., 1952, North Carolina State University; Ph.D., Iowa State University, 1955; Post Doctorate, Oregon State University, 1971
- BYRNS, RALPH TRUMAN, II, *Assistant Professor of Economics*  
A.A., Phoenix College, 1962; B.S., Arizona State University, 1965; M.S., Rice University, 1972
- CAFFREY, BERNARD, *Head of Psychology Department; Associate Professor of Psychology*  
B.A., St. Vincent College, 1956; M.A., 1963, Ph.D., 1966, Catholic University of America
- CALEY, PAUL COCHRAN, *Associate Professor of Industrial Education*  
B.S., 1963, M.A., 1964, Ph.D., 1969, Ohio State University
- CALHOUN, RICHARD JAMES, *Alumni Professor of English*  
B.A., George Peabody College, 1948; M.A., Johns Hopkins University, 1950; Ph.D., University of North Carolina, 1959; Post Doctorate, Duke University, 1964-65
- CALVASINA, RICHARD VICTOR, *Assistant Professor of Industrial Management*  
B.B.A., 1964, M.B.A., 1965, Ph.D., 1973, University of Mississippi
- CALVEZ, DANIEL JEAN, *Instructor in French*  
License ès Lettres, Angers University, 1965
- CAMPBELL, MARY JUDY, *Instructor in Nursing, Baccalaureate Program*  
B.S.N., University of Kentucky, 1969; M.S.N., University of Alabama (Birmingham), 1973
- CAMPER, NYAL DWIGHT, *Associate Professor of Plant Pathology and Physiology and of Botany*  
B.S., 1962, Ph.D., 1966, North Carolina State University



## 18 Faculty

- CANTRELL, FURMAN, *Lecturer in Medical Technology, School of Medical Technology, Greenville General Hospital; Clinical Microbiologist*  
B.S., Furman University, 1961; M.S., University of North Carolina, 1965; Ph.D., Clemson University, 1968; Post Doctorate, 1968-69; M.T. (ASCP); Mi (ASCP)
- CAPEL, WILLIAM CLYDE, JR., *Associate Professor of Sociology*  
A.B., Washington and Lee University, 1932; M.A., Columbia University, 1933
- CARD, EDITH BRYSON, ° *Instructor in Music*  
A.B., Furman University, 1944; M.M.E., Florida State University, 1957
- CARMACK, VERONICA DELORIA, *Assistant Professor of Home Economics*  
B.S., University of Kentucky, 1965; M.S., University of Tennessee, 1969
- CARNER, GERALD ROY, *Assistant Professor of Entomology and Economic Zoology*  
B.A., Asbury College, 1964; M.S., 1966, Ph.D., 1969, Auburn University
- CARNEY, ELIZABETH DONNELLY, *Instructor in History*  
B.A., Smith College, 1969; M.A., Duke University, 1973
- CARPENTER, EARL THOMAS, *Head of Agricultural Education Department; Professor of Agricultural Education*  
B.S., 1948, M.Ed., 1954, Ed.D., 1960, University of Missouri
- CARPENTER, KENNETH EDSON, *Associate Professor of Architecture*  
B.Arch., University of Oklahoma, 1962; M.Arch., University of Minnesota, 1967; A.I.A.
- CARPENTER, TERYLE WILDER, *Instructor in Education*  
B.S., University of Oklahoma, 1960; M.Ed., Clemson University, 1970
- CARROLL, ADGER BOWMAN, *State Leader Extension Community and Resource Development Programs; Professor of Agricultural Economics and Rural Sociology*  
B.S., 1958, M.S., 1961, Clemson University; Ph.D., North Carolina State University, 1966
- CARROLL, JANE BOYCE, *Instructor in Nursing, Baccalaureate Program*  
B.S.N., University of South Carolina, 1962; M.N., Emory University, 1965
- CARTER, CLIFTON WALKER, *Assistant Professor of Engineering Graphics*  
B.S., Clemson University, 1933
- CASH, LEE WILEY, *Assistant Professor of Aerospace Studies*  
Major, United States Air Force; B.S., North Carolina State University, 1958; M.S., University of Southern California, 1966
- CASKEY, CLAIRE OMAR, *Associate Professor of English*  
B.S., Appalachian State University, 1947; A.M., Duke University, 1948
- CASTRO, WALTER ERNEST, *Professor of Engineering Mechanics*  
B.S., Indiana Institute of Technology, 1959; M.S., Clemson University, 1962; Ph.D., University of West Virginia, 1965; P.E.
- CATO, LEWIS FELTON, *Assistant Professor of Animal Science*  
B.S., 1948, M.S., 1962, Clemson University
- CELY, MARVIN SINGLETON, JR., *District Extension Leader; Assistant Professor of Horticulture*  
B.S., 1957, M.S., 1970, Clemson University
- CETTO, MAX LUDWIG, *Visiting Professor of Architecture*  
Cand.Arch., Technische Hochschule Munich (Germany), 1923; Dipl.Ing., Technische Universität Berlin (Germany), 1925
- CHAPLIN, ROBERT LEE, JR., *Professor of Physics*  
B.S., Clemson University, 1948; M.S., 1953, Ph.D., 1962, North Carolina State University
- CHAPMAN, WILLIAM STEWART, *Assistant Professor of Military Science*  
Major, United States Army; B.S., North Georgia College, 1959; M.B.A., Clemson-Furman Universities, 1973
- CHARTIER, ROBERT LESTER, *Instructor in Architecture*  
B.Arch., North Carolina State University, 1967; M.Arch., Clemson University, 1972
- CHISMAN, JAMES ALLEN, *Associate Professor of Operations Research*  
B.S., University of Akron, 1958; M.S., 1960, Ph.D., 1963, University of Iowa; P.E.
- CHOLEWINSKI, FRANK MICHAEL, *Professor of Mathematical Sciences*  
E.P., 1958, M.S., 1959, Auburn University; Ph.D., Washington University, 1964

° On leave.

- CLARK, JACK LEWIS, *Professor of Building Science*  
B.Arch., University of Florida, 1955; M.S., 1968, M.A., 1969, Bradley University
- CLARK, JAMES EDWIN, *Associate Professor of Civil Engineering*  
B.S.C.E., 1957, M.E., 1964, University of South Carolina; Ph.D., North Carolina State University, 1967; P.E.
- CLARK, MATTHEW AITKEN, *Visiting Associate Professor of Architecture*  
Arch., D.RIBA, University of Leicester (England), 1967; M.C.P., Architectural Association, London, 1970
- CLINE, MICKEY RAY, *Visiting Instructor in Political Science*  
B.A., 1961, M.A., 1966, University of South Carolina
- CLINKSCALES, WILLIAM CHERRY, *State 4-H and Youth Development Coordinator; Instructor in Agricultural Education*  
B.S., South Carolina State College, 1965
- COFFEEN, WILLIAM W., *Associate Professor of Ceramic Engineering*  
B.S., 1935, M.S., 1937, University of Illinois; Ph.D., Rutgers University, 1969
- COHOON, DANIEL FRED, *Superintendent of Edisto Experiment Station; Professor of Plant Pathology and Physiology*  
B.S., University of Western Ontario, 1952; Ph.D., Rutgers University, 1956
- COLE, SPURGEON NOTHERN, *Associate Professor of Psychology*  
A.B., 1960, M.S., 1965, Ph.D., 1966, University of Georgia
- COLLINS, DONALD LYNN, *Assistant Professor of Architecture*  
B.L.A., North Carolina State University, 1968; M.L.A., Harvard University, 1969
- COLLINS, THOMAS FRANK, *Assistant Professor of Physics and Astronomy*  
A.B., Mercer University, 1956; M.S., Clemson University, 1958
- CONSTANTINE, RANDOLPH, JR., *Visiting Assistant Professor of Mathematical Sciences*  
B.S., 1960, M.A., 1963, University of North Carolina; Ph.D., University of Houston, 1972
- COOK, BRUCE FARRELL, *Assistant Director of Bands; Assistant Professor of Music*  
B.M.E., 1954, M.A., 1965, West Texas State University
- COOK, WILTON PIERCE, *Assistant Professor of Horticulture*  
B.S., Clemson University, 1962; M.S., University of Florida, 1964
- COOKE, FRANCIS WALTER, *Head of Division of Interdisciplinary Studies; Associate Professor of Bioengineering and Materials Engineering*  
B.S., Notre Dame University, 1957; Ph.D., Rensselaer Polytechnic Institute, 1966
- COOL, BINGHAM MERCUR, *Professor of Forestry*  
B.S., Louisiana State University, 1940; M.S., Iowa State University, 1941; Ph.D., Michigan State University, 1957
- COOLEDGE, HAROLD NORMAN, JR., *Alumni Professor of History and Visual Studies*  
B.S., 1943, B.Arch., 1950, Harvard University; M.A., 1957, Ph.D., 1964, University of Pennsylvania
- COOPER, JAMES BRONAUGH, *Associate Professor of Poultry Science*  
B.S., 1935, M.S., 1938, University of Kentucky
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B.S.A., University of Georgia, 1948; M.S., Clemson University, 1958; Ph.D., University of Wisconsin, 1966
- CORDER, WILLIAM OWENS, *Associate Professor of Education*  
B.A., University of South Carolina, 1947; M.S., Clemson University, 1957; Ed.S., Peabody College, 1965; Ed.D., University of Virginia, 1969
- COTT, DONALD WING, *Assistant Professor of Mechanical Engineering*  
B.S., 1964, M.S., 1966, Oklahoma State University; Ph.D., University of Tennessee Space Institute, 1969
- COUCH, JAMES HOUSTON, *Associate Professor of Industrial Engineering*  
B.S., 1941, M.S., 1954, Clemson University
- COULTER, EDWIN MARTIN, *Associate Professor of Political Science*  
B.A., Furman University, 1962; Ph.D., University of Virginia, 1965

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- COVER, ALAN SEYMOUR, *Associate Professor of Mathematical Sciences*  
B.S., Indiana State University, 1954; M.A., 1960, Ph.D., 1964, Pennsylvania State University
- COX, EUGENE CARY, *Lecturer in Medical Technology; Co-director, School of Medical Technology, Greenville General Hospital*  
B.S., Furman University, 1954; M.D., Medical University of South Carolina, 1958
- COX, HEADLEY MORRIS, *Dean, College of Liberal Arts; Professor of English*  
A.B., 1937, M.A., 1939, Duke University; Ph.D., University of Pennsylvania, 1958
- CRADDOCK, GARNET ROY, *Head of Agronomy and Soils Department; Professor of Agronomy and Soils*  
B.S., Virginia Polytechnic Institute, 1952; Ph.D., University of Wisconsin, 1955
- CRAIG, JAMES TELFORD, *Associate Professor of Agricultural Engineering*  
B.S., Clemson University, 1951; M.S., University of Georgia, 1960
- CRAVEN, RUBY MAE, *State Leader, Extension Home Economics Programs; Professor of Home Economics*  
B.S., Winthrop College, 1934; M.S., University of Tennessee, 1949; Ph.D., University of Wisconsin, 1963
- CROSS, DEE LEWIS, *Assistant Professor of Poultry Science*  
B.S., Austin Peay State University, 1969; M.S., 1971, Ph.D., 1973, University of Kentucky
- CROSS, JOAN TILTON, *Lecturer in English*  
A.B., Stetson University, 1965; M.A., University of North Carolina, 1966
- CROSS, ROBERT LYMAN, *Assistant Professor of English*  
A.B., Stetson University, 1964; M.A., University of North Carolina, 1966
- CROUCH, JAMES PAGE, *Associate Professor of Industrial Education*  
A.B., 1964, M.A., 1966, San Diego State College; Ed.D., University of Missouri, 1968
- CROWE, EDYTHE JOYCE, *Visiting Instructor in Nursing, Baccalaureate Program*  
B.S.N., Medical College of Georgia, 1971; M.N., Emory University, 1972
- CUNNINGHAM, BENNIE LEE, *State Leader, Extension Special Programs; Associate Professor of Agricultural Education*  
B.S., 1948, M.S., 1957, South Carolina State College
- CURRIN, ROBERT EUGENE, III, *Associate Professor of Agronomy and Soils, Pee Dee Experiment Station*  
B.S., North Carolina State University, 1949; M.S., Clemson University, 1964
- DALTON, JAMES EDWARD, *Assistant to the Dean, College of Architecture; Associate Professor of Architecture*  
B.Arch., University of Miami, 1964; M.Arch., University of Minnesota, 1965
- DAVENPORT, JOHN DOUGLAS, *Associate Professor of Psychology*  
B.S., Clemson University, 1943; M.A., Furman University, 1958; Ph.D., University of Maryland, 1967
- DAVIS, CECIL COOK, *Professor of Industrial Management*  
B.B.A., 1947, M.B.A., 1949, University of Georgia; C.P.A., 1966
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B.S., 1962, M.S., 1964, Winthrop College
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A.B., 1946, M.A., 1947, University of Georgia
- DAY, FRANK LOUIS, *Assistant Professor of English*  
B.S., Gorham State College, 1954; M.A., University of Tennessee, 1959; M.A., University of Rochester, 1967
- DEAN, JORDAN ARTHUR, *Associate Professor of Modern Languages*  
A.B., Wofford College, 1933; M.A., Vanderbilt University, 1934
- DeHAVEN, RALPH KENNETH, *Assistant Professor of Agricultural Economics and Rural Sociology*  
B.S., Southwest Missouri State College, 1964; M.S., 1966, Ph.D., 1969, University of Missouri
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B.A., Northeast Louisiana University, 1968; M.A., University of Georgia, 1970
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B.A., Tabor College, 1965; M.S., 1968, Ph.D., 1971, Kansas State University

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B.S., 1956, M.S., 1962, North Carolina State University; Ph.D., Pennsylvania State University, 1965
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B.S., University of Florida, 1960; M.S., University of Kentucky, 1967
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- DOUGLASS, THOMAS ERNEST, *Associate Professor of English*  
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- DRAKE, THOMAS LYNN, *Associate Professor of Electrical and Computer Engineering*  
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B.S., 1940, M.D., 1943, Tulane University
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B.S., Alfred University, 1970; M.S., Boston University, 1972
- DREWS, ALISON CLAIRE, *Visiting Lecturer in Industrial Management*  
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B.S., Tennessee Polytechnic Institute, 1948; M.S., Virginia Polytechnic Institute, 1955; Ph.D., Michigan State University, 1963; P.E.
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- EFLAND, THOMAS DANIEL, *Associate Dean, College of Industrial Management and Textile Science; Director of Research; Professor of Textiles*  
B.S., North Carolina State University, 1949; M.S., Georgia Institute of Technology, 1956
- EFLIN, ROBERT DEAN, *Campus Master Planner; Associate Professor of Architecture*  
B.Arch., University of Minnesota, 1954; M.Arch., Rice University, 1972
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- EISIMINGER, STERLING KENWOOD,\* *Instructor in English*  
B.S., 1967, M.A., 1968, Auburn University
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B.S., University of Nebraska, 1965; M.S., 1967, Ph.D., 1971, University of Illinois
- ELLING, RUDOLF ERNEST, *Associate Professor of Civil Engineering and Engineering Mechanics*  
B.S., Michigan State University, 1950; M.S., University of Illinois, 1952; Ph.D., Stanford University, 1967; P.E.
- ELLIOTT, NINA THOMAS, *Instructor in Psychology*  
B.A., Knoxville College, 1971; M.A., Western Carolina University, 1972
- ELLIOTT, RALPH DELANO, *Director of Professional Development, College of Industrial Management and Textile Science; Assistant Professor of Economics*  
B.S., 1967, M.S., 1968, Ph.D., 1972, North Carolina State University
- ELLIS, OROUS LEO, JR., *Assistant Professor of Military Science*  
Major, Armor, United States Army; B.S., University of Southern Mississippi, 1958
- ELROD, ALVON CREIGHTON, *Associate Professor of Mechanical Engineering*  
B.M.E., 1949, M.M.E., 1951, Clemson University; Ph.D., Purdue University, 1959; P.E.
- ENGLAND, ROBERT DURANT, *Associate Professor of History and Visual Studies*  
B.A., University of Virginia, 1928; M.A., Oglethorpe University, 1934
- EPPS, WILLIAM MONROE, *Head of Plant Pathology and Physiology Department; Professor of Plant Pathology and Physiology; State Plant Pathologist*  
B.S., Clemson University, 1937; Ph.D., Cornell University, 1942
- ESKEW, ELIAS BENTON, *Associate Professor of Agronomy and Soils*  
B.S., Clemson University, 1943; M.S., Ohio State University, 1951
- EZELL, DANNY ODELL, *Associate Professor of Horticulture*  
B.S., 1962, M.S., 1964, Clemson University; Ph.D., University of Florida, 1968
- EZZARD, RUTH ARRENDALE, *Assistant Professor of Education*  
B.S., University of Georgia, 1934; M.Ed., University of Louisville, 1963; Ed.D., University of Georgia, 1972
- FAIN, CHARLES CLIFFORD, *Associate Professor of Ceramic Engineering*  
B.Cer.E., 1954, M.S., 1957, Clemson University; Ph.D., Ohio State University, 1967
- FAIREY, JOHN EDWARD, III, *Assistant Professor of Botany*  
B.S., University of South Carolina, 1962; M.S., 1964, Ph.D., 1972, University of West Virginia
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B.A., 1950, M.A., 1951, University of Minnesota; M.R.P., University of North Carolina, 1961; A.I.P.

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B.S., The Citadel, 1953; M.S., 1956, Ph.D., 1960, Georgia Institute of Technology;  
Post Doctorate, Tulane University, 1960-61
- FEAR, ARTHUR J., *Associate Professor of Speech*  
A.B., DePauw University, 1935; M.A., State University of Iowa, 1939; Ph.D., University  
of Southern California, 1966
- FEARRINGTON, DORIS BOULWARE, *Assistant Professor of Home  
Economics*  
B.S., Winthrop College, 1947; M.S., Simmons College and Harvard School of Public  
Health, 1952
- FEDELE, ANDE MITCHELL, *Lecturer in Mathematical Sciences*  
B.S., Clemson University, 1967
- FELDMAN, HENRY JACK, *Assistant Professor of Education*  
B.S., Chicago State University, 1964; M.Ed., DePaul University, 1969; Ph.D., Miami  
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- FENNELL, ROBERT EMMETT, *Assistant Professor of Mathematical Sciences*  
B.A., Bradley University, 1964; M.S., 1966, Ph.D., 1969, University of Iowa
- FENNEMORE, CHARLES FREDERICK, *Assistant Professor of Mathematical  
Sciences*  
A.B., University of Rochester, 1966; Ph.D., Pennsylvania State University, 1969
- FENTON, LUCY ABBOTT, *Assistant Professor of Nursing, Baccalaureate  
Program*  
B.S., Temple University, 1948; M.S.N., University of California (Los Angeles), 1960
- FERA, CESARE, *Visiting Professor of Architecture*  
Ph.D.Arch., University of Rome (Italy), 1966; Post Doctorate, University of Palermo  
(Italy), 1970
- FERNANDEZ, ELENA GONZALES, *Lecturer in Spanish*  
A.B., Instituto de la Habana, 1942
- FERNANDEZ, GASTON JUAN, *Associate Professor of Spanish*  
B.L.S., Instituto de Segunda Ensenanza de Remedios; LL.D., University of Havana,  
1942; M.A., University of North Carolina, 1967; Ph.D., University of Kentucky, 1971
- FERREE, ROY JAMES, *Associate Professor of Horticulture*  
B.S., Clemson University, 1939; M.S., Rutgers University, 1941
- FITCH, LEWIS THOMAS, *Associate Professor of Electrical and Computer  
Engineering*  
B.S.E.E., Duke University, 1954; M.S., North Carolina State University, 1960; Ph.D.,  
Ohio State University, 1969
- FLATT, JAMES LEVERN, *Associate Professor of Mathematical Sciences*  
B.S., Bethel College, 1949; M.A., 1950, Ph.D., 1965, George Peabody College
- FLEISHMAN, HELEN MARIE, *Assistant Professor of Sociology*  
B.S., 1951, M.S., 1955, University of Utah; Ph.D., Emory University, 1973
- FLEMING, HORACE WELDON, JR., *Assistant Professor of Political Science*  
B.A., 1965, M.A., 1966, University of Georgia; Ph.D., Vanderbilt University, 1973
- FLETCHER, SARAH ANN, *Visiting Assistant Professor of Recreation and  
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B.S., University of Wisconsin, 1964; M.S., Indiana University, 1966
- FORD, WILLIAM HERSHEL, *Assistant Professor of Mathematical Sciences*  
B.S., Massachusetts Institute of Technology, 1967; M.S., 1969, Ph.D., 1972, University  
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- FOWLER, WILLIAM RANDALL, JR., *Assistant Professor of Psychology*  
B.A., Emory University, 1960; Ph.D., Duke University, 1965
- FOX, RICHARD CHARLES, *Professor of Entomology and Economic Zoology*  
B.S., 1948, M.For., 1949, Ph.D., 1958, Michigan State University
- FREEMAN, DONALD KENNETH, JR., *Director, Students' Mental Health  
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B.A., Brown University, 1956; M.D., University of Rochester, 1961
- FREEMAN, EDWIN ARMISTEAD, *Assistant Professor of Music*  
B.S., Clemson University, 1949; B.Mus., Louisiana State University, 1954; M.A.,  
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B.S., Marion College, 1953; M.Ed., University of South Dakota, 1954; Ed.D., University  
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B.S., Western Carolina University, 1942; M.A., Columbia University, 1947
- FULMER, JOHN PATRICK, *Associate Professor of Horticulture*  
B.S., 1953, M.S., 1955, Clemson University
- FULMER, LOUISE GRAY, *Instructor in Mathematical Sciences*  
A.B., Winthrop College, 1937
- FULTON, JOHN DAVID, *Associate Professor of Mathematical Sciences*  
B.S., 1960, M.S., 1963, Ph.D., 1965, North Carolina State University
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B.S., 1948, M.S., 1960, Clemson University
- GADDIS, JOSEPH LEO, *Associate Professor of Mechanical Engineering*  
B.S., 1961, M.S., 1963, New Mexico State University; Ph.D., University of Texas (Austin), 1969
- GAHAN, LAWRENCE WILLARD, *Associate Professor of Recreation and Park Administration*  
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B.A., Erskine College, 1958; M.A., Furman University, 1963; Ed.D., University of Georgia, 1972
- GAMBRELL, CARL EDWIN, JR., *Assistant Professor of Horticulture, Sandhill Experiment Station*  
B.S., 1948, M.S., 1960, Clemson University
- GANIM, VIRGINIA LYNN,\* *Instructor in English*  
B.A., 1963, M.A., 1966, University of North Carolina
- GARCIA, CRISOSTOMO BAUTISTA, *Assistant Professor of Mathematical Sciences*  
B.S., University of the Philippines, 1968; M.S., 1970, Ph.D., 1973, Rensselaer Polytechnic Institute
- GARNER, THOMAS HAROLD, *Professor of Agricultural Engineering*  
B.S., 1952, M.S., 1956, Ph.D., 1964, North Carolina State University; P.E.
- GARRETT, SUE GENA, *Instructor in Sociology*  
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- GARRISON, OLEN BRANFORD, *Director of Agricultural Experiment Station; Director of Research in Agriculture; Professor of Horticulture*  
B.S., Clemson University, 1933; M.S., Louisiana State University, 1934; Ph.D., Cornell University, 1939
- GAUTHREAUX, SIDNEY ANTHONY, JR., *Associate Professor of Zoology*  
B.S., 1963, M.S., 1965, Ph.D., 1968, Louisiana State University; Post Doctorate, University of Georgia, 1968-70
- GELDARD, JOHN FRANCIS, *Associate Professor of Chemistry*  
B.Sc., 1958, M.Sc., 1959, Ph.D., 1964, University of Sydney; Post Doctorate, University of Illinois, 1963-65
- GETTYS, WILLIAM EDWARD, *Professor of Physics*  
B.S., 1960, M.S., 1961, Clemson University; Ph.D., Ohio University, 1964
- GILCHRIST, RALPH WAYNE, *Professor of Electrical and Computer Engineering*  
B.S., Tri-State College, 1947; M.S., University of Michigan, 1951; Ph.D., Michigan State University, 1960; P.E.
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- GODLEY, WILLIE CECIL, *Associate Director of Agricultural Experiment Station; Professor of Animal Science*  
 B.S., Clemson University, 1943; M.S., 1949, Ph.D., 1955, North Carolina State University
- GOEBEL, NORBERT BERNARD, *Associate Professor of Forestry*  
 B.S., Colorado State University, 1940; M.F., Duke University, 1946
- GOODIN, CURTIS PAUL, *Associate Professor of Electrical and Computer Engineering*  
 B.S., University of Kentucky, 1948; M.S., Georgia Institute of Technology, 1957
- GOREE, JAMES GLEASON, *Associate Professor of Engineering Mechanics*  
 B.S., University of Florida, 1960; M.S., University of Washington, 1962; Ph.D., University of Alabama, 1966
- GOSSETT, BILLY JOE, *Professor of Agronomy and Soils*  
 B.S., University of Tennessee, 1957; M.S., 1959, Ph.D., 1962, University of Illinois
- GOWDY, JOHN NORMAN, *Assistant Professor of Electrical and Computer Engineering*  
 B.S., Massachusetts Institute of Technology, 1967; M.S., 1968, Ph.D., 1971, University of Missouri (Columbia)
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 B.S., Birmingham-Southern College, 1957; M.S., 1961, Ph.D., 1962, University of Tennessee
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 B.S., Texas Technology College, 1962; M.S., 1965, Ph.D., 1967, Purdue University
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 B.S., 1957, M.S., 1967, Ph.D., 1970, University of Wisconsin
- GRANT, ROBERT CARL, *Assistant Professor of Aerospace Studies*  
 Lieutenant Colonel, United States Air Force; B.S., Clemson University, 1955; M.S., Southern Methodist University, 1964
- GRAY, FURMAN RAY, *Associate Professor of Industrial Management*  
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- GRAY, GORDON WALTER, *Professor of Education*  
 B.S., 1958, M.A., 1964, East Tennessee State University; Ed.D., University of Tennessee, 1967
- GREEN, CLAUD BETHUNE, *Dean, Undergraduate Studies; Professor of English*  
 B.A., 1935, M.A., 1938, University of Georgia; Ph.D., Duke University, 1953
- GRIFFIN, BARBARA JEAN, *Assistant Professor of Agricultural Mechanization*  
 B.A., Winthrop College, 1954; M.A., Syracuse University, 1956
- GRIFFIN, DEUEL NORTON, *Assistant Professor of English*  
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- GRIFFIN, RANDALL PARRISH, *Instructor in Entomology and Economic Zoology*  
 B.S., 1971, M.S., 1973, Clemson University
- GRIFFIN, VILLARD STUART, JR., *Associate Professor of Geology*  
 B.A., 1959, M.S., 1961, University of Virginia; Ph.D., Michigan State University, 1965
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 B.S., 1961, M.Ed., 1963, Pennsylvania State University
- GRUBB, CHARLES ALAN, *Assistant Professor of History*  
 B.A., Washington and Lee University, 1963; M.A., 1964, Ph.D., 1969, Columbia University
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 B.A., Occidental College, 1966; M.A., 1968, Ph.D., 1972, University of California
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B.S., 1970, M.S., 1972, Michigan State University
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B.S., North Carolina State University, 1949; Ph.D., Cornell University, 1953
- HAMMOND, ALEXANDER FRANCIS, *Associate Professor of Engineering Technology*  
B.E.E., 1949, M.S., 1957, Clemson University
- HANDLIN, DALE LEE, *Associate Professor of Animal Science*  
B.S., Kansas State University, 1951; M.S., Texas A&M University, 1954
- HANNAH, HOWARD BARRY,\* *Associate Professor of English*  
B.A., Mississippi College, 1964; M.A., 1966, M.F.A., 1967, University of Arkansas
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B.S., Mississippi College, 1947; M.A., University of Tennessee, 1949
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B.S.M.E., University of Tennessee, 1946; M.S.M.E., Virginia Polytechnic Institute, 1949; Ph.D., Georgia Institute of Technology, 1965
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- HARGEST, THOMAS S., *Adjunct Professor of Mechanical Engineering and Bioengineering*  
B.A., Lafayette College, 1950
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B.S., University of South Carolina, 1950
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- HARSHMAN, RICHARD CALVERT, *Professor of Chemical Engineering*  
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- HARVEY, LAWRENCE HARMON, *Professor of Agronomy and Soils*  
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- HENRICKS, DONALD MAURICE, *Associate Professor of Food Science and of Biochemistry*  
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B.S., 1956, M.S., 1958, Clemson University; Ph.D., North Carolina State University, 1965
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B.S., 1931, Ph.D., 1933, Edinburgh University
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- HINDMAN, MARIE SMITH, *Associate Professor of Home Economics*  
B.S., Winthrop College, 1935; M.S., University of Tennessee, 1949
- HINGERS, ROBERT HENRY, *Visiting Instructor in Sociology*  
B.A., State University of New York, 1971; M.S., Virginia Polytechnic Institute and State University, 1973
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B.S.N., 1960, M.S.N., 1964, University of North Carolina
- HITE, JAMES CLEVELAND, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S., Clemson University, 1963; M.A., Emory University, 1964; Ph.D., Clemson University, 1966
- HOBSON, JAMES HARVEY, *Alumni Professor of Chemistry*  
B.S., University of South Carolina, 1939; M.A., 1947, Ph.D., 1953, Emory University
- HODGES, VERNON SEYMOUR, *Professor of Architecture*  
S.B., Harvard College, 1934; M.Arch., Harvard University, 1939
- HOLAHAN, URSULA ANN, *Associate Professor of Home Economics*  
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B.S., Quachita Baptist University, 1967; M.S., University of Arkansas, 1969
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B.A., 1957, M.A., 1959, Washington State University; Ph.D., Stanford University, 1966
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- HOOD, CLARENCE ELAM, JR., *Associate Professor of Agricultural Engineering*  
B.S., 1959, M.S., 1961, Ph.D., 1964, North Carolina State University; P.E.
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- HOUSE, RANDOLPH WATKINS, *Assistant Professor of Military Science*  
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B.S., Michigan State University, 1935; Ph.D., University of California, 1943
- HUNTER, ROBERT HOWARD, *Professor of History and Visual Studies*  
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B.S., King's College (Pennsylvania), 1968; M.S., 1970, Ph.D., 1972, University of Illinois
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- JACOBUS, OTHA JOHN, *Associate Professor of Chemistry*  
B.S., Southwestern at Memphis, 1962; Ph.D., University of Tennessee, 1965; Post Doctorate, Princeton University, 1966-68
- JACQUES, JOHN DAVID, *Visiting Instructor in Planning Studies*  
B.Arch., Clemson University, 1970
- JAMESON, LAKE HUGH, *Associate Professor of Engineering Graphics*  
B.S., Clemson University, 1942; M.S., North Carolina State University, 1952
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B.S.A., University of Manitoba, 1944; M.S., 1947, Ph.D., 1952, Post Doctorate, 1952-53, University of Wisconsin
- JEN, JOSEPH JWU-SHAN, *Assistant Professor of Food Science and of Biochemistry*  
B.S., National Taiwan University, 1960; M.S., Washington State University, 1964; Ph.D., University of California, 1969
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B.S., Winthrop College, 1962; M.Ed., University of North Carolina, 1970
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B.S., 1960, M.S., 1965, Ph.D., 1970, Texas A&M University
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- JONES, ROBERT E., JR., *Lecturer in Medical Technology; Co-director, School of Medical Technology, and Pathologist, Anderson Memorial Hospital*  
B.A., Duke University, 1956; M.D., Bowman Gray School of Medicine, 1960
- JONES, THOMAS LESLIE, *Assistant Professor of Horticulture, Sandhill Experiment Station*  
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- JONES, ULYSSES SIMPSON, *Professor of Agronomy and Soils*  
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- JORDAN, JOHNNY WAYNE, *Instructor in Agricultural Economics and Rural Sociology*  
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- JORDAN, LILLIAN FRANCES, *Associate Professor of Home Economics*  
B.S., University of North Carolina, 1947; M.S., Ohio State University, 1953; Ph.D., Florida State University, 1972
- JORDAN, WRIGHT SINQUEFIELD, *Associate Professor of Horticulture*  
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- JUTRAS, MICHEL WILFRID, *Associate Professor of Agronomy and Soils*  
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B.E.E., 1962, M.E.E., 1964, University of Florida; Ph.D., Clemson University, 1972
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B.S., Villanova University, 1957; M.D., Georgetown University, 1961
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- KELLER, CAROLYN JOAN, *Visiting Instructor in Nursing, Baccalaureate Program*  
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- KELLER, DON FREDERICK, *Assistant Professor of Education*  
B.S., 1962; M.A., Southeast Missouri State College, 1968; Ed.D., Indiana University, 1973
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- KILGORE, DONALD GIBSON, JR., *Lecturer in Medical Technology; Co-director, School of Medical Technology, and Pathologist, Greenville General Hospital*  
M.D., Southwestern Medical College of the University of Texas, 1949
- KING, EDWIN WALLACE, *Professor of Entomology and Economic Zoology*  
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- KING, JOHN CALVIN, *Instructor in Dairy Science*  
B.S., Clemson University, 1937
- KING, MORRIS AUDREY, *Head of Elementary and Secondary Education Department; Professor of Education*  
B.S.Ed., University of Georgia, 1939; M.A., 1946, Ed.D., 1952, Columbia University
- KING, SAMUEL CARL, *Assistant Professor of Spanish*  
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- KING, WILLIS ALONZO, *Head of Dairy Science Department; Professor of Dairy Science*  
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- KINGSLAND, GRAYDON CHAPMAN, *Associate Professor of Plant Pathology and Physiology*  
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B.S., 1958, M.S., 1961, Ph.D., 1966, Clemson University
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## 32 Faculty

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B.S., 1944, M.A., 1948, Teachers College, Columbia University; Ed.D., George Peabody College for Teachers, 1967
- LaFLEUR, KERMIT STILLMAN, *Associate Professor of Agronomy and Soils*  
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- LaGRONE, JOHN WALLACE, *Associate Professor of Mathematical Sciences*  
B.S., Clemson University, 1932; M.A., Vanderbilt University, 1934
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B.A.E., 1958, M.S.E., 1962, University of Florida; Ph.D., North Carolina State University, 1964; P.E.
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- LASKAR, RENU CHAKRAVARTI, *Associate Professor of Mathematical Sciences*  
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- LEE, PETER ROALD, *Associate Professor of Architecture*  
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B.Cer.E., Clemson University, 1952; M.S.Cer.E., 1957, Ph.D., 1960, University of Illinois
- LEMOINE, AUSTIN JOSEPH, *Assistant Professor of Mathematical Sciences*  
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- LEWIS, ALEXANDER DODGE, *Professor of Mechanical Engineering*  
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- LEWIS, ARCHIE JEFFERSON, III, *Instructor in Horticulture*  
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- LEWIS, STEPHEN ALBERT, *Assistant Professor of Plant Pathology and Physiology*  
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- LING, ROBERT FRANCIS, *Visiting Associate Professor of Mathematical Sciences*  
B.A., Berea College, 1961; M.A., University of Tennessee, 1963; Ph.D., Yale University, 1971
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B.S., University of Alabama, 1952; M.D., Medical College of Alabama, 1956

## 34 Faculty

- LOVE, JACKSON SPENCER, JR., *Assistant Professor of Civil Engineering*  
B.S., Carnegie Institute of Technology, 1965; M.S., Pennsylvania State University, 1967;  
Ph.D., West Virginia University, 1971; P.E.
- LOYACANO, HAROLD ANTHONY, JR., *Assistant Professor of Entomology  
and Economic Zoology and of Zoology*  
B.S., Tulane University, 1962; M.S., Louisiana State University, 1967; Ph.D., Auburn  
University, 1970
- LOYD, MAX IRA, *Associate Professor of Agricultural Economics and Rural  
Sociology*  
B.S., 1956, M.S., 1963, Ph.D., 1970, North Carolina State University
- LUDWIGSEN, BERNHARD, *Lecturer in Medical Technology, School of  
Medical Technology, Greenville General Hospital; Clinical Biochemist*  
Ph.D., University of Denmark, 1954; Post Doctorate, University of Canada
- LUEDEMAN, JOHN KEITH, *Associate Professor of Mathematical Sciences*  
B.A., Valparaiso University, 1963; M.A., Southern Illinois University, 1965; Ph.D., State  
University of New York (Buffalo), 1969
- LUKAWECKI, ANN RUSSELL, *Visiting Instructor in Nursing, Baccalaureate  
Program*  
A.B., Shorter College, 1949; B.S., Emory University, 1952; M.A., University of Chicago,  
1959
- LUKAWECKI, STANLEY MICHAEL, *Acting Head of Mathematical Sciences  
Department; Professor of Mathematical Sciences*  
B.S., Southeastern Louisiana College, 1953; M.S., 1957, Ph.D., 1961, Auburn University
- LUMPKIN, OLIVER REESE, *Associate Professor of Education*  
B.S., Fort Valley State College, 1948; M.Ed., Tuskegee Institute, 1953; Ph.D., Ohio  
State University, 1971
- LUNCEFORD, EMMETT MARVIN, JR., *Adjunct Professor of Bioengineering*  
B.S., Memphis State University, 1950; M.D., University of Tennessee Medical School,  
1953
- LUNSFORD, RONALD FRANKLIN,\* *Instructor in English*  
B.A., 1970, M.A., 1971, University of North Carolina
- LURIE, GORDON ALLEN, *Visiting Instructor in Sociology*  
B.A., Temple University, 1967; M.A., University of Illinois, 1973
- LYNN, HERMAN PINKNEY, *Associate Professor of Agricultural Engineering*  
B.S., 1949, M.S., 1968, Clemson University
- LYONS, DONALD W., *Associate Professor of Textile Science and Mechanical  
Engineering*  
B.M.E., 1961, Ph.D., 1966, Georgia Institute of Technology; P.E.
- LYTLE, JOHN STEVENS, *Associate Professor of Agricultural Economics and  
Rural Sociology*  
B.S., 1962, M.S., 1963, Ph.D., 1966, Ohio State University
- MABRY, RODNEY HUGH, *Instructor in Economics*  
B.S., University of Kentucky, 1969
- MACAULAY, HUGH HOLLEMAN, JR., *Alumni Professor of Economics and  
Industrial Management*  
B.S., 1947, M.S., 1948, University of Alabama; Ph.D., Columbia University, 1957
- McCARTER, JACKSON HOWARD, *Lecturer in Medical Technology; Co-  
director, School of Medical Technology, Greenville General Hospital*  
M.D., University of Pittsburgh, 1963
- McCLAIN, EUGENE FREDERICK, *Assistant Professor of Agronomy and  
Soils*  
B.S., University of Idaho, 1954; M.S., University of California, 1956; Ph.D., University  
of Georgia, 1973
- McCLARE, ALAN DAVID, *Instructor in History*  
B.A., Amherst College, 1966; M.A., Duke University, 1968
- McCLURE, HARLAN EWART, *Dean, College of Architecture; Professor of  
Architecture*  
A.B., B.Arch., George Washington University, 1937; ARK, KKH, Royal Swedish  
Academy, 1938; M.Arch., Massachusetts Institute of Technology, 1941; A.I.A., 1946;  
F.A.I.A., 1962

\* On leave.

- McCOLLOUGH, JOE LAWRENCE, *Assistant Professor of Philosophy*  
B.A., Wake Forest University, 1957; M.A., 1961, Ph.D., 1970, Emory University
- McCONNELL, JAMES CALVIN, JR., *Assistant Professor of Animal Science*  
B.S., 1965, Ph.D., 1970, University of Tennessee
- McCORMAC, JACK CLARK,<sup>o</sup> *Associate Professor of Civil Engineering*  
B.S., The Citadel, 1948; M.S., Massachusetts Institute of Technology, 1949; P.E.
- McGEE, CHARLES McKAY, JR., *Associate Professor of English*  
A.B., Furman University, 1934; A.M., Duke University, 1941
- McGREGOR, ROB ROY, JR., *Associate Professor of French*  
B.A., Erskine College, 1952; B.D., Columbia Theological Seminary, 1957; M.A., University of South Carolina, 1965; Ph.D., University of Georgia, 1969
- McGREGOR, WILLIAM HENRY DAVIS, *Dean, College of Forest and Recreation Resources; Professor of Forestry*  
B.S., Clemson University, 1951; B.S.F., M.F., University of Michigan, 1953; Ph.D., Duke University, 1958
- McHUGH, CARL MANNING, *Coordinator of Engineering Graphics; Associate Professor of Engineering Graphics*  
B.S., Clemson University, 1936; P.E.
- McINNIS, THOMAS McLEOD, JR., *Assistant Professor of Botany*  
B.S., 1966, Ph.D., 1971, University of North Carolina
- McKENZIE, MARTIN CHAPIN, *Associate Professor of Agricultural Engineering*  
B.S., Clemson University, 1937
- McLAUGHLIN, JOHN JOSEPH, *Associate Professor of English*  
B.S., Temple University, 1950; M.A., 1963, Ph.D., 1966, University of California
- McLEAN, EDWARD LEE, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S., 1961, M.S., 1964, University of Wisconsin; Ph.D., Iowa State University, 1968
- McLELLAN, ROBERT WESLEY, *Associate Professor of Recreation and Park Administration*  
B.A., University of Saskatchewan, 1965; M.S., Florida State University, 1967; Ph.D., University of Minnesota, 1971
- McLEMORE, DAN LUCIEN, *Assistant Professor of Agricultural Economics and Rural Sociology*  
B.A., Presbyterian College, 1966; M.S., 1969, Ph.D., 1971, Clemson University
- McMILLAN, HELEN MARION, *Instructor in Home Economics*  
B.S., Auburn University, 1968; M.S., Purdue University, 1972
- McNATT, JO ANN,<sup>o</sup> *Assistant Professor of French*  
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- McPEAK, THOMAS EPHREM, *Head of History and Visual Studies Department; Associate Professor of History and Visual Studies*  
B.F.A., Washburn University of Topeka, 1957; M.F.A., University of Kansas, 1965
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A.B., 1962, M.A.T., 1963, University of North Carolina
- MAERTENS, THOMAS BROCK, *Head of Military Science Department; Professor of Military Science*  
Colonel, Infantry, United States Army; B.S., United States Military Academy, 1945; M.S., University of Alabama, 1962
- MAGRUDER, CHRISTOPHER HERBERT, *Lecturer in Medical Technology, School of Medical Technology, Self Memorial Hospital*  
M.D., Tulane University School of Medicine, 1958
- MALPHRUS, LEWIS DANIEL, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S., Clemson University, 1938; M.S., University of Tennessee, 1940; Ph.D., Purdue University, 1954
- MALSTROM, CARL WAYNE, *Instructor in Electrical and Computer Engineering*  
B.S., University of Tennessee (Chattanooga), 1960; M.S.E.E., Clemson University, 1973
- MANDEL, JEROME HERBERT, *Associate Professor of English*  
B.A., Oberlin College, 1959; M.A., 1961, Ph.D., 1966, Ohio State University

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- MANDEL, MIRIAM BAUER, *Part-time Instructor in English*  
B.A., State University of New York (Binghamton), 1963; M.A., Ohio State University, 1966
- MANSON, JOSEPH RICHARD, *Associate Professor of Physics*  
B.S., University of Richmond, 1965; Ph.D., University of Virginia, 1969
- MANWILLER, ALFRED, *Associate Professor of Agronomy and Soils, Pee Dee Experiment Station*  
B.S., 1938, M.S., 1939, Iowa State University; Ph.D., Pennsylvania State University, 1944
- MARBUT, SAMUEL ALEXANDER, *Assistant Professor of Forestry*  
B.S., University of Georgia, 1939
- MARTIN, JOHN ALLEN, JR., *Associate Professor of Horticulture*  
B.S., Clemson University, 1936
- MARTIN, JOHN CAMPBELL, *Professor of Electrical and Computer Engineering*  
B.E.E., Clemson University, 1948; M.S., Massachusetts Institute of Technology, 1953; Ph.D., North Carolina State University, 1962
- MARTZ, MARY REID, *Assistant Professor of Political Science*  
B.A., Georgetown College, 1959; M.A., University of North Carolina, 1961; Ph.D., Duke University, 1971
- MARULLO, NICASIO PHILIP, *Professor of Chemistry*  
B.S., Queens College, 1952; Ph.D., Polytechnic Institute of Brooklyn, 1961; Post Doctorate, California Institute of Technology, 1960-61; Senior NSF Fellow, Princeton University, 1969, University of Strasbourg, 1970
- MARVIN, JOHN HENRY, JR., *Associate Professor of Textiles*  
B.S., Clemson University, 1941; M.S., Georgia Institute of Technology, 1960
- MARX, DAVID JAMES, *Assistant Professor of Psychology*  
B.S., 1966, M.A., 1969, Ph.D., 1972, Loyola University
- MATTHEWS, JAMES EDWARD, *Associate Professor of Education*  
B.S.Ed., 1949, M.Ed., 1950, Ed.D., 1970, University of Florida
- MATTOX, RONALD DARIUS, *Lecturer in Vocational Education*  
B.S., Georgia Southern College, 1969
- MAURER, DONALD EDWIN, *Professor of Industrial Education*  
B.S., 1957, M.S., 1957, Stout State University; Ed.D., University of Missouri, 1966
- MAXWELL, JAMES DONALD, *Associate Professor of Agronomy and Soils*  
B.S., Mississippi State University, 1962; M.S., Cornell University, 1965; Ph.D., North Carolina State University, 1968
- MAY, HUNTER WILLYARD, *Lecturer in Medical Technology; Director, School of Medical Technology, Self Memorial Hospital*  
M.D., Louisiana State University School of Medicine, 1945
- MAZUR, ANTHONY ROBERT, *Assistant Professor of Horticulture*  
B.S., 1963, M.S., 1968, University of Rhode Island; Ph.D., University of Illinois, 1973
- MEANS, GEORGE CALVIN, JR., *Professor of Architecture*  
B.Arch., Western Reserve University, 1947; M.Arch., Georgia Institute of Technology, 1955; A.I.A.
- MELARAGNO, MICHELE G., *Associate Professor of Planning Studies*  
Dipl., College Nazareno, 1948; Ph.D., University of Bari, 1959; P.E.
- MELSHEIMER, STEPHEN SAMUEL, *Assistant Professor of Chemical Engineering*  
B.S., Louisiana State University, 1965; Ph.D., Tulane University, 1969
- MELTON, JUDITH MARY, *Assistant Professor of German*  
B.A., 1963, M.A., 1966, Ph.D., 1972, Louisiana State University
- MERCER, ROBERT JACKSON, *Associate Professor of Vocational Education*  
B.S., 1951, M.S., 1959, North Carolina State University; Ed.D., Pennsylvania State University, 1969
- MILLER, ANSEL ELDON, *Assistant Professor of Forestry*  
B.S., Mississippi State University, 1964; M.S., Clemson University, 1969; Ph.D., University of Georgia, 1973
- MILLER, DONALD PIGUET, *Associate Professor of Physics*  
B.S., Texas A&M University, 1948; M.S., Tulane University, 1952; Ph.D., Polytechnic Institute of Brooklyn, 1962



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B.S., Clemson University, 1961; M.S., Virginia Polytechnic Institute, 1964; Ph.D., Auburn University, 1971

MILLER, MAX GARDNER, *Associate Professor of Physics*

B.S., 1953, Ph.D., 1961, University of North Carolina

MILLER, ROBERT WALKER, JR., *Assistant Professor of Plant Pathology and Physiology*

B.S., University of Delaware, 1964; M.S., University of Arizona, 1970; Ph.D., University of Delaware, 1971

MIN, HONG SHIK, *Head of Zoology Department; Professor of Zoology*

B.A., 1957, M.S., 1958, West Virginia University; Ph.D., University of Georgia, 1963

MISHOE, STAFFORD MICHAEL, *Instructor in Agricultural Economics and Rural Sociology*

B.S., 1970, M.S., 1972, Clemson University

MITCHELL, CHARLIE ROBERTSON, *Assistant Professor of Engineering Mechanics*

B.S., Virginia Polytechnic Institute, 1956; M.S.C.E., West Virginia University, 1961; P.E.

MITCHELL, JACK HARRIS, JR., *Professor of Food Science*

B.S., Clemson University, 1933; Ph.D., Purdue University, 1941

MITCHELL, THEO WALKER, *Visiting Part-time Lecturer in Industrial Management*

A.B., Fisk University, 1960; J.D., Howard University, 1969

MIXON, ROBERT FLOYD, *Assistant Professor of Spanish*

B.S., Clemson University, 1954; M.A., University of North Carolina, 1961

MIZELLE, WILLIAM OTHA, JR., *Instructor in Agricultural Economics and Rural Sociology*

B.S., 1967, M.S., 1970, North Carolina State University

MONAHAN, SHARON ROSE, *Instructor in Nursing, Associate Degree Program*

B.S., St. Xavier College, 1967; M.S., University of Michigan, 1973

MONTGOMERY, BARBARA MARIE, *Instructor in Speech*

B.S., Ball State University, 1968; M.A., Memphis State University, 1970

MONTGOMERY, CHARLES LEDFORD, JR., *Instructor in Speech*

B.S., 1968, M.A., 1969, Ball State University

MOONEYHAN, JACK LAVERNE, *Assistant Professor of Military Science*

Lieutenant Colonel, United States Army; B.S., 1952, M.S., 1973, Clemson University

MOORE, RONALD RALPH, *Adjunct Professor of Bioengineering*

B.S., Clemson University, 1964; D.M.D., University of Kentucky, 1970

MOORMAN, ROBERT WARDLAW, *Head of Engineering Mechanics Department; Professor of Engineering Mechanics*

B.C.E., Clemson University, 1940; M.S., 1947, Ph.D., 1955, University of Iowa; P.E.

MORGAN, HARVEY EUGENE, JR., *Associate Professor of Industrial Education*

B.S., 1951, M.S., 1956, Clemson University

MOYLE, DAVID DOUGLAS, *Assistant Professor of Materials Engineering and Bioengineering*

B.S., Wilkes College, 1964; Ph.D., 1969, Post Doctorate, 1969-71, Rensselaer Polytechnic Institute

MULLEN, ANN MARIE, *Instructor in Nursing, Baccalaureate Program*

B.S.N., Duquesne University, 1965; M.N., Emory University, 1972

MULLINS, JOSEPH CHESTER, *Associate Professor of Chemical Engineering*

B.S., 1955, M.S., 1960, Ph.D., 1965, Georgia Institute of Technology

MURPHY, THOMAS LUTHER, *Assistant Professor of Military Science*

Captain, Infantry, United States Army; B.A., North Georgia College, 1965

MURRAY, JOHN MICHAEL, *Instructor in Electrical and Computer Engineering*

B.S.E.E., M.S.E.E., University of South Florida, 1970



- MUSEN, HAROLD LOUIS, *Professor of Agronomy and Soils, Edisto Experiment Station*  
 B.S., Tennessee Polytechnic Institute, 1949; M.S., Auburn University, 1951; Ph.D., Rutgers University, 1955
- NEAL, JERRY MILTON, *Assistant Professor of Education*  
 B.S., Samford University, 1965; M.S., 1968, Ed.D., 1971, Indiana University
- NEWTON, ALFRED FRANKLIN, *Head of Industrial Education Department; Professor of Industrial Education*  
 B.S., 1952, M.S., 1958, Clemson University; Ed.D., University of Tennessee, 1961
- NICHOLSON, JAMES HARVEY, *Assistant Professor of Mathematical Sciences*  
 B.A., Southern Methodist University, 1950; M.A., University of Texas, 1957
- NIX, LAWRENCE EDWARD, *Assistant Professor of Forestry*  
 B.S., 1968, M.S., 1970, Mississippi State University
- NOBLET, GAYLE PITTMAN, *Assistant Professor of Entomology and Economic Zoology and of Zoology*  
 B.S., Oklahoma Panhandle State College, 1968; Ph.D., Rice University, 1972
- NOBLET, RAYMOND, *Assistant Professor of Entomology and Economic Zoology*  
 B.S.A., 1965, M.S., 1967, Ph.D., 1970, University of Georgia
- NOLAN, CLIFFORD NEWELL, *Professor of Agronomy and Soils*  
 B.S., University of Florida, 1951; M.S., University of Georgia, 1957; Ph.D., University of Florida, 1960
- NORDQUIST, LOWELL EUGENE, *Instructor in Economics*  
 B.S., North Dakota State University, 1968; M.A., Western Michigan University, 1969
- NORTHERN, WILLIAM LAURUS, *Professor of Dairy Science*  
 B.S., North Carolina State University, 1950; M.Ag., West Virginia University, 1956; Ph.D., University of Minnesota, 1970
- NOWACK, ROBERT FRANCIS, *Associate Professor of Engineering Mechanics*  
 B.S., Carnegie-Mellon University, 1948; M.S., University of Pittsburgh, 1952
- O'DELL, GLEN DEWITT, *Associate Professor of Dairy Science*  
 B.S., 1953, M.S., 1955, Clemson University; Ph.D., University of Georgia, 1970
- O'DELL, WAYNE TALMADGE, *Director of Cooperative Extension Service; Professor of Dairy Science*  
 B.S., 1948, M.S., 1951, Clemson University; Ph.D., Pennsylvania State University, 1958
- OGLE, WAYNE LeROY, *Professor of Horticulture*  
 B.S., University of Tennessee, 1948; M.S., University of Delaware, 1950; Ph.D., University of Maryland, 1952
- OLIVE, EDWARD FLEMING, *Assistant Professor of Education*  
 B.A., Louisiana Tech University, 1949; M.Ed., Louisiana State University, 1954; Ed.D., Auburn University, 1971
- OLIVER, EDWARD LEE, III, *Assistant Professor of Military Science*  
 Captain, Infantry, United States Army; B.A., The Citadel, 1966
- OLSON, EDWARD STURE, *Associate Professor of Textile Chemistry*  
 B.S., 1938, M.S., 1960, Clemson University
- OWENS, RAMETH RICHARD, *Assistant Professor of History*  
 B.A., Agnes Scott College, 1956; M.A., Florida State University, 1961
- OWENS, WALTON HARRISON, JR., *Associate Professor of Political Science*  
 A.B., Emory University, 1958; M.A., 1961, Ph.D., 1967, Florida State University
- OWINGS, MARVIN ALPHEUS, *Head of English Department; Professor of English*  
 A.B., Wofford College, 1931; M.A., 1932, Ph.D., 1941, Vanderbilt University
- PACKER, MYRTON ALFRED, *Coordinator of Educational Services; Professor of Education*  
 A.B., 1936, B.D., 1939, M.Ed., 1961, Wittenberg University; Ed.D., Florida State University, 1964
- PADGETT, ADRIAN LEWIS, *Assistant Professor of Agricultural Economics and Rural Sociology*  
 B.S., 1958, M.S., 1959, Clemson University

- PAGE, NORWOOD RUFUS, *Head of Agricultural Chemical Services Department; Professor of Agronomy and Soils*  
B.S., Clemson University, 1939; M.S., North Carolina State University, 1941; Ph.D., University of Georgia, 1959
- PALMER, JAMES HOWELL, *Assistant Professor of Agronomy and Soils*  
B.S., Clemson University, 1964; M.S., University of Georgia, 1966; Ph.D., Clemson University, 1969
- PALMER, MERRILL CRAIG, *Director of Computer Center; Associate Professor of Mathematical Sciences*  
B.S., University of Chattanooga, 1947; M.A., Vanderbilt University, 1948
- PARDUE, FRED EUGENE, *Associate Professor of Dairy Science*  
B.S., Berea College, 1960; M.S., University of Kentucky, 1962; Ph.D., University of Georgia, 1973
- PARK, EUGENE, *Associate Professor of Mathematical Sciences*  
A.B., University of Georgia, 1939; M.A., Lehigh University, 1941
- PARK, GEORGE BENNET, *Assistant Professor of Chemistry*  
B.S., Newberry College, 1967; M.A., University of North Carolina, 1969; Ph.D., University of Kansas, 1973
- PARK, LAURETTA IRENE, *Assistant Professor of Psychology*  
B.A., Muskingum College, 1969; M.S., 1971, Ph.D., 1972, Florida State University
- PARKER, ROBERT ALLEN, *Part-time Lecturer in Recreation and Park Administration*  
B.S., Florida State University, 1964; M.S., University of Wisconsin, 1969
- PARKS, CLYDE LEONARD, *Associate Professor of Agronomy and Soils*  
B.S., Tennessee Technological University, 1950; M.S., Auburn University, 1956; Ph.D., Texas A&M University, 1963
- PARKS, SUZANNE LOWRY, *Assistant Professor of Nursing, Baccalaureate Program*  
B.S., Emory University, 1958; M.S., University of Maryland, 1959
- PARRADO, PEDRO FRANCISCO, *Assistant Professor of Spanish*  
LL.D., University of Havana, 1941; M.A., University of Miami, 1970
- PARRY, THOMAS HERBERT, *Associate Professor of Education*  
B.A., University of Florida, 1950; M.Ed., 1958, Ed.D., 1967, University of Virginia
- PATE, DOVE HENRY, JR., *Assistant Professor of Industrial Education*  
B.S., 1965, M.In.Ed., 1967, Clemson University; Ed.D., North Carolina State University, 1970
- PATRICK, THOMAS MOORE, JR., *Visiting Lecturer in Industrial Management*  
B.A., Davidson College, 1962; LL.B., University of Virginia, 1965
- PATTERSON, GORDON WHITFIELD, *Instructor in Architecture*  
B.A., B.Arch., University of Arkansas, 1965
- PAYNTER, MALCOLM JAMES BENJAMIN, *Head of Microbiology Department; Associate Professor of Microbiology*  
B.Sc., 1959, M.Sc., 1962, Ph.D., 1964, Sheffield University (England)
- PECK, JOHN CHARLES, *Assistant Professor of Mathematical Sciences and Computer Analyst*  
B.S., 1966, M.S., 1968, Ph.D., 1971, University of Southwestern Louisiana
- PEDEN, RALPH KENNETH, *Assistant Professor of Education*  
B.S., Presbyterian College, 1956; M.A., Middle Tennessee State University, 1965; Ed.D., University of Mississippi, 1972
- PEDEN, S T, *Visiting Part-time Lecturer in Industrial Management*  
B.S., South Carolina State College, 1966
- PEELE, THOMAS CHRISTOPHER, *Professor of Agronomy and Soils*  
B.S., North Carolina State University, 1929; Ph.D., Cornell University, 1933
- PENNSCOTT, WILLIAM WALTER, *Associate Professor of Education*  
B.S., Northern Illinois University, 1950; M.A., University of Illinois, 1952; Ed.S., 1965, Ed.D., 1967, Indiana University
- PEPPERS, LARRY GENE, *Assistant Professor of Sociology*  
B.S., 1969, M.A., 1971, Memphis State University; Ph.D., Oklahoma State University, 1973
- PERRY, LEONARD THOMAS, *Instructor in Spanish*  
Certificado de Aptitud, Escuela Central de Idiomas de Madrid, 1960; B.A., John Carroll University, 1964; M.A., University of Tennessee, 1969

## 40 Faculty

- PERRY, ROBERT LINDSAY, *Associate Professor of Engineering Technology*  
B.M.E., 1947, M.M.E., 1953, Clemson University; P.E.
- PERTUIT, ALTON JOSEPH, JR., *Assistant Professor of Horticulture*  
B.S., 1962, M.S., 1964, Louisiana State University; Ph.D., University of Maryland, 1970
- PHARR, WALTER MORGAN, JR., *Instructor in Philosophy*  
B.A., Mercer University, 1966; M.A., University of Virginia, 1970
- PHILLIPS, WILLIAM ARNOLD, *Associate Professor of Architecture*  
B.S., Georgia Institute of Technology, 1958; B.L.A., Louisiana State University, 1960; M.L.A., Harvard University, 1962; A.S.L.A.
- PIERCE, HAPPY, *Instructor in Industrial Management*  
B.B.A., Arkansas A&M College, 1969; M.B.A., University of Mississippi, 1971
- PIERCE, SHIRLEY FORD, *Instructor in Industrial Management*  
B.B.A., Southern State College, 1970; M.B.A., University of Mississippi, 1971
- PILO, MARVIN ROBERT, *Instructor in Political Science*  
B.A., Columbia College, 1966; M.A., Columbia University, 1969
- PINDER, ALBERT REGINALD, *Fred Harvey Hall Calhoun Professor of Chemistry*  
B.Sc., 1941, Ph.D., 1948, D.Sc., 1963, University of Sheffield; D.Phil., University of Oxford, 1950
- PIPPIN, WILLIAM LEON, JR., *Instructor in History*  
B.A., Tulane University, 1965; M.A., Wake Forest University, 1967
- PITNER, JOHN BRUCE, *Superintendent of Pee Dee Experiment Station; Professor of Agronomy and Soils*  
B.S., 1938, M.S., 1939, Mississippi State University; Ph.D., University of Wisconsin, 1944
- PITTMAN, JEROLD FRANKLIN, *Professor of Agricultural Economics and Rural Sociology*  
B.S., 1951, M.S., 1956, Clemson University; Ph.D., North Carolina State University, 1969
- PIVORUN, EDWARD BRONI, *Assistant Professor of Zoology*  
B.S., Tufts University, 1968; Ph.D., University of Minnesota, 1973
- POE, HERBERT VERNON, *Associate Professor of Electrical and Computer Engineering*  
B.S., North Carolina State University, 1944; M.S., Texas A&M University, 1950; P.E.
- POLK, HENRY TASKER, *Professor of Chemistry*  
B.S., 1931, M.S., 1933, University of Kentucky; Ph.D., Cornell University, 1938
- POLLET, DALE KEITH, *Assistant Professor of Entomology and Economic Zoology*  
B.S., 1966, M.S., 1969, Louisiana State University; Ph.D., Virginia Polytechnic Institute, 1972
- PORTER, JOHN JEFFERSON, *Associate Professor of Textile Chemistry*  
B.S. in Ch.E., 1956, Ph.D., 1960, Georgia Institute of Technology; P.E.
- POSTER, GERBRAND, III, *Instructor in English*  
B.A., University of the South, 1965; M.A., Rice University, 1967
- POWELL, GARY LEE, *Associate Professor of Biochemistry*  
B.S., University of California (Los Angeles), 1962; Ph.D., Purdue University, 1967; Post Doctorate, Washington University, 1967-69
- POWERS, EDWARD LEE, *Assistant Professor of Industrial Management*  
B.S., 1963, M.B.A., 1964, West Virginia University; Ph.D., University of South Carolina, 1971
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B.S.N., Queens College (North Carolina), 1947; M.N., Emory University, 1957
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B.S., 1960, M.S., 1961, D.V.M., 1969, University of Georgia
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B.S., 1963, M.S., 1968, Clemson University
- PRIVETTE, ESTHER BAUKNIGHT, *Visiting Instructor in Nursing, Baccalaureate Program*  
B.S.N., University of South Carolina, 1969

- PROCTOR, ROSA ELLEN, *Lecturer in Medical Technology; Educational Coordinator, School of Medical Technology, Self Memorial Hospital*  
B.S., Lander College, 1957
- PROCTOR, THOMAS GILMER, *Associate Professor of Mathematical Sciences*  
B.N.E., 1956, M.S., 1962, Ph.D., 1964, North Carolina State University
- PRUITT, JAMES ROBERT, *Adjunct Professor of Bioengineering*  
B.S., The Citadel, 1956; M.D., Medical University of South Carolina, 1960
- RABEY, DUNCAN WILKIE, JR., *Head of Aerospace Studies Department; Professor of Aerospace Studies*  
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- RAD, PARVIZ FOROOTAN, *Assistant Professor of Civil Engineering*  
B.S., Teheran University (Iran), 1964; M.S., Ohio State University, 1966; C.E., 1968, Ph.D., 1970, Massachusetts Institute of Technology
- RAETSCH, BARBARA MORRIS, *Assistant Professor of Education*  
B.S., Winthrop College, 1968; M.Ed., 1971, Ed.D., 1973, University of Georgia
- RAETSCH, FREDERICK CARL, *Assistant Professor of Education*  
B.A., Western Michigan University, 1965; M.A., Appalachian State University, 1970; Ph.D., University of Georgia, 1972
- RAY, JOHN ROBERT, *Associate Professor of Physics and Astronomy*  
B.S., Rose Polytechnic Institute, 1961; Ph.D., Ohio University, 1964
- REAMER, LARRY DONALD, *Assistant Professor of Forestry*  
B.S., 1961, M.S., 1966, Clemson University
- RECKTENWALD, ROBERT PETER, *Assistant Professor of English*  
B.A., University of Florida, 1960; M.A., University of North Carolina, 1964
- RECOULLEY, ALFRED LUNSFORD, III, *Assistant Professor of English*  
B.A., Louisiana State University, 1964; M.A., Duke University, 1965; Ph.D., University of North Carolina, 1968
- REEL, JEROME VINCENT, JR., *Associate Professor of History*  
B.S., 1960, M.A., 1961, University of Southern Mississippi; Ph.D., Emory University, 1967
- REEVES, CALVIN BRIGHT, *Assistant Professor of Dairy Science*  
B.S., Oklahoma A&M College, 1942; M.S., Ohio State University, 1947
- REGNIER, IRELAND G., *Associate Professor of History and Visual Studies*  
B.F.A., 1950, M.F.A., 1951, Kansas City University
- RENEKE, JAMES ALLEN, *Associate Professor of Mathematical Sciences*  
B.A., 1958, M.A., 1960, University of Florida; Ph.D., University of North Carolina, 1964
- RICE, JAMES SHELBY, *Assistant Professor of Agronomy and Soils*  
B.S., 1966, M.S., 1968, University of Tennessee; Ph.D., University of Illinois, 1971
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B.S., 1947, M.S., 1948, Ph.D., 1951, Virginia Polytechnic Institute; P.E.
- RICHARDSON, ELEANOR JOYCE, *State 4-H and Youth Development Coordinator; Instructor in Home Economics*  
B.S., 1962, M.S., 1966, Auburn University
- RICHARDSON, JOEL LANDRUM, *Associate Professor of Textiles*  
B.S., Clemson University, 1942; M.S., North Carolina State University, 1960; P.E.
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B.S.M.E., Clemson University, 1957; M.S., North Carolina State University, 1962; M.A., Ph.D., 1965, University of Alabama
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B.S., 1965, M.S., 1967, Clemson University
- RIFE, LAWRENCE ALBERT, *Associate Professor of Mathematical Sciences*  
B.S., North Dakota State University, 1940; M.A., University of Nebraska, 1947
- RISHER, CHARLES FRANKLIN, *Assistant Professor of Poultry Science*  
B.S., Clemson University, 1953
- ROBBINS, HAL GARDNER, JR., *Visiting Assistant Professor of Industrial Management*  
B.A., Marion College, 1952; M.A., Longwood College, 1969



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B.S., Winthrop College, 1945; M.Ed., University of Maryland, 1958
- ROBERTS, CARLETON WHITMAN, *Associate Professor of Textile Chemistry*  
B.A., New York University, 1943; M.S., 1947, Ph.D., 1950, Polytechnic Institute of Brooklyn
- ROBERTS, FREDDY LEE, *Assistant Professor of Civil Engineering*  
B.S.C.E., 1964, M.S.C.E., 1966, University of Arkansas; Ph.D., University of Texas, 1969
- ROBERTS, KENNETH JOSEPH, *Assistant Professor of Agricultural Economics and Rural Sociology*  
B.S., 1966, M.S., 1969, Louisiana State University; Ph.D., Oregon State University, 1972
- ROBINSON, BOBBY HUGH, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S., Berea College, 1964; M.S., North Carolina State University, 1967; Ph.D., Clemson University, 1968
- ROBINSON, GILBERT CHASE, *Head of Ceramic Engineering Department; Professor of Ceramic Engineering*  
B.Cer.E., North Carolina State University, 1940; Sc.D., Alfred University, 1970; P.E.
- RODGERS, JOHN HASFORD, *Professor of Agricultural Education*  
B.S., 1952, M.S., 1953, Clemson University; Ph.D., Ohio State University, 1961
- ROGERS, ERNEST BRASINGTON, JR., *Associate Professor of Agricultural Engineering*  
B.S., Clemson University, 1948; M.S., Texas A&M University, 1952; P.E.
- ROGERS, RODNEY OUTHWAITE, *Assistant Professor of English*  
B.S., Massachusetts Institute of Technology, 1958; M.A., University of Virginia, 1966
- ROMPALA, JOHN THADDEUS, *Assistant Professor of Physics*  
B.S., DePaul University, 1964; Ph.D., Clemson University, 1969
- ROSTRON, JOSEPH PRUGH, *Professor of Civil Engineering*  
B.S. in C.E., Southern Methodist University, 1941; M.C.E., Clemson University, 1956, P.E.
- ROSVAL, LEON, *Director, Associate Degree Program in Nursing; Associate Professor of Nursing*  
B.S., Adelphi College, 1951; M.S., Teachers College, Columbia University, 1954
- RUCKLE, WILLIAM HENRY, *Professor of Mathematical Sciences*  
A.B., Lincoln University, 1960; M.S., 1962, Ph.D., 1963, Florida State University
- RUDISILL, CARL SIDNEY, *Associate Professor of Mechanical Engineering*  
B.S.M.E., 1954, M.S.M.E., 1961, Ph.D., 1968, North Carolina State University
- RUDOWSKI, VICTOR ANTHONY, *Assistant Professor of English*  
B.A., Union College, 1955; Ph.D., Harvard University, 1964
- RUHLE, RICHARD DAVID, JR., *Visiting Lecturer in Industrial Management*  
B.A., 1960, J.D., 1963, Washington and Lee University
- RUSSELL, CHARLES BRADLEY, *Associate Professor of Mathematical Sciences and Industrial Management*  
B.A., University of the South, 1962; M.S., 1963, Ph.D., 1967, Florida State University
- RUSO, KENNETH JOHN, *Associate Professor of Architecture*  
B.Arch., Oklahoma State University, 1957; M.Arch., Clemson University, 1965; A.I.A.
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B.S., Clemson University, 1959; M.F., Yale University, 1963
- SALLEY, JAMES RAWORTH, JR., *Associate Professor of Chemistry*  
B.S., College of Charleston, 1937; M.S., Clemson University, 1953
- SANDBERG, BRUCE LeROY, *Associate Professor of Education*  
B.A., Gustavus Adolphus College, 1951; M.A., Northwestern University, 1955; Ph.D., University of Illinois, 1966
- SARGENT, JAMES EDWARD, *Assistant Professor of History*  
B.S., Eastern Michigan University, 1964; M.A., 1968, Ph.D., 1972, Michigan State University

- SARGENT, JANICE LOUISE,<sup>o</sup> *Instructor in Speech*  
B.M.E., Eastern Michigan University, 1966; M.A., Michigan State University, 1970
- SAUER, BARRY WILLIAM, *Assistant Professor of Bioengineering*  
D.V.M., University of Georgia, 1966
- SAUNDERS, RICHARD LEROY, JR., *Assistant Professor of History*  
B.A., Northwestern University, 1962; M.A., 1964, Ph.D., 1971, University of Illinois
- SAVITSKY, GEORGE BORIS, *Professor of Chemistry*  
B.S., Aurora University, 1947; Ph.D., University of Florida, 1959; Post Doctorate, Princeton University, 1959-61
- SAVITSKY, LUDMILA ALEXANDER, *Lecturer in Russian*  
B.A., Clemson University, 1971
- SAWYER, CORINNE HOLT, *Associate Professor of English*  
B.A., 1945, M.A., 1948, University of Minnesota; Ph.D., University of Birmingham, 1954
- SCHOENIKE, ROLAND ERNST, *Associate Professor of Forestry*  
B.S., 1951, M.S., 1953, Ph.D., 1962, University of Minnesota
- SCHOUEST, RUSSELL STANLEY, *Assistant Professor of Mathematical Sciences; Manager of Systems Programming, Computer Center*  
B.S., 1966, M.S., 1968, University of Southwestern Louisiana
- SCHWARTZ, ARNOLD EDWARD, *Dean, Graduate Studies and University Research; Professor of Civil Engineering*  
B.S.C.E., 1958, M.S.C.E., 1960, University of Notre Dame; Ph.D., Georgia Institute of Technology, 1963; P.E.
- SCHWARTZ, ROBERTA CHRISTINE, *Assistant Professor of English*  
B.A., Marygrove College, 1960; M.A., 1961, Ph.D., 1968, Wayne State University
- SEAMON, LEON EDWARD, *Assistant Professor of Spanish*  
B.S., Georgia Institute of Technology, 1962; M.A., 1964, Ph.D., 1972, University of Georgia
- SEFICK, HAROLD JOHN, *Associate Professor of Horticulture*  
B.S., 1935, M.S., 1937, Rutgers University
- SENN, DAVID JAMES, *Associate Professor of Psychology*  
B.A., North Central College, 1962; M.A., Northern Illinois University, 1964; Ph.D., University of Massachusetts, 1967
- SENN, TAZE LEONARD, *Head of Horticulture Department; Professor of Horticulture*  
B.S., Clemson University, 1939; M.S., 1950, Ph.D., 1958, University of Maryland
- SEO, KENZO, *Associate Professor of Mathematical Sciences*  
B.S., Tokyo University of Education, 1953; M.S., 1958, Ph.D., 1962, Purdue University
- SHAIN, WILLIAM ARTHUR, *Associate Professor of Forestry*  
B.S.F., 1953, M.F., 1957, University of Georgia; Ph.D., Michigan State University, 1963
- SHANNON, RUSSELL DELBERT, *Associate Professor of Economics*  
B.A., Duke University, 1960; M.A., 1962, Ph.D., 1966, Tulane University
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B.S., 1959, M.S., 1969, Clemson University
- SHEPARD, BUFORD MERLE, *Assistant Professor of Entomology and Economic Zoology*  
B.S., Middle Tennessee State University, 1966; M.S., University of Georgia, 1968; Ph.D., Texas A&M University, 1971
- SHERRILL, MAX DOUGLAS, *Associate Professor of Physics*  
B.S., 1952, Ph.D., 1961, University of North Carolina
- SHIVELY, JESSUP MacLEAN, *Head of Biochemistry Department; Professor of Biochemistry*  
B.S., 1957, M.S., 1959, Ph.D., 1962, Purdue University
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B.S., Clemson University, 1934; M.Litt., University of Pittsburgh, 1951; Ph.D., American University, 1966
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B.S., Spring Hill College, 1950; M.A., University of Kentucky, 1961
- SIMON, FREDERICK T., *J. E. Sirrine Professor of Textile Science*  
B.S., Morris Harvey College, 1955; M.S., Marshall University, 1958
- SIMPSON, CLAUDE SHERARD, JR., *Assistant Professor of Military Science*  
Lieutenant Colonel, Signal Corps, United States Army; B.S., 1953, M.Ed., 1972, Clemson University
- SIMS, ERNEST THEODORE, JR., *Professor of Horticulture*  
B.S.A., University of Georgia, 1954; M.Sc., 1959, Ph.D., 1962, Ohio State University
- SITTERLY, WAYNE ROBERT, *Superintendent of Truck Experiment Station; Professor of Plant Pathology and Physiology*  
B.S., Iowa State University, 1953; M.S., 1955, Ph.D., 1957, Purdue University
- SKARDON, BEVERLY NORTON, *Assistant Professor of English*  
B.S., Clemson University, 1938; M.A., University of Georgia, 1964
- SKELLEY, GEORGE CALVIN, JR., *Professor of Animal Science*  
B.S., Oklahoma Panhandle State College, 1958; M.S., 1960, Ph.D., 1963, University of Kentucky
- SKELTON, BILLY RAY, *Professor of Economics*  
B.S., 1956, M.S., 1958, Clemson University; Ph.D., Duke University, 1964
- SKELTON, BOBBY JOE, *Associate Professor of Horticulture*  
B.S., 1957, M.S., 1960, Clemson University; Ph.D., Virginia Polytechnic Institute, 1966
- SKELTON, THOMAS EUGENE, *Associate Professor of Entomology and Economic Zoology*  
B.S., 1953, M.S., 1956, Clemson University; Ph.D., University of Georgia, 1969
- SKOVE, MALCOLM JOHN, *Alumni Professor of Physics*  
B.S., Clemson University, 1956; Ph.D., University of Virginia, 1960
- SLANN, MARTIN WAYNE, *Assistant Professor of Political Science*  
A.B., University of Miami, 1964; M.A., University of Connecticut, 1966; Ph.D., University of Georgia, 1970
- SMITH, BENJAMIN LANDIS, *Instructor in Industrial Education*  
B.S., Florida State University, 1966; M.In.Ed., Clemson University, 1972
- SMITH, BILL ROSS, *Assistant Professor of Agronomy and Soils*  
B.S., Texas Tech University, 1964; M.S., University of Arizona, 1966; Ph.D., North Carolina State University, 1970
- SMITH, CHESTER ROLAND, *Associate Professor of Industrial Management*  
B.S., University of Alabama, 1941; M.A., 1947, Ph.D., 1950, University of Virginia
- SMITH, DANIEL BRUCE, *Assistant Professor of Agricultural Economics and Rural Sociology*  
B.S., Auburn University, 1963; M.S., University of Tennessee, 1965; Ph.D., University of Kentucky, 1973
- SMITH, FRED HARRISON, *Professor of Plant Pathology and Physiology*  
B.S.A., 1951, M.S.A., 1952, Ph.D., 1970, University of Georgia
- SMITH, LARRY JULIAN, *Instructor in Agricultural Economics and Rural Sociology*  
B.S., 1966, M.S., 1968, Clemson University
- SNELL, ABSALOM WEST, *Head of Agricultural Engineering Department; Professor of Agricultural Engineering; Chairman of Directorate of the Water Resources Research Institute*  
B.S., Clemson University, 1949; M.S., Iowa State University, 1952; Ph.D., North Carolina State University, 1964; P.E.
- SNELSIRE, ROBERT WILLIAM, *Associate Professor of Electrical and Computer Engineering*  
B.A., Bethany College, 1956; B.S., 1956, M.S., 1958, Ph.D., 1964, Carnegie Institute of Technology
- SNIPES, DAVID STRANGE, *Associate Professor of Geology*  
B.S., Wake Forest University, 1950; Ph.D., University of North Carolina, 1965
- SOBCZYK, ANDREW FLORIAN, *Samuel Maner Martin Professor of Mathematical Sciences*  
B.A., 1935, M.A., 1936, University of Minnesota; Ph.D., Princeton University, 1939

- SPARKS, LeGRAND McIVER, *Assistant Professor of Entomology and Economic Zoology*  
B.S., 1941, M.S., 1957, Clemson University
- SPECTOR, MYRON, *Assistant Professor of Bioengineering and Materials Engineering*  
B.S., 1967, M.S., 1969, Ph.D., 1971, Carnegie-Mellon University; Post Doctorate, University of Pittsburgh, 1971-72
- SPENCER, HAROLD GARTH, *Head of Chemistry and Geology Department; Professor of Chemistry*  
B.S.E., 1952, M.S., 1958, Ph.D., 1959, University of Florida
- SPIERS, JUDITH ELAINE, *Instructor in Home Economics*  
B.S., Winthrop College, 1967; M.S., University of Tennessee, 1971
- SPRAY, RICHARD ALLMAN, *Assistant Professor of Agricultural Engineering*  
B.S., 1966, M.S., 1967, West Virginia University; Ph.D., University of Missouri (Columbia), 1972
- SPURLOCK, HOOPER CLYDE, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S., University of Tennessee, 1935; M.S., 1951, Ph.D., 1956, University of Florida
- STACY, CAREY IRENE, *Visiting Lecturer in Spanish*  
B.A., Coker College, 1961; M.A., University of North Carolina, 1971
- STAFFORD, DONALD BENNETT, *Associate Professor of Civil Engineering*  
B.S., 1961, M.S., 1963, Ph.D., 1968, North Carolina State University; P.E.
- STANLEY, VIRGINIA BELCHER, *Instructor in Education*  
B.S., Winthrop College, 1965; M.Ed., Clemson University, 1971
- STEADMAN, MARK SIDNEY, JR., *Associate Professor of English*  
A.B., Emory University, 1951; M.A., 1956, Ph.D., 1963, Florida State University
- STEARNS, EDWIN IRA, *Head of Textile Department; Professor of Textiles*  
B.S., Lafayette College, 1932; M.S., Rensselaer Polytechnic Institute, 1933; Ph.D., Rutgers University, 1945
- STEINER, PINCKNEY ALSTON, *Assistant Professor of Physics*  
B.S., University of Georgia, 1959; Ph.D., Duke University, 1965; Post Doctorate, University of Copenhagen, 1964-66
- STEIRER, WILLIAM FRANK, JR., *Assistant Professor of History*  
B.A., Gettysburg College, 1959; M.A., 1962, Ph.D., 1972, University of Pennsylvania
- STELLING, FRANK H., *Adjunct Professor of Bioengineering*  
B.S., Augusta College, 1934; M.D., Medical College of Georgia, 1938
- STEMBRIDGE, GEORGE EUGENE, *Professor of Horticulture*  
B.S., Clemson University, 1958; M.S., 1959, Ph.D., 1961, University of Maryland
- STAPP, JAMES MARVIN, *Alumni Professor of Agricultural Economics and Rural Sociology*  
A.B., Berea College, 1937; M.A., 1938, Ph.D., 1940, University of Virginia
- STEVENSON, JOHN LOVETT, *Associate Professor of Recreation and Park Administration*  
B.S., Davidson College, 1952; B.D., 1955, Th.M., 1957, Union Theological Seminary; Ph.D., Indiana University, 1968
- STEWART, HARRY EUGENE, *Head of Languages Department; Professor of French*  
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- STILLWELL, EPHRAIM POSEY, JR., *Head of Physics and Astronomy Department; Professor of Physics*  
B.S., Wake Forest University, 1956; M.S., 1958, Ph.D., 1960, University of Virginia
- STOKES, SARA TURNER, *Instructor in Nursing, Associate Degree Program*  
B.S.N., Vanderbilt University, 1952; M.S., Texas Woman's University, 1970
- STRADER, GLADYS ANNE, *Instructor in French*  
B.A., San Francisco College for Women, 1960; License ès Lettres, The Sorbonne, 1968
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A.B., 1939, M.A., 1949, Georgetown University



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B.S., 1950, M.S., 1952, North Carolina State University
- TARBERT, FOARD HOLDEN, JR., *Visiting Instructor in Industrial Management*  
A.B., Newberry College, 1970
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B.S., Winthrop College, 1936; M.S., University of Tennessee, 1951
- TEKLITS, MARY ANN, *Instructor in Nursing, Associate Degree Program*  
B.S., St. Joseph College, 1965; M.N., Emory University, 1971
- THODE, FREDERICK WILBUR, *Associate Professor of Horticulture*  
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B.S., North Georgia College, 1968; M.S., Clemson University, 1971
- THOMPSON, CARL STASSEN, *Assistant Professor of Agricultural Economics and Rural Sociology*  
B.S., M.S., 1968, Murray State University; Ph.D., University of Kentucky, 1973
- THOMPSON, PATRICIA, *Lecturer in Medical Technology; Educational Coordinator, School of Medical Technology, Greenville General Hospital*  
B.S., Furman University, 1951; Medical Technology (ASCP), 1952
- THOMPSON, REGINA, *Assistant Professor of Nursing, Baccalaureate Program*  
B.S., Bluefield State College, 1951; M.A., Teachers College, Columbia University, 1958
- THOMPSON, SHARON WOLFF, *Instructor in Nursing, Baccalaureate Program*  
B.S.N., Murray State University, 1968; M.S.N., University of Kentucky, 1972
- THURSTON, JAMES NORTON, *Alumni Professor of Electrical and Computer Engineering; University Marshal*  
B.E.E., Ohio State University, 1936; S.M., 1943, Sc.D., 1950, Massachusetts Institute of Technology; P.E.
- TINSLEY, WILLIAM ALLAN, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S., 1956, M.S., 1960, University of Illinois; Ph.D., University of Minnesota, 1963
- TITUS, SYLVIA FERN, *Instructor in English*  
B.A., Southwestern State College, 1968; M.A., Oklahoma State University, 1970
- TITUS, TERRY CHARLES, *Assistant Professor of Food Science*  
B.S., Washington State University, 1963; M.S., 1969, Ph.D., 1970, Oklahoma State University
- TODD, BOYD JOSEPH, *Professor of Industrial Management and Mathematical Sciences*  
B.S., 1946, M.S., 1948, Clemson University; Ph.D., North Carolina State University, 1969
- TOLINS, IRWIN SOLOMON, *Associate Professor of Operations Research*  
B.S.C.E., 1948, M.S.C.E., 1949, Columbia University; M.S., Stanford University, 1969; Ph.D., Columbia University, 1961; P.E.
- TOMBES, AVERETT SNEAD, *Associate Professor of Zoology*  
B.S., University of Richmond, 1954; M.S., Virginia Polytechnic Institute, 1956; Ph.D., Rutgers University, 1961; Post Doctorate, University of Virginia, 1965-66
- TOOMEY, ROBERT EDWARD, *Visiting Professor of Industrial Management*  
B.S., Harvard University, 1940; M.Ed., Boston University, 1941; M.S., Columbia University, 1951; LL.D., Clemson University, 1968
- TOPAZIAN, RICHARD G., *Adjunct Professor of Bioengineering*  
B.A., Houghton College, 1951; D.D.S., McGill University (Canada), 1955

- TRENT, BUFORD EARL, *Director of University Union and YMCA; Assistant Professor of Recreation and Park Administration*  
B.A., Wofford College, 1954; M.Ed., Springfield College, 1961
- TREVILLIAN, WALLACE DABNEY, *Dean, College of Industrial Management and Textile Science; Professor of Economics*  
B.S., 1940, M.A., 1947, Ph.D., 1954, University of Virginia
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B.S., 1953, M.N.S., 1957, Cornell University; Ph.D., University of Wisconsin, 1960
- TURNER, JAMES A., JR., *Associate Professor of Industrial Management*  
B.S., University of North Carolina, 1961; J.D., University of South Carolina, 1966; C.P.A.
- TURNER, RAYMOND CLYDE, *Assistant Professor of Physics*  
B.S., Carnegie Institute of Technology, 1960; Ph.D., University of Pittsburgh, 1966
- TURNER, THOMAS GEORGE, JR., *Assistant Professor of History and Visual Studies*  
B.S., Illinois State University, 1968; M.F.A., Clemson University, 1973
- TURNIPSEED, SAMUEL GUY, *Professor of Entomology and Economic Zoology, Edisto Experiment Station*  
B.A., University of North Carolina, 1956; M.S., Clemson University, 1958; Ph.D., North Carolina State University, 1961
- TUTTLE, JACK EDWIN, *Associate Professor of Political Science*  
B.A., 1940, M.A., 1948, Pennsylvania State University
- ULBRICH, CARLTON WILBUR, *Associate Professor of Physics*  
B.S., 1960, M.S., 1962, Ph.D., 1965, University of Connecticut
- ULBRICH, HOLLEY HEWITT, *Part-time Assistant Professor of Economics*  
B.A., 1963, M.A., 1964, Ph.D., 1968, University of Connecticut
- UMPHLETT, CLYDE JEFFERSON, *Head of Botany Department; Professor of Botany*  
B.S., 1951, M.S., 1957, Virginia Polytechnic Institute; Ph.D., University of North Carolina, 1961
- UNDERWOOD, RICHARD ALLAN, *Assistant Professor of English*  
B.A., 1955, M.A., 1967, Ph.D., 1970, University of Michigan
- USREY, MALCOLM ORTHELL, *Associate Professor of English*  
B.A., Abilene Christian College, 1951; M.A., 1956, Ph.D., 1963, Texas Technological University
- VACHER, JOHN MICHAEL, *Assistant Professor of Psychology*  
A.B., West Virginia University, 1962; M.A., University of North Carolina, 1969
- VAN BLARICOM, LESTER OSCAR, *Professor of Horticulture*  
B.S., 1938, M.S., 1940, Ch.E., 1954, Oregon State University
- VAN HOY, MILTON SPANGLER, *Instructor in English*  
B.A., Duke University, 1965; M.A., University of North Carolina, 1969
- VAN LEAR, DAVID HYDE, *Associate Professor of Forestry*  
B.S., 1963, M.S., 1965, Virginia Polytechnic Institute; Ph.D., University of Idaho, 1969; Post Doctorate, University of Florida, 1968-69
- VARENHORST, GLENN ELMER, *Acting Head of Planning Studies Department; Associate Professor of Planning Studies*  
B.A., M.P.A., University of Kansas, 1952; M.S., University of Wisconsin, 1965
- VAUGHN, EDWARD ALLEN, *Associate Professor of Textiles*  
B.S., Lynchburg College, 1962; M.S., Institute of Textile Technology, 1964; Ph.D., Victoria University of Manchester (England), 1969
- VAUGHN, JOHN RICHARD, JR., *Lecturer in Recreation and Park Administration*  
B.S., Clemson University, 1961; M.D., Medical University of South Carolina, 1966
- VELEZ, ALEJANDRO, *Instructor in Economics*  
B.A., American University, 1963; M.A., University of Florida, 1971
- VERICH, THOMAS MICHAEL, *Assistant Professor of History*  
B.A., Lawrence University, 1965; M.A., 1968, Ph.D., 1973, Duke University
- VOGEL, HENRY ELLIOTT, *Dean, College of Physical, Mathematical and Biological Sciences; Professor of Physics*  
B.S., Furman University, 1948; M.S., 1950, Ph.D., 1962, University of North Carolina

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- VON TUNGELN, GEORGE ROBERT, *Associate Professor of Agricultural Economics and Rural Sociology*  
B.S., 1951, M.S., 1956, Southern Illinois University
- WADDLE, GERALD LEE, *Assistant Professor of Industrial Management*  
B.A., Baldwin-Wallace College, 1965; M.B.A., Kent State University, 1968; Ph.D., University of South Carolina, 1973
- WADSWORTH, PHILLIP JULIAN, *Instructor in Sociology*  
B.S., Florence State University, 1970; M.A., Memphis State University, 1972
- WAGNER, MARY MARGARET, *Assistant Professor of Nursing, Baccalaureate Program*  
B.S., Villanova University, 1963; M.S., University of Pennsylvania, 1966
- WALKER, JOHN HENRY, *Assistant Professor of Education*  
B.S., Southwest Missouri State College, 1959; M.R.E., 1962, D.R.E., 1966, Southwestern Baptist Theological Seminary; M.A., Furman University, 1969; Ph.D., University of Texas, 1973
- WALKER, RICHARD FRANCIS, *Assistant Professor of Zoology*  
B.S., Rutgers University, 1961; M.S., New Mexico State University, 1969; Ph.D., Rutgers University, 1971
- WALKER, WALTER SAXON, *Associate Professor of Poultry Science*  
B.S., Clemson University, 1951; M.Ed., University of South Carolina, 1957
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WILLIAM F. GEER, JR., B.S., *Senior Accountant*

VIVIAN R. HARRELL, *Supervisor, Data Processing*

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JAMES T. ROBERTS, B.S., *Internal Auditor*

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RONALD T. HERRIN, *Accountant*

COY H. HOWARD, *Supervisor, Accounts Payable*

GARY M. McCOMBS, B.S., *Accountant*

WILLIAM A. THOMPSON, B.S., *Manager, Accounting*

JOSEPH S. WALKER, B.S., *Bursar*

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RAY L. THOMPSON, B.S., *Associate Director, Personnel*

WALTER E. BERRY, B.S., *Coordinator, Safety*

GEORGE H. BONNETTE, B.S., *Administrative Assistant*

RALEIGH FREEMAN, *Personnel Assistant*

### PHYSICAL PLANT DIVISION

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DANIEL J. BOYER, M.Arch., *Superintendent, Planning and Engineering*

JAMES C. CAREY, B.S., *Superintendent, Grounds and Special Services*

JAMES M. HANNA, B.S., *Engineer, Plant*

DAN C. HERR, B.Arch., *Engineer, Facilities Design*

GEORGE C. JONES, B.S., *Superintendent, Buildings*

WALTER A. MOORE, B.S., *Assistant Engineer, Plant*

JULIAN L. MURPH, B.S., P.E., *Assistant Superintendent, Planning and Engineering*

JAMES A. STANLEY, JR., B.S., *Supervisor, Work Order Planning*

JAMES C. SUBER, B.S., *Assistant Superintendent, Grounds and Special Services*

JACK W. WEEDEN, *Chief of Security*

KILLOUGH H. WHITE, III, B.A., *Engineer, Facilities Design*

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JOHN C. NEWTON, B.S., *Associate Director, Auxiliary Enterprises*

WILLIAM D. CROMER, *Supervisor, Central Office Services*

THOMAS R. RHYMES, *Manager, Laundry*

JOHN W. YOUNG, JR., B.M.E., *Associate Director, Housing*

WILLIAM L. KINCAID, B.S., *Assistant Manager, Housing*



## 58 Development Activities

### THE CLEMSON HOUSE HOTEL

VERNER E. CATHCART, *Manager*

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STANLEY G. NICHOLAS, B.S., *Vice President for Development*

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GEORGE M. MOORE, B.S., *Associate Director, Alumni Relations*

JOHN C. MANN, B.A., *Editor, Alumni*

JOSEPH J. TURNER, B.S., *Field Representative, Alumni*

### PLANNING AND CORPORATE RELATIONS

JAMES L. STROM, B.S., *Director, Planning and Corporate Relations*

### DEFERRED GIFTS AND ESTATE PLANNING

HORACE D. HARBY, B.S., *Director, Deferred Gifts*

### CAMPUS MASTER PLAN

ROBERT D. EFLIN, M.Arch., *Campus Master Planner*

### PUBLIC RELATIONS

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JOHN L. ALLEN, B.A., *Associate Director, Public Relations*

J. ROSS CORNWELL, M.A., *Assistant Director, University Information*

LUCIUS C. HAMILTON, M.S., *Assistant Director, Public Service Information*

DORIS A. TIMMERMAN, M.S., *Assistant Director, Publications*

BEULAH R. CHENEY, B.A., *Editor, University Publications*

ANDREW J. CURRY, M.A., *Editor, Experiment Station*

SHIRLEY G. OWENS, M.A., *Editor, Research Publications*

JAMES H. ROGERS, B.A., *Editor, Extension*

DOROTHY S. YANDLE, B.A., *Associate Editor, Experiment Station*

### UNIVERSITY COMMUNICATIONS CENTER

WILLIAM H. DURHAM, M.A., *Director, University Communications Center*

JAMES P. BURNS, *Associate Director, University Communications Center*

E. ROBERT AUSTIN, M.A., *Editor, Radio-Television*

EARL T. COSENS, *Chief Engineer*

WILLIAM B. EARLE, JR., *Artist*

LILY R. HALL, B.S., *Producer, Radio*

CHARLES W. HARALSON, *Supervisor, Central Photography*

JOHN R. MATTISON, B.S., *Editor, Radio*

ANN L. McPHAIL, B.A., *Assistant Editor, Radio-Television*

THOMAS H. SHOCKLEY, *Assistant Director, Photographic Service*

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VIRGIL F. LINDER, '69, Columbia, South Carolina, *Vice President*

JOE E. SHERMAN, '34, Clemson, South Carolina, *Secretary*

TRESCOTT N. HINTON, Clemson, South Carolina, *Treasurer*

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 TRESCOTT N. HINTON, Clemson, South Carolina, *Ex Officio*  
 GEORGE M. MOORE, '58, Clemson, South Carolina, *Ex Officio*  
 STANLEY G. NICHOLAS, Clemson, South Carolina, *Ex Officio*  
 JOE E. SHERMAN, '34, Clemson, South Carolina, *Ex Officio*  
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 J. STUART LAND, '40, Abbeville, South Carolina, *District 3*  
 MACK H. ALMAN, '42, Spartanburg, South Carolina, *District 4*  
 GOODWIN G. THOMAS, '42, Rock Hill, South Carolina, *District 5*  
 VIRGIL F. LINDER, JR., '69, Columbia, South Carolina, *District 6*  
 DAN A. KENNERLY, '47, Orangeburg, South Carolina, *District 7*  
 JAKE F. WATSON, '41, Camden, South Carolina, *District 8*  
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 HENRY C. CHAMBERS, '49, Beaufort, South Carolina, *District 10*  
 DANIEL S. LESESNE, '38, Mt. Pleasant, South Carolina, *District 11*  
 J. GARNER BAGNAL, '34, Statesville, North Carolina, *District 12*  
 LEONARD C. BUTLER, '53, Burlington, North Carolina, *District 13*  
 FRANK L. JOHNSON, '66, Atlanta, Georgia, *District 14*  
 THOMAS C. BREAZEALE, '42, Knoxville, Tennessee, *District 16*  
 TERENCE R. KINARD, '63, Tarentum, Pennsylvania, *District 17*  
 DAVIS T. MOORHEAD, '54, Anandale, Virginia, *District 18*  
 T. SCOTT DuBOSE, '34, Altadena, California, *District 19*  
 THOMAS C. BREAZEALE, '42, Knoxville, Tennessee, *Past President,*  
*Clemson Alumni Association*  
 J. HARVEY HOBSON, Clemson, South Carolina, *Faculty Representative*  
 THOMAS E. THORNHILL, '48, Charleston, South Carolina, *Foundation*  
*Representative*  
 T. CARROLL ATKINSON, '45, Marion, South Carolina, *IPTAY Representative*  
 LEWIS F. HOLMES, '44, Trenton, South Carolina, *IPTAY Representative*  
 JOHN S. PRATT, '74, Granville, Ohio, *Student Representative*

## 1973 CLEMSON UNIVERSITY FOUNDATION

## Officers

- HENRY C. COLEMAN, Daytona Beach, Florida, *President*  
 R. ROY PEARCE, Columbia, South Carolina, *Vice President*  
 JOE E. SHERMAN, Clemson, South Carolina, *Secretary*  
 TRESCOTT N. HINTON, Clemson, South Carolina, *Treasurer*

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 STANLEY G. NICHOLAS, Clemson, South Carolina, *Ex Officio*  
 GEORGE H. AULL, JR., Winston-Salem, North Carolina  
 PATRICK N. CALHOUN, Charlotte, North Carolina  
 WOFFORD B. CAMP, Bakersfield, California  
 T. KENNETH CRIBB, Spartanburg, South Carolina  
 WILLIAM J. ERWIN, Danville, Virginia  
 WILLIAM H. GRIER, Rock Hill, South Carolina  
 CHARLES E. HAMMOND, Pittsburgh, Pennsylvania  
 LUCIUS H. HARVIN, Henderson, North Carolina  
 R. FRANK KOLB, Columbia, South Carolina  
 PAUL W. McALISTER, Laurens, South Carolina  
 SILAS C. McMEEKIN, Columbia, South Carolina

## 60 Student Affairs

LAWRENCE V. STARKEY, Atlanta, Georgia  
MURRAY M. STOKELY, Greenville, South Carolina  
THOMAS E. THORNHILL, Charleston, South Carolina  
WILSON C. WEARN, SR., Greenville, South Carolina  
ROBERT H. YEARGIN, Greenville, South Carolina

### Administration of Student Affairs

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KENNETH N. VICKERY, B.S., *Assistant Vice President for Student Affairs and Dean of Admissions and Registration*  
FRANK J. HOWARD, B.S., *Assistant to the Vice President for Student Affairs*  
GEORGE E. COAKLEY, B.S., *Associate Dean of Students*  
SUSAN G. DELONY, M.S., *Associate Dean of Students*  
CATHY C. TURNER, B.A., *Assistant Dean of Students*  
FRANK A. BURTNER, Ph.D., *Director, Fraternity Affairs*  
JAMES W. SUTHERLAND, M.Ed., *Administrative Assistant*

### OFFICE OF ADMISSIONS, REGISTRATION, AND FINANCIAL AID

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ALBERT B. MARX, M.S., *Associate Director, Admissions and Registration*  
REGINALD J. BERRY, B.S., *Registrar*  
WILLIAM R. MATTOX, M.S., *Assistant Director, Admissions*  
ARNOLD M. BLOSS, B.S., *Director, Financial Aid*  
FRANCES H. BLAIR, B.S., *Recorder*  
MARVIN G. CARMICHAEL, B.S., *Administrative Assistant*  
STANLEY B. SMITH, JR., M.A., *Administrative Assistant*  
LINDA B. LAW, B.A., *Counselor, Admissions*  
WALTER A. MAYFIELD, M.Ed., *Counselor, Admissions*

### RESIDENCE HALLS OFFICE

MANNING N. LOMAX, B.S., *Director, Residence Halls*  
JOEL L. FELSBURG, M.S., *Manager, Residence Halls*  
GEORGE M. GILCHRIST, B.S., *Administrative Assistant*  
FRANK MAULDIN, B.S., *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*

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. COOLEIDGE, 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*





## 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 forty-seven undergraduate and fifty-three 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 10,112 for the first semester, 1973-74. Since the opening of the University, through the first semester, 1973-74, 70,128 students have attended Clemson, and of this number, 25,156 have been awarded the bachelor's degree. During this same period, 132 associate degrees, 2,842 master's degrees, and 324 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.

## 64 General Information

- 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. 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 subsection 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. All applicants should apply by February 1, to be assured of consideration. 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 whose major includes Math 101 or 106 in the first semester of the freshman year curriculum, 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.

**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.

**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 \$85.00 for room rent and \$120.00 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 Office with the completed "Student Application for Room Reservation" card not later than June 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 1974-75

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

	<i>Full-Time S. C. Resident</i>	<i>Full-Time Nonresident</i>
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

(Excluding Room and Board) .....	\$320.00	\$670.00
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### Room

#### East Campus (Air-conditioned with Telephones)

Barnett, Byrnes, Lever, Manning, Mauldin, Smith .....	\$230.00
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#### West Campus (Air-conditioned with Telephones)

Johnstone: Old Sections D, E, F .....	\$190.00
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Johnstone: New Sections A, F .....	\$215.00
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Bowen, Bradley, Donaldson, Norris, Wannamaker . . . . .	\$230.00
Benet, Cope, Geer, Sanders, Young . . . . .	\$215.00
West Campus (Air-conditioned without Telephones)	
Johnstone: Old Sections A, B, C . . . . .	\$175.00

### Board

Five-Day Plan (Monday through Friday) . . . . .	\$240.00
Seven-Day Plan . . . . .	\$295.00

**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.

	<i>S. C. Resident</i>	<i>Nonresident</i>
Matriculation Fee (nonrefundable) . . . . .	\$ 5.00	\$ 5.00
Tuition (per semester hour) . . . . .	\$ 6.00	\$16.00
University Fee (per semester hour) . . . . .	\$16.00	\$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) . . . . .	\$ 8.00	\$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. 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 in industry, business, education, nonprofit organizations, or governmental agencies. For all four-year curricula under the Cooperative 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.

The Office of Cooperative Education strives to refer students to employers who will provide work experiences which are related to the student's academic major.

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.

A Cooperative Education certificate, a companion document to the University diploma, will be awarded to all students who successfully complete the required work periods.

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 Architecture offers participation in Building Construction. The College of Physical, Mathematical and Biological Sciences offers participation in Botany, Chemistry, Mathematics, and Microbiology.

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

A nominal fee is assessed each 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 in-



tention 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 SERVICE

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 1973, 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, its students, 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

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 halls will be required to sign a Residence Hall contract relating to terms and conditions of occupancy for the full academic year. All students, regardless of whether they live in residence halls or off campus, must complete a locator card as part of the registration process, and report all changes of address to the Student Information Office.

Complete information to include application forms, description of residence halls, and contract will be forwarded by the Residence Halls Office to all students who have been accepted for enrollment and have paid the admissions deposit.

A \$75.00 advance payment must accompany the residence hall application. This amount is credited to the fall semester's room rent, and is refundable only under the conditions outlined in the contract.

## 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 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 \$480 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 \$590 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. Individual Meals. Students who are not on a board plan may purchase 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 discontinue the plan 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. Refunds, when authorized, will be made on a daily pro rata basis.

## 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, two full-time psychiatrists, thirteen full-time registered nurses, two full-time registered laboratory technicians, 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 operation 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 college. 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 services of the counseling psychologists. The service is dedicated to helping students in self-understanding, self-improvement, and in the attaining of academic and vocational goals.

## **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 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. Candidates for the advanced ROTC courses will be administered a written Officer Qualification Test and a physical examination during their freshman or sophomore year to determine eligibility for advanced 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. 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. No deposit is required for advanced program cadets. The uniform becomes the property of the student when he is commissioned.

Students who have one year or more active military service and have successfully completed two or more years of ROTC training at the high school level, may substitute such service or preparatory schooling for 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.

## **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 successfully complete the program. Most male cadets are expected to become Air Force flying officers.

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. 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 ad-

mission into the POC. Cadets who enter the POC attend a four-week training period at an Air Force base usually 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 established.

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.

Nonflying officers can expect active duty tours of four years or less. Flying officers can serve as pilots or navigators for five years after completing the rated specialty training.

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 374 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

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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.

**Graduate Study.** 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.

**Commissions.** All Clemson University graduates who successfully complete the four-year Army ROTC program will be commissioned as Second Lieutenants. Those who have not applied for or received Regular Army commissions will be appointed in the U.S. Army Reserve and, depending upon the needs of the Army, will either be called for two years of active duty or for a three to six month period of active duty for training only.

Army service obligations are 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 \$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 507,000 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 En-

gineering. These two buildings and their excellent equipment represent gifts from the Olin Foundation totaling nearly \$2 million.

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. Two hundred and fifty individual units and apartments provide living accommodations for married students.







## 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.

W—*Withdrew*. This grade indicates that the student withdrew from the course. No credit hours taken are recorded for the grade of W provided that the course is dropped prior to the last five weeks of classes in the semester. A student enrolled during any part of the last five weeks of classes shall have final grades recorded.

**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 and prior to the last five weeks is recorded as W—Withdraw.

**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 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 begin-

ning 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.

**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:

<i>Grade-Point Ratio (Semester or Cumulative, Whichever Is Higher)</i>	<i>Recommended Maximum Number of Semester Hours to Be Scheduled</i>
0.00 to 0.99 .....	15 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

**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, or W.

**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 grade-point 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 five weeks of classes in the semester without having grades recorded. A student enrolled during any part of the last five weeks of classes shall have final semester grades recorded.

After the first withdrawal from the University 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. Ineligibility to continue the following semester also includes any intervening summer school.

A student who has been credited with 90-or-more credit hours of work taken at Clemson shall be permanently ineligible for readmission (regular or summer sessions), if at the time of withdrawal his cumulative grade-point ratio is below the requirement for 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 that:

1. The candidate can furnish evidence of having done satisfactory study for the examination.
2. The examination is not given until after the regular degree date.
3. 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. 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.

**Make-up 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 removing 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.
Major concentrations:	
Economic Zoology	
Entomology	
Plant Pathology	
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	
Architecture	B.Arch.
Pre-architecture	B.A., B.S.
Building Construction	B.S.



Curriculum	Undergraduate Degree
College of Education	
Agricultural Education†	B.S.
Early Childhood Education	B.A.
Elementary Education	B.A.
Industrial Education	B.S.
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.
Wood Utilization	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.

° 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 Liberal Arts

## Bachelor of Arts

## Major concentrations:

English

History

Modern Languages

Political Science

Psychology

Sociology

B.A.

## College of Nursing

## Associate Degree Program

## Baccalaureate Program

A.A. in Nursing

B.S. in Nursing

College of Physical, Mathematical and  
Biological Sciences

Botany

Chemistry

Geology

Mathematics

Medical Technology

Microbiology

Physics

Pre-pharmacy

Zoology

B.S.

B.A. in Arts and Sciences, B.S.

B.A. in Arts and Sciences, B.S.

B.A. in Arts and Sciences, B.S.

B.S.

B.S.

B.A. in Arts and Sciences, B.S.

Nondegree

B.S.

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

### BACHELOR OF ARTS AND BACHELOR OF SCIENCE IN PREPROFESSIONAL STUDIES

Clemson University will award the degree of Bachelor of Arts or Bachelor of Science in Preprofessional Studies to a student who has satisfactorily completed three years of undergraduate work in an appropriate curriculum and the first year of work in an accredited medical, dental, veterinary, law, or other accredited, professional, postgraduate school provided the student fulfills the requirements for the three-year program as follows and the other specified conditions are met.

1. At least two of the three years of preprofessional work, including the third year, must be taken in residence at this University.
2. A minimum of three years of undergraduate work (*i.e.*, preprofessional school credit) must be presented.
3. Normal progress must have been made toward fulfilling the degree requirements of the curriculum in which the student is enrolled at Clemson.

4. The student applying for the Bachelor of Arts or Bachelor of Science in Preprofessional Studies must be recommended by the college at Clemson in which the curriculum that he is majoring as a Clemson student is located or by the college in which three years of normal progress toward a degree can be identified.
5. If the combination of preprofessional work taken and the work in the first year of professional school is equivalent to that which is required in some other bachelor's degree program at Clemson, the college concerned may recommend the other bachelor's degree.

*The above requirements and conditions will become effective July 1, 1974, and will apply to all students who satisfy these requirements and conditions after that date.*

A Clemson student having left the University before receiving the bachelor's degree (prior to July 1, 1974), and having enrolled immediately in an accredited, professional, postgraduate school may apply for a bachelor's degree from Clemson and have his application considered on an individual basis. The college or colleges at Clemson considering his application are authorized to examine the student's entire record in both preprofessional and professional studies and exercise their own judgment concerning the three-year requirement for preprofessional studies.

## 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.

### Curriculum 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	Second Semester
BOT 101 Plant Biology . . . . . 3 (3,0)	AGRIC 101 Intro. to Agriculture . . 1 (1,0)
BOT 103 Plant Biology Lab. . . . 1 (0,2)	CH 102 or 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)	MATH 104 Trigonometry† . . . . . 2 (2,0)
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)
HIST 102 American History . . . . 3 (3,0)	or BOT 101 Plant Biology . . . . 3 (3,0)
MATH 103 College Algebra† . . . . 2 (2,0)	and BOT 103 Plant Biology Lab. 1 (0,2)
Elective . . . . . 1	Elective . . . . . 1
17	15

For students in Economic Biology and Food Science.

AGRIC 101 Intro. to Agriculture . . 1 (1,0)	CH 102 or 112 General Chemistry <sup>o</sup> 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)
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)
CH 101 General Chemistry . . . . . 4 (3,3)	or BOT 101 Plant Biology . . . . 3 (3,0)
ENGL 101 English Composition . . 3 (3,0)	and BOT 103 Plant Biology Lab. 1 (0,2)
MATH 103 College Algebra . . . . . 2 (2,0)	Elective . . . . . 1
MATH 104 Trigonometry . . . . . 2 (2,0)	16
Elective . . . . . 1	17

<sup>o</sup> 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 economics 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.

See page 108 for Freshman Year.

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



# 110 Degrees and Curricula

See page 108 for Freshman Year.

## SOPHOMORE YEAR

First Semester		Second Semester	
AG ED 201 Intro. to Agric. Ed. . . . .	3 (2,3)	AGM 205 Principles of Farm Shop . . . . .	3 (2,3)
AGRIC 202 Intro. to Plant Sci. . . . .	3 (2,3)	AGM 206 Agric. Mechanization . . . . .	3 (2,3)
ECON 201 Principles of Economics . . . . .	3 (3,0)	AGRIC 201 Intro. to Animal Ind. . . . .	3 (2,3)
History-Literature Requirement* . . . . .	3 (3,0)	AGRON 202 Soils . . . . .	3 (2,2)
PHYS 207 General Physics . . . . .	4 (3,2)	History-Literature Requirement* . . . . .	3 (3,0)
Elective . . . . .	1	Elective . . . . .	1
	17		16

## JUNIOR YEAR

AGM 301 Soil and Water Conserva. . . . .	3 (2,3)	AG EC 302 Agric. Firm Mgt. . . . .	3 (2,3)
AGRON 301 Fertilizers . . . . .	3 (3,0)	AN SC 301 Feeds and Feeding . . . . .	3 (3,0)
ENGL 301 Public Speaking . . . . .	3 (3,0)	FOR 305 Elements of Forestry . . . . .	2 (2,0)
Approved Horticulture Elective . . . . .	3	FOR 307 Elem. of Forestry Lab. . . . .	1 (0,3)
Minor† . . . . .	6	Minor† . . . . .	6
	18	Elective . . . . .	3
			18

## SENIOR YEAR

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

† 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

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

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)	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 Resources Engineering I	3 (2,3)	AGE 212 Fund. of Mechanization	3 (2,3)
EG 109 Engr. Graphical Com.	2 (0,6)	EM 202 Engr. Mech. (Dynamics)	3 (3,0)
EM 201 Engr. Mech. (Statics)	3 (3,0)	MATH 208 Engineering Math. I	4 (4,0)
Literature Requirement <sup>a</sup>	3 (3,0)	Humanistic—Social Elective†	3 (3,0)
MATH 206 Calculus of Sev. Var.	4 (4,0)	Plant Science Elective†	3
PHYS 221 Thermal and Elec. Phen.	3 (3,0)	Elective	1
Elective	1		17
	19		

# 112 Degrees and Curricula

## 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 364 Ag. Waste-Mgt. Sys. . .	2 (2,0)
E&CE 307 Basic Elec. Engr. . . . .	3 (2,2)	AGE 433 Design Criteria for Plant	
EM 304 Mechanics of Materials. . . .	3 (3,0)	and Animal Environment . . . . .	2 (2,0)
or EM 320 Fluid Mechanics . . . . .	3 (3,0)	AGE 465 Engr. Prop. of Biol. Mat. 2	(1,3)
Animal Science Elective† . . . . .	3	PHYS 222 Optics and Mod. Phys. 3	(3,0)
Engineering Science Elective† . . . .	3	Engineering Science Elective† . . .	3
	<hr/>	Soils Elective† . . . . .	3
	16		<hr/>
			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 200 Economic Concepts . . . . .	3 (3,0)	Resources Engineering II . . . . .	3 (2,3)
or ECON 201 Prin. of Economics 3	(3,0)	AGE 442 Agric. Process Engr. . . .	3 (2,3)
Humanistic-Social Elective† . . . . .	3 (3,0)	Engineering Science Elective† . . .	6
Mathematics Elective† . . . . .	3 (3,0)	Elective . . . . .	3
Elective . . . . .	3		<hr/>
	<hr/>		18
	16	138 Total Semester Hours	

\* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.  
† Electives to be selected in consultation with adviser.

## 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.

See page 108 for Freshman Year.

## 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
	<hr/>		<hr/>
	17		17

**JUNIOR YEAR**

ACCT 201 Principles of Accounting 3 (3,0)	AG EC 309 Economics of Agricultural Marketing . . . . . 3 (3,0)
or AG EC 305 Agric. Bus. Anal. . . . . 3 (2,3)	or AG EC 402 Economics of Agricultural Production . . . . . 3 (3,0)
AGM 303 Cal. for Mech. Agric. . . . . 2 (2,0)	AG EC 351 Advertising and Merchandising . . . . . 3 (3,0)
AGM 308 Mech. and Hydraulic Systems . . . . . 3 (2,3)	AGM 301 Soil and Water Conserva. 3 (2,3)
AGRIC 201 Intro. to Animal Ind. 3 (2,3)	ENGL 301 Public Speaking . . . . . 3 (3,0)
AGRON 202 Soils . . . . . 3 (2,2)	Approved Agriculture Elective† . . . . . 3
Social Science Elective† . . . . . 3 (3,0)	Elective . . . . . 3
Elective . . . . . 3	
20	18

**SENIOR YEAR**

AG EC 456 Prices . . . . . 3 (3,0)	AGM 404 Farm Structures . . . . . 3 (2,3)
AGM 452 Farm Power . . . . . 3 (2,3)	AGM 408 Equip. Sales and Ser. . . . . 3 (3,0)
AGM 460 Farm and Home Utilities 3 (2,3)	Approved Agriculture Elective† . . . . . 3
Approved Economics Elective† . . . . . 3	Approved Economics Elective† . . . . . 3
Elective . . . . . 3	Elective . . . . . 3
15	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.



# 114 Degrees and Curricula

See page 108 for Freshman Year.

## SOPHOMORE YEAR

First Semester	Second Semester
AN PH 301 Physiology and Anatomy of Domestic Animals . . . . . 3 (2,3)	AGRIC 202 Intro. to Plant Sciences 3 (2,3)
CH 223 Organic Chemistry† . . . . . 3 (3,0)	AN SC 202 Intro. to Animal Sci. 3 (2,3)
CH 227 Organic Chemistry Lab.† 1 (0,3)	History—Literature Requirement* . . 3 (3,0)
or BIOC 210 Elem. Biochem. 4 (3,3)	PHYS 207 General Physics . . . . . 4 (3,2)
or CH 201 General Chemistry . . . . . 4 (3,3)	Minor† . . . . . 3
ECON 201 Principles of Economics 3 (3,0)	Elective . . . . . 1
History—Literature Requirement* . . 3 (3,0)	17
Minor† . . . . . 3	
Elective . . . . . 1	
17	

## 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 and Evaluation . . . . . 2 (1,3)
AN SC 355 Meats Lab. . . . . 1 (0,3)	ENGL 301 Public Speaking . . . . . 3 (3,0)
GEN 302 Genetics . . . . . 4 (3,3)	Social Science Elective§ . . . . . 3 (3,0)
MICRO 305 General Microbiology 4 (3,3)	Minor† . . . . . 6
Elective . . . . . 3	Elective . . . . . 3
17	18

## SENIOR YEAR

AN SC 401 Beef Production . . . . 3 (3,0)	AN SC 406 Seminar . . . . . 2 (2,0)
AN SC 403 Beef Production Lab. 1 (0,3)	AN SC 408 Pork Production . . . 3 (3,0)
DY SC 453 Animal Reproduction. 3 (3,0)	AN SC 410 Pork Production Lab. 1 (0,3)
NUTR 401 Fund. of Nutrition . . 3 (3,0)	AN SC 452 Animal Breeding . . . 3 (3,0)
Minor† . . . . . 3	Elective . . . . . 7
Elective . . . . . 4	16
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.

† 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 108 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)	17
History-Literature Requirement* . . . 3 (3,0)	
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 402 Dairy Manufactures . . . 4 (3,3)	AN SC 452 Animal Breeding . . . 3 (3,0)
or DY SC 453 Animal Repro. . . 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
DY SC 409 Dairy Sci. Seminar . . . 2 (2,0)	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 of 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 108 for Freshman Year.

### SOPHOMORE YEAR

First Semester	Second Semester
AGRIC 202 Intro. to Plant Sci. . . . . 3 (2,3)	ECON 201 Principles of Economics 3 (3,0)
CH 223 Organic Chemistry† . . . . . 3 (3,0)	History-Literature Requirement* . . . 3 (3,0)
CH 227 Organic Chemistry Lab.† 1 (0,3)	MICRO 305 General Microbiology 4 (3,3)
or BIOCH 210 Elem. Biochem. 4 (3,3)	PHYS 207 General Physics . . . . . 4 (3,2)
or CH 201 General Chemistry. . . . . 4 (3,3)	PS 352 Breeder Flock and Hatchery Management . . . . . 3 (3,0)
GEN 302 Genetics . . . . . 4 (3,3)	PS 353 Breeder Flock and Hatchery Management Lab. . . . . 1 (0,3)
History-Literature Requirement* . . . 3 (3,0)	Elective . . . . . 1
PS 203 Avian Science . . . . . 2 (2,0)	19
Elective . . . . . 1	
17	

### JUNIOR YEAR

AN PH 301 Physiology and Anatomy of Domestic Animals . . . . . 3 (2,3)	PS 359 Management of Egg, Broiler and Turkey Enterprises . . . . . 2 (2,3)
AN SC 301 Feeds and Feeding. . . . . 3 (3,0)	PS 451 Poultry Nutrition . . . . . 2 (2,0)
ENGL 301 Public Speaking . . . . . 3 (3,0)	Minor§ . . . . . 6
PS 355 Poultry Products Grading and Technology . . . . . 3 (2,3)	Approved Elective¶ . . . . . 3
Minor§ . . . . . 3	Elective . . . . . 2
Social Science Elective‡ . . . . . 3 (3,0)	16
18	

### SENIOR YEAR

PS 401 Animal Environ. Tech. . . . . 2 (2,0)	PS 460 Seminar . . . . . 2 (2,0)
PS 403 Ani. Environ. Tech. Lab. 1 (0,3)	Minor§ . . . . . 3
PS 458 Avian Micro. and Parasit. 4 (3,3)	Approved Elective¶ . . . . . 3-2
Minor§ . . . . . 3	Elective . . . . . 8-9
Approved Elective¶ . . . . . 3	16
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.

† 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 108 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 108 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 . . . . .	4 (3,3)
PHYS 207 General Physics . . . . .	4 (3,2)	Elective . . . . .	3
WB 306 Wildlife Res. of SE. U.S. . . . .	2 (2,0)		
ZOOL 301 Comp. Vert. Anatomy . . . . .	3 (2,3)		
Elective . . . . .	2		17
	17		



# 118 Degrees and Curricula

## 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 ... 4 (3,3)
ZOOL 456 Parasitology .. 4 (3,3)	Social Science Elective† .. 3 (3,0)
Social Science Elective† .. 3 (3,0)	Elective .. 6
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; (6) insect control in the pest control industry; and (7) entomologists in the armed forces.

See pages 108 and 117 for Freshman and Sophomore Years.

## JUNIOR YEAR

### First Semester

ACCT 201 Principles of Accounting 3 (3,0)	or AG EC 305 Agric. Bus. Anal. 3 (2,3)
or EX ST 301 Intro. Statistics .. 3 (2,2)	
ENGL 301 Public Speaking .. 3 (3,0)	
ENT 405 Insect Morphology .. 4 (3,3)	
PHYS 207 General Physics .. 4 (3,2)	
ZOOL 201 Invertebrate Zoology.. 4 (3,3)	
18	

### Second Semester

ENT 410 Insect Taxonomy .. 3 (1,6)
ENT 468 Introduction to Research .. 2 (1,3)
MICRO 305 General Microbiology 4 (3,3)
PHYS 208 General Physics .. 4 (3,2)
Elective .. 3
16

## SENIOR YEAR

ENT 461 Special Problems in Entomology and Econ. Zool. .. 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 108 and 117 for Freshman and Sophomore Years.

**JUNIOR YEAR**

First Semester	Second Semester
MICRO 305 General Microbiology . . . . . 4 (3,3)	BOT 331 Intro. Plant Taxonomy . . . 3 (2,3)
PHYS 207 General Physics . . . . . 4 (3,2)	BOT 421 Plant Physiology . . . . . 4 (3,3)
PL PA 401 Plant Pathology . . . . . 3 (2,3)	PHYS 208 General Physics . . . . . 4 (3,2)
or PL PA 405 Forest Pathology 3 (2,3)	Plant Pathology Elective <sup>o</sup> . . . . . 3
Group A Elective† . . . . . 3	Elective . . . . . 3
Social Science Elective† . . . . . 3 (3,0)	17
17	

**SENIOR YEAR**

ENGL 301 Public Speaking . . . . . 3 (3,0)	Group A Elective† . . . . . 3
EX ST 301 Introductory Statistics 3 (2,2)	Group B Elective§ . . . . . 3
Group A Elective† . . . . . 3	Plant Pathology Elective <sup>o</sup> . . . . . 3
Group B Elective§ . . . . . 3	Social Science Elective† . . . . . 3 (3,0)
Plant Pathology Elective <sup>o</sup> . . . . . 3	Elective . . . . . 4
Elective . . . . . 3	16
18	

134 Total Semester Hours

<sup>o</sup> 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, 451, 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, 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, and 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.

See page 108 for Freshman Year.

### 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
	<hr/>
	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
	<hr/>
	17

### JUNIOR YEAR

EX ST 301 Introductory Statistics . . . . .	3 (2,2)
FD SC 305 Dairy and Food Engr. . . . .	3 (2,3)
FD SC 425 Nutrition and Dietetics . . . . .	3 (3,0)
MICRO 305 General Microbiology . . . . .	4 (3,3)
Minor† . . . . .	3
Elective . . . . .	1
	<hr/>
	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
	<hr/>
	16

**SENIOR YEAR**

FD SC 401 Food Chemistry I . . . 4 (3,3) FD SC 431 Food Processing . . . . 2 (2,0) FD SC 433 Food Processing Lab. 2 (1,3) Minor† . . . . . 6 Elective . . . . . 3 <hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 17	FD SC 402 Food Chemistry II . . . 4 (3,3) FD SC 418 Seminar . . . . . 1 (1,0) FD SC 432 Food Processing . . . . 2 (2,0) FD SC 434 Food Processing Lab. 2 (1,3) Minor† . . . . . 3 Elective . . . . . 4 <hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 16
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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 and land-use 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 systems.

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 108 for Freshman Year.

### SOPHOMORE YEAR

First Semester		Second Semester	
AGRIC 202 Intro. to Plant Sciences	3 (2,3)	AGRIC 201 Intro. to Animal Ind.	3 (2,3)
CH 223 Organic Chemistry	3 (3,0)	AGRON 202 Soils	3 (2,2)
CH 227 Organic Chemistry Lab.	1 (0,3)	History-Literature Requirement*	3 (3,0)
or BIOCH 210 Elem. Biochem.	4 (3,3)	Minor†	6
or CH 201 General Chemistry	4 (3,3)	Elective	1
ECON 201 Principles of Economics	3 (3,0)		16
History-Literature Requirement*	3 (3,0)		
PHYS 207 General Physics	4 (3,2)		
Elective	1		
	18		

### JUNIOR YEAR

AGRON 301 Fertilizer†	3 (3,0)	AGRON 308 Soil and Plant Anal.	3 (1,6)
AGRON 410 Cotton and Other Fiber Crops†	2 (2,0)	AGRON 320 Forage and Pasture Crops†	3 (3,0)
or AGRON 411 Grain Crops	2 (2,0)	AGRON 322 Forage Crops Lab.†	1 (0,2)
or AGRON 412 Tobacco and Special Use Crops	2 (2,0)	AGRON 410 Cotton and Other Fiber Crops†	2 (2,0)
BOT 421 Plant Physiology	4 (3,3)	or AGRON 411 Grain Crops	2 (2,0)
GEN 302 Genetics	4 (3,3)	or AGRON 412 Tobacco and Special Use Crops	2 (2,0)
MICRO 305 General Microbiology	4 (3,3)	Minor†	6
	17	Social Science Elective§	3 (3,0)
			18

### SENIOR YEAR

AGRON 403 Soil Genesis and Classification†	2 (1,3)	AGRON 405 Plant Breeding†	3 (2,2)
AGRON 407 Prin. of Weed Control†	3 (2,2)	or MICRO 410 Soil Micro- biology	3 (2,3)
AGRON 455 Seminar	1 (1,0)	AGRON 452 Soil Fert. and Mgt.†	2 (2,0)
Minor†	5	AGRON 456 Seminar	1 (1,0)
Elective	6	Minor†	4
	17	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 108 for Freshman Year.

**SOPHOMORE YEAR**

First Semester	Second Semester
AGRON 202 Soils . . . . . 3 (2,2)	AGRIC 201 Intro. to Animal Ind. 3 (2,3)
CH 223 Organic Chemistry . . . . . 3 (3,0)	ENT 301 General Entomology . . . 3 (2,3)
CH 227 Organic Chemistry Lab. . . 1 (0,3)	History-Literature Requirement* . . 3 (3,0)
or BIOCH 210 Elem. Biochem. 4 (3,3)	PHYS 207 General Physics . . . . . 4 (3,2)
or CH 201 General Chemistry . . 4 (3,3)	Electives . . . . . 4
ECON 201 Principles of Economics 3 (3,0)	17
History-Literature Requirement* . . 3 (3,0)	
HORT 201 General Horticulture . . . 3 (2,2)	
Elective . . . . . 1	
17	

**JUNIOR YEAR**

GEN 302 Genetics . . . . . 4 (3,3)	BOT 421 Plant Physiology . . . . . 4 (3,3)
HORT 305 Plant Propagation . . . . 3 (2,3)	HORT 302 Prin. of Veg. Prod. . . . 3 (2,3)
HORT 352 Commercial Pomology 3 (2,3)	HORT 451 Small Fruit Culture . . . 3 (2,3)
Minor† . . . . . 3	MICRO 305 General Microbiology 4 (3,3)
Social Science Elective† . . . . . 3 (3,0)	Minor† . . . . . 3
Elective . . . . . 2	17
18	

**SENIOR YEAR**

HORT 405 Nut Tree Culture . . . . . 2 (2,0)	HORT 410 Seminar . . . . . 1 (1,0)
HORT 407 Landscape Design . . . . 3 (2,3)	HORT 456 Vegetable Crops . . . . 3 (3,0)
HORT 409 Seminar . . . . . 1 (1,0)	Minor† . . . . . 6
HORT 464 Post Harvest Hort. . . . . 3 (2,2)	Elective . . . . . 5
PL PA 401 Plant Pathology . . . . . 3 (2,3)	15
Minor† . . . . . 3	
Elective . . . . . 3	
18	

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*.

## 124 Degrees and Curricula

See page 108 for Freshman Year.

### SOPHOMORE YEAR

First Semester	Second Semester
AGM 301 Soil and Water Conserva. 3 (2,3)	AGRON 202 Soils . . . . . 3 (2,2)
CH 223 Organic Chemistry . . . . . 3 (3,0)	ENT 301 General Entomology . . . 3 (2,3)
CH 227 Organic Chemistry Lab. 1 (0,3)	History-Literature Requirement* . 3 (3,0)
or BIOC 210 Elem. Biochem. 4 (3,3)	PHYS 207 General Physics . . . . . 4 (3,2)
or CH 201 General Chemistry . . 4 (3,3)	Elective . . . . . 4
ECON 201 Principles of Economics 3 (3,0)	17
History-Literature Requirement* . . 3 (3,0)	
HORT 201 General Horticulture . . . 3 (2,2)	
Elective . . . . . 1	
17	

### JUNIOR YEAR

BOT 421 Plant Physiology . . . . . 4 (3,3)	HORT 304 Plant Materials II . . . 3 (2,3)
GEN 302 Genetics . . . . . 4 (3,3)	HORT 308 Landscape Design . . . 3 (2,3)
HORT 303 Plant Materials I . . . . . 3 (2,3)	HORT 310 Floriculture . . . . . 3 (2,3)
HORT 305 Plant Propagation . . . . . 3 (2,3)	Minor† . . . . . 6
Social Science Elective† . . . . . 3 (3,0)	Elective . . . . . 3
17	18

### SENIOR YEAR

HORT 409 Seminar . . . . . 1 (1,0)	HORT 406 Nursery Technology . . 3 (2,3)
HORT 412 Turf Management . . . . . 3 (2,3)	HORT 410 Seminar . . . . . 1 (1,0)
HORT 414 Retail Flower Business 1 (1,0)	HORT 462 Landscape Design
HORT 416 Floral Design . . . . . 1 (0,3)	Implementation . . . . . 3 (2,3)
HORT 461 Prob. in Landscap. Des. 3 (2,3)	PL PA 401 Plant Pathology . . . . . 3 (2,3)
Minor† . . . . . 6	Minor† . . . . . 3
Elective . . . . . 3	Elective . . . . . 2
18	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.

## 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.

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

**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—ANIMAL SCIENCE MAJOR**

**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.



## 126 Degrees and Curricula

### PRE-VETERINARY MEDICINE—DAIRY SCIENCE MAJOR

See page 125 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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	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—POULTRY SCIENCE MAJOR

See page 125 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
	<hr/>
	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
	<hr/>
	18

**JUNIOR YEAR**

AN SC 301 Feeds and Feeding . . .	3 (3,0)	AGRIC 202 Intro. to Plant Sci . . .	3 (2,3)
MICRO 305 General Microbiology . .	4 (3,3)	ENGL 301 Public Speaking . . . . .	3 (3,0)
PS 355 Poultry Products Grading and Technology . . . . .	3 (2,3)	PS 352 Breeder Flock and Hatchery Management . . . . .	3 (3,0)
PS 401 Animal Envir. Technology . . .	2 (2,0)	PS 353 Breeder Flock and Hatchery Management Lab. . . . .	1 (0,3)
PS 403 Animal Envir. Tech. Lab. . . .	1 (0,3)	PS 451 Poultry Nutrition . . . . .	2 (2,0)
PS 458 Avian Micro. and Parasit. . .	4 (3,3)	PS 460 Seminar . . . . .	2 (2,0)
	17	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—ZOOLOGY MAJOR**

See page 125 for Freshman Year.

**SOPHOMORE YEAR**

First Semester		Second Semester	
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)
ZOOL 201 Invertebrate Zoology . . . .	4 (3,3)	ZOOL 202 Vertebrate Zoology† . . . .	4 (3,3)
or ZOOL 202 Vertebrate Zool. . . .	4 (3,3)	or ZOOL 201 Invertebrate Zool†	4 (3,3)
Social Science Elective† . . . . .	3 (3,0)	Elective . . . . .	1
Elective . . . . .	1		16
	19		

**JUNIOR YEAR**

BOT 421 Plant Physiology . . . . .	4 (3,3)	NUTR 401 Fund. of Nutrition . . . . .	3 (3,0)
ENGL 301 Public Speaking . . . . .	3 (3,0)	ZOOL 302 Vertebrate Embryology . . .	4 (3,3)
GEN 302 Genetics . . . . .	4 (3,3)	ZOOL 411 Animal Ecology . . . . .	3 (2,3)
ZOOL 301 Comp. Vert. Anatomy . . . .	3 (2,3)	ZOOL 470 Animal Behavior . . . . .	3 (2,3)
Social Science Elective† . . . . .	3 (3,0)	Social Science Elective† . . . . .	3 (3,0)
	17		16

**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

the environmental arts and sciences are presented by the Clemson Architectural Foundation and are 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 programs. 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.



The Clemson Architectural Foundation sponsors an Overseas Center for Building Research and Urban Study in Genoa, Italy. Normally, fifth-year students in Architecture, City and Regional Planning, and Visual Studies and fourth-year students in Building Construction are involved in an intensive six-months program in the center annually.

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 1974. 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, sculpture studio, jury room, 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 performance 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 December 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.

The Bachelor of Architecture program is available to a limited number of students who have completed a first degree in Pre-architecture or its equivalent and who show professional promise. Admission to this program will be with the approval of the College of Architecture Admissions Committee.

### 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 engi-

neer, 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. Each of these programs requires 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 innovative and imaginative solutions to fine arts problems.

BACHELOR OF ARTS IN PRE-ARCHITECTURE

FIRST YEAR

First Semester

ARCH 101 Architectural Analysis	3 (1,6)
ENGL 101 English Composition	3 (3,0)
MATH 103 College Algebra	2 (2,0)
MATH 104 Trigonometry	2 (2,0)
Modern Language	4 (3,1)
Elective	3
	17

Second Semester

ARCH 102 Architectural Analysis	3 (1,6)
ENGL 102 English Composition	3 (3,0)
MATH 106 Calculus of One Var.	4 (4,0)
Modern Language	4 (3,1)
Elective	3
	17

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)
Modern Language	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)
Modern Language	3 (3,0)
Visual Studies <sup>o</sup>	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

136 Total Semester Hours

<sup>o</sup> 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 9 credits of specified courses.



## BACHELOR OF SCIENCE 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 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)
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)
ECON 201 Principles of Economics	3 (3,0)	ECON 202 Principles of Economics	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

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 9 credits of specified courses.

## BACHELOR OF ARCHITECTURE

See Pre-architecture curricula (Bachelor of Arts or Bachelor of Science).

## FIFTH YEAR

First Semester		Second Semester	
ARCH 553 Arch. Design VII	9(3,18)	ARCH 481 Arch. Office Practice	3 (3,0)
CRP 441 History of Planning	3 (3,0)	ARCH 554 Arch. Design VIII	9(3,18)
Elective*	3	Elective*	3
	15		15

## SIXTH YEAR

## First Semester

ARCH 403 Seminar in Analysis and Criticism of Architectural and Town Building Works	3 (3,0)
ARCH 559 Terminal Project in Architecture	9(1,24)
Elective*	3
	15

\* Electives shall be determined by each individual student in consultation with his major adviser to complement and reinforce the student's planned area of study.

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 Organiza-		BLDSC 242 Construction Planning	
tions and Estimating .....	5 (2,9)	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		BLDSC 342 Construction Labor	
Systems .....	5 (2,9)	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. Curricula 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.

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



ing major and the College of Education. They include public school observation and supervised teaching experiences which provide the student an opportunity to work under the direction of a competent, experienced classroom teacher.

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 is staffed and equipped to provide a well-rounded program of professional education for teachers, including opportunities to participate in such special activities as observation and experimentation in a learning clinic, an educational testing laboratory, an audio-visual laboratory, and a curriculum laboratory.

Professional services rendered by the College of Education include school-staff development, teacher placement, and the production of educational media.

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

The College of Education is a member of the American Association of Colleges for Teacher Education and is fully accredited by the Southern Association of Colleges and Schools and the South Carolina State Department of Education.

## ADMISSION

Admission to programs in the College of Education is accomplished in three phases: preprofessional, professional, 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 education students meet the mental, physical, personal, and social standards expected of teachers and to assist students in selecting the appropriate curricula, candidates for admission to education programs are interviewed by a faculty adviser. 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 ad-



mission 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 Science, 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 AND ELEMENTARY EDUCATION PROGRAMS

A total of 129 semester hours is required for the Bachelor of Arts degree in either the Early Childhood Education or the Elementary Education curriculum. The Early Childhood Education curriculum prepares the student for teaching positions in kindergarten or grades 1-3. The Elementary Education curriculum prepares the student for teaching on the elementary school level.

Application to Directed Teaching—(Ed 484) for Early Childhood Education, and (Ed 481) for Elementary Education—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 Directed Teaching.

### FRESHMAN AND SOPHOMORE YEAR PROGRAMS

#### 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 101 American History . . . .	3 (3,0)
MATH 115 Contemporary Math.		MATH 116 Contemporary Math. . .	
for Elementary Teachers I . . . .	3 (3,0)	for Elementary Teachers II . . .	3 (3,0)
Modern Language . . . . .	4 (3,1)	Modern Language . . . . .	4 (3,1)
Science† . . . . .	4	Science† . . . . .	4
Elective . . . . .	1	Elective . . . . .	1
	<hr/>		<hr/>
	16		18

# 140 Degrees and Curricula

## SOPHOMORE YEAR

HIST 102 American History . . . . .	3 (3,0)	HIST 171 or 172 West. Civilization	3 (3,0)
Literature Requirement <sup>o</sup> . . . . .	3 (3,0)	Literature Requirement <sup>o</sup> . . . . .	3 (3,0)
MATH 215 Algebra for Elementary Teachers . . . . .	3 (3,0)	MATH 216 Geometry for Elementary Teachers . . . . .	3 (3,0)
Modern Language . . . . .	3 (3,0)	Modern Language . . . . .	3 (3,0)
Science† . . . . .	4	Science† . . . . .	4
Elective . . . . .	1	Elective . . . . .	1
	17		17

<sup>o</sup> To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

† The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, chemistry, geology, physical science, or physics).

## EARLY CHILDHOOD EDUCATION

### JUNIOR YEAR

#### First Semester

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

#### Second Semester

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 334 Child Growth and Dev. . . . .	3 (3,0)
ED 458 Health Education . . . . .	3 (3,0)	ED 461 Teaching Reading in the Elementary School . . . . .	3 (1,4)
ED 466 Curriculum for Early Childhood Education . . . . .	3 (3,0)	ED 483 Methods and Materials for Early Childhood Education	3 (3,0)
MUS 210 Music Appreciation . . . . .	3 (3,0)	ED 484 Directed Teaching <sup>o</sup> . . . . .	6 (1,15)
Elective . . . . .	3		
	15		15

129 Total Semester Hours

<sup>o</sup> Block schedule must be taken as shown in either semester of the senior year.

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

## ELEMENTARY EDUCATION

### JUNIOR YEAR

#### First Semester

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

#### Second Semester

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 334 Child Growth and Dev. . . . .	3 (3,0)
ED 458 Health Education . . . . .	3 (3,0)	ED 461 Teaching Reading in the Elementary School . . . . .	3 (1,4)
MUS 210 Music Appreciation . . . . .	3 (3,0)	ED 481 Directed Teaching <sup>o</sup> . . . . .	6 (1,15)
Interest Area† . . . . .	6	ED 485 Meth. and Cur. in Elem. Math. and Science . . . . .	3 (3,0)
	15	or ED 486 Meth. and Cur. in Elem. Social Studies and Lang. Arts . . . . .	3 (3,0)
			15

129 Total Semester Hours

<sup>o</sup> 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 requirements 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 335, 424, and 498, 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		
	<u>18-19</u>		<u>17-18</u>

#### SOPHOMORE YEAR

ECON 201 Principles of Economics 3 (3,0)		ACCT 201 Principles of Accounting 3 (3,0)	
Literature Requirement <sup>o</sup> . . . . .	3 (3,0)	ECON 202 Principles of Economics 3 (3,0)	
MATH 203 Elem. Stat. Inference. 3 (3,0)		Literature Requirement <sup>o</sup> . . . . .	3 (3,0)
Modern Language . . . . .	3 (3,0)	Modern Language . . . . .	3 (3,0)
Science† . . . . .	4-3	Science† . . . . .	4-3
Elective . . . . .	1	Elective . . . . .	1
	<u>17-16</u>		<u>17-16</u>



**JUNIOR YEAR**

ED 301 Principles of American Ed.	3 (3,0)	Teaching Major	9
ED 302 Educational Psychology	3 (3,0)	Electives	6
Teaching Major	9		<u>15</u>
	<u>15</u>		

**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)
	<u>15</u>	ED 498 Teaching Secondary	
		School Reading	3 (1,4)
			<u>15</u>

129 Total Semester Hours

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

† The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, 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 the following: 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
	<u>16</u>

**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
	<u>18</u>

**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
	<u>17</u>

Literature Requirement*	3 (3,0)
Modern Language	3 (3,0)
Science†	4
Social Science Elective§	3 (3,0)
Elective	4
	<u>17</u>

**JUNIOR YEAR**

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

ED 302 Educational Psychology	3 (3,0)
HIST 363 History of England	3 (3,0)
Teaching Major	9
	<u>15</u>

**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)
	15	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.  
 † The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, 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)
	15	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.  
 † The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, 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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	18-17

COMP SC 205 Elem. Comp. Prog.	3 (3,0)
HIST 172 or 173 West. Civilization	3 (3,0)
Literature Requirement*	3 (3,0)
Modern Language	3 (3,0)
Science†	4-3
Social Science Elective§	3 (3,0)
Elective	1
	<hr/>
	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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	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)
	<hr/>
	15

129 Total Semester Hours

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

† The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, 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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	17

Literature Requirement° .....	3 (3,0)
Modern Language .....	3 (3,0)
Science† .....	4
Social Science Elective§ .....	3 (3,0)
Elective .....	4
	<hr/>
	17

## JUNIOR YEAR

ED 301 Principles of American Ed.	3 (3,0)
Teaching Major .....	9
Elective .....	3
	<hr/>
	15

ED 302 Educational Psychology..	3 (3,0)
Teaching Major .....	9
Elective .....	3
	<hr/>
	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
	<hr/>
	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)
	<hr/>
	15

128 Total Semester Hours

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

† The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, 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, 309, 403, 404, 405, 406, 407, 408.

German Major: Must include Ger 301, 302, 305. Select electives from Ger 306, 307, 308, 407, 408, 409, 410.

Spanish Major: Must include Span 303, 304, 305. Select electives from Span 306, 307, 308, 401, 402, 405, 406.



# 146 Degrees and Curricula

## 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 335 Adol. Growth and Dev. . . . .	3 (3,0)
ASTR 202 Stellar Astronomy . . . . .	3 (3,0)	ED 412 Directed Teaching† . . . . .	6 (1,15)
ED 458 Health Education . . . . .	3 (3,0)	ED 424 Methods and Materials in	
MUS 210 Music Appreciation . . . . .	3 (3,0)	Secondary School Instruction . . . . .	3 (3,0)
Science Elective† . . . . .	3	ED 498 Teaching Secondary	
	15	School Reading . . . . .	3 (1,4)
			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 Amer. Nat. Govt.	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.	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.

† The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, chemistry, geology, physical science, or physics).

‡ 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

# 148 Degrees and Curricula

## 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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	17-16

### JUNIOR YEAR

ED 301 Principles of American Ed.	3 (3,0)
Teaching Major	9
Elective	3
	<hr/>
	15

ED 302 Educational Psychology	3 (3,0)
Teaching Major	6
Social Science Elective§	3 (3,0)
Elective	3
	<hr/>
	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
	<hr/>
	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)
	<hr/>
	15

129 Total Semester Hours

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

† The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, chemistry, geology, physical science, or physics).

‡ 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
	<hr/>
	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
	<hr/>
	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
	<hr/>
	17-16

Literature Requirement° .....	3 (3,0)
Modern Language .....	3 (3,0)
SOC 202 Social Problems .....	3 (3,0)
Science§ .....	4-3
Elective .....	4
	<hr/>
	17-16

## JUNIOR YEAR

ED 301 Principles of American Ed.	3 (3,0)
Teaching Major .....	9
Elective† .....	6
	<hr/>
	18

ED 302 Educational Psychology..	3 (3,0)
Teaching Major .....	9
Elective .....	3
	<hr/>
	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
	<hr/>
	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)
	<hr/>
	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.

§ The following courses are required: Bot 101, 103; Zool 101, 103; and a two-semester sequence of the same science (astronomy, 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	Second Semester
BOT 101 Plant Biology . . . . . 3 (3,0)	AGRIC 101 Intro. to Agriculture . . 1 (1,0)
BOT 103 Plant Biology Lab. . . . 1 (0,2)	CH 102 or 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)	MATH 104 Trigonometry . . . . . 2 (2,0)
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)
HIST 102 American History . . . . 3 (3,0)	or BOT 101 Plant Biology . . . 3 (3,0)
MATH 103 College Algebra . . . . . 2 (2,0)	and BOT 103 Plant Biol. Lab. 1 (0,2)
Elective . . . . . 1	Elective . . . . . 1
17	15

#### SOPHOMORE YEAR

AG ED 201 Intro. to Agric. Ed. . . 3 (2,3)	AGM 205 Principles of Farm Shop 3 (2,3)
AGRIC 202 Intro. to Plant Sciences 3 (2,3)	AGM 206 Agric. Mechanization . . 3 (2,3)
ECON 201 Principles of Economics 3 (3,0)	AGRIC 201 Intro. to Animal Ind. . 3 (2,3)
History-Literature Requirement* . 3 (3,0)	AGRON 202 Soils . . . . . 3 (2,2)
PHYS 207 General Physics . . . . . 4 (3,2)	History-Literature Requirement* . 3 (3,0)
Elective . . . . . 1	Elective . . . . . 1
17	16

#### JUNIOR YEAR

AGM 301 Soil and Water Conserva. 3 (2,3)	AG EC 302 Agric. Firm Mgt. . . . 3 (2,3)
AGRON 301 Fertilizers . . . . . 3 (3,0)	AN SC 301 Feeds and Feeding . . 3 (3,0)
ENGL 301 Public Speaking . . . . . 3 (3,0)	FOR 305 Elements of Forestry . . 2 (2,0)
Approved Horticulture Elective . . 3	FOR 307 Elem. of Forestry Lab. 1 (0,3)
Minor† . . . . . 6	Minor† . . . . . 6
18	Elective . . . . . 3
	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 (2,3)
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)
	<hr/>		<hr/>
	17	134 Total Semester Hours	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.

† 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	Second Semester
EG 115 Engineering Graphics for	ENGL 102 English Composition . . .
Industrial Education . . . . .	IN ED 105 Machining Practices . .
2 (0,6)	3 (1,6)
ENGL 101 English Composition . .	MATH 104 Trigonometry . . . . .
3 (3,0)	2 (2,0)
IN ED 101 Intro. to Ind. Ed. . . .	Science Elective§ . . . . .
2 (1,2)	4 (3,3)
IN ED 102 Woodworking I . . . . .	Social Science Elective† . . . . .
2 (1,3)	3 (3,0)
MATH 103 College Algebra . . . . .	Elective . . . . .
2 (2,0)	1
Science Elective§ . . . . .	<hr/>
4 (3,3)	16
Elective . . . . .	
1	
<hr/>	
16	

## SOPHOMORE YEAR

IN ED 203 Basic Metal Processes	3 (1,6)	ECON 201 Principles of Economics	3 (3,0)
Literature Requirement° . . . . .	3 (3,0)	IN ED 204 Graphic Arts . . . . .	3 (1,6)
SOC 201 Introductory Sociology . .	3 (3,0)	IN ED 208 Electricity . . . . .	3 (2,3)
Science Elective§ . . . . .	4 (3,3)	PSYCH 201 General Psychology . .	3 (3,0)
Social Science Elective† . . . . .	3 (3,0)	Elective . . . . .	4
Elective . . . . .	1	<hr/>	<hr/>
<hr/>		17	16

# 152 Degrees and Curricula

## JUNIOR YEAR

ECON 301 Economics of Labor . . .	3 (3,0)	ENGL 301 Public Speaking . . . .	3 (3,0)
ED 302 Educational Psychology . .	3 (3,0)	IE 303 Job Evaluation and	
IM 307 Personnel Management . . .	3 (3,0)	Wage Incentives . . . . .	3 (3,0)
IN ED 302 Dwelling Materials		IM 415 Managerial Dec. Making . .	3 (3,0)
and Construction Methods . . . .	2 (1,2)	IN ED 325 Ind. Org. and People .	3 (3,0)
PSYCH 301 Industrial Psychology .	3 (3,0)	Approved Elective† . . . . .	6
Elective . . . . .	3		<hr/>
	17		18

## SENIOR YEAR

IM 408 Work Simp. and Stand. . .	3 (3,0)	IN ED 408 Training Prog. in Ind.	3 (3,0)
IN ED 405 Course Org. and Eval. .	3 (3,0)	IN ED 496 Public Relations . . .	3 (3,0)
IN ED 422 History and Philosophy		SOC 351 Industrial Sociology . . .	3 (3,0)
of Industrial and Voc. Ed. . . .	3 (3,0)	Approved Elective† . . . . .	8
TEXT 460 Textile Processes . . . .	3 (3,0)		<hr/>
Approved Elective† . . . . .	6		17
	18		

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 (2,0)
Science Elective§ . . . . .	4 (3,3)
Elective . . . . .	1
	<hr/>
	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 (2,0)
Social Science Elective† . . . . .	3 (3,0)
Elective . . . . .	1
	<hr/>
	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
	<hr/>
	17

IN ED 204 Graphic Arts . . . . .	3 (1,6)
IN ED 208 Electricity . . . . .	3 (2,3)
IN ED 313 Arts and Crafts . . . .	3 (1,6)
Science Elective§ . . . . .	4 (3,3)
Approved Elective† . . . . .	3
Elective . . . . .	1
	<hr/>
	17

**JUNIOR YEAR**

ED 302 Educational Psychology . . . . .	3 (3,0)	ED 335 Adol. Growth and Dev. . . . .	3 (3,0)
IN ED 302 Dwelling Materials and Construction Methods . . . . .	2 (1,2)	ENGL 301 Public Speaking . . . . .	3 (3,0)
IN ED 414 Electronics for Teach. . . . .	3 (1,6)	IN ED 416 Management and Operation of Ind. Ed. Labs. . . . .	3 (2,2)
TEXT 460 Textile Processes . . . . .	3 (3,0)	Social Science Elective† . . . . .	3 (3,0)
Social Science Elective† . . . . .	3 (3,0)	Elective . . . . .	6
Approved Elective† . . . . .	5		<u>18</u>
	<u>19</u>		

**SENIOR YEAR**

AAH 303 Evol. of Visual Arts . . . . .	3 (3,0)	ED 458 Health Education . . . . .	3 (3,0)
IN ED 422 History and Philosophy of Industrial and Voc. Ed. . . . .	3 (3,0)	IN ED 402 Directed Teaching . . . . .	6(0,18)
IN ED 441 Comp. Lab. Field Exper. . . . .	2 (1,3)	IN ED 405 Course Organization and Evaluation . . . . .	3 (3,0)
MUS 210 Music Appreciation . . . . .	3 (3,0)	IN ED 425 Teaching Ind. Subj. . . . .	3 (3,0)
Approved Elective† . . . . .	6		<u>15</u>
	<u>17</u>		

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 (2,0)
Science Elective§ . . . . .	4 (3,3)
Elective . . . . .	1
	<u>16</u>

**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 (2,0)
Social Science Elective† . . . . .	3 (3,0)
Elective . . . . .	3
	<u>16</u>

**SOPHOMORE YEAR**

IN ED 203 Basic Metal Processes . . . . .	3 (1,6)	ENGL 301 Public Speaking . . . . .	3 (3,0)
IN ED 205 Power Technology . . . . .	3 (2,2)	IN ED 204 Graphic Arts . . . . .	3 (1,6)
Literature Requirement* . . . . .	3 (3,0)	IN ED 208 Electricity . . . . .	3 (2,3)
Science Elective§ . . . . .	4 (3,3)	Science Elective§ . . . . .	4 (3,3)
Social Science Elective† . . . . .	3 (3,0)	Elective . . . . .	1
Elective . . . . .	1		<u>14</u>
	<u>17</u>		

**SUMMER**

IN ED 350 Industrial Cooperative Experience . . . . .	6
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# 154 Degrees and Curricula

## JUNIOR YEAR

ED 302 Educational Psychology . . . . .	3 (3,0)	ED 335 Adol. Growth and Dev. . . . .	3 (3,0)
IN ED 302 Dwelling Materials and Construction Methods . . . . .	2 (1,2)	IN ED 416 Management and Operation of Ind. Ed. Labs. . . . .	3 (2,2)
Social Science Elective† . . . . .	3 (3,0)	Social Science Elective† . . . . .	3 (3,0)
Elective (Area of Spec.) . . . . .	3 (3,0)	Approved Elective† . . . . .	3
Elective . . . . .	4	Elective (Area of Spec.) . . . . .	3
	15		15

## SUMMER

IN ED 450 Industrial Cooperative Experience . . . . .	6
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## SENIOR YEAR

AAH 303 Evol. of Visual Arts . . . . .	3 (3,0)	ED 458 Health Education . . . . .	3 (3,0)
IN ED 422 History and Philosophy of Industrial and Voc. Ed. . . . .	3 (3,0)	IN ED 402 Directed Teaching . . . . .	6 (0,18)
IN ED 441 Comp. Lab. Field Exper. . . . .	2 (1,3)	IN ED 405 Course Organization and Evaluation . . . . .	3 (3,0)
MUS 210 Music Appreciation . . . . .	3 (3,0)	IN ED 425 Teaching Ind. Subj. . . . .	3 (3,0)
Elective (Area of Spec.) . . . . .	4		15
	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.

## 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	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 106 Calculus of One Var. . . . .	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 103 College Algebra . . . . .	2 (2,0)	Elective . . . . .	1
MATH 104 Trigonometry . . . . .	2 (2,0)		16
Elective . . . . .	1		
	17		

**SOPHOMORE YEAR**

HIST 171 or 172 West. Civilization	3 (3,0)	HIST 172 or 173 West. Civilization	3 (3,0)
Literature Requirement <sup>o</sup>	3 (3,0)	Literature Requirement <sup>o</sup>	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 <sup>§</sup>	3 (3,0)
	18	Elective	1
			18

**JUNIOR YEAR**

BOT 202 Survey of Plant Kingdom	4 (3,3)	BOT 421 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 <sup>§</sup>	3 (3,0)	MICRO 305 General Microbiology	4 (3,3)
	16	Elective	3
			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 Secondary School Instruction	3 (3,0)
Major Elective†	6-7	ED 498 Teaching Secondary School Reading	3 (1,4)
	15-16		15

133 Total Semester Hours

- <sup>o</sup> 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**

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 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)	HIST 172 or 173 West. Civilization	3 (3,0)
Literature Requirement <sup>o</sup>	3 (3,0)	Literature Requirement <sup>o</sup>	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		

# 156 Degrees and Curricula

## 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)
	<hr/>		<hr/>
	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

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 101 Math. Analysis I§ . . . . .	3 (3,0)
Elective . . . . .	1
	<hr/>
	16

#### Second Semester

CH 102 General Chemistry . . . . .	4 (3,3)
ENGL 102 English Composition. . . . .	3 (3,0)
MATH 102 Math. Analysis II . . . . .	3 (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 . . . . .	2
	<hr/>
	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		<hr/>
	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 the Weather 3 (3,0)	
MATH 203 Elem. Stat. Inference 3 (3,0)		Science Elective . . . . .	3
Elective . . . . .	4	Social Science Elective† . . . . .	3 (3,0)
	<hr/>		<hr/>
	16		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	
	<hr/>	School Reading . . . . .	3 (1,4)
	15		<hr/>
			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	Second Semester
BOT 101 Plant Biology . . . . . 3 (3,0)	CH 102 or 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)	COMP SC 205 Elem. Comp. Prog. 3 (3,0)
Literature Requirement <sup>o</sup> . . . . . 3 (3,0)	HIST 172 or 173 West. Civilization 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)	Literature Requirement <sup>o</sup> . . . . . 3 (3,0)
PHYS 207 General Physics . . . . . 4 (3,2)	PHYS 208 General Physics . . . . . 4 (3,2)
Elective . . . . . 2	Elective . . . . . 4
16	17

## JUNIOR YEAR

ED 301 Principles of American Ed. 3 (3,0)	ED 302 Educational Psychology . . . 3 (3,0)
MATH 301 Statistical Theory and Methods I . . . . . 3 (3,0)	MATH 408 Topics in Geometry . . . 3 (3,0)
MATH 308 College Geometry . . . 3 (3,0)	MATH 411 Linear Algebra . . . . . 3 (3,0)
Science Elective . . . . . 3	Science Elective . . . . . 3
Social Science Elective <sup>§</sup> . . . . . 3 (3,0)	Social Science Elective <sup>§</sup> . . . . . 3 (3,0)
	Elective . . . . . 2
15	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)
MATH 412 Intro. to Modern Algebra . . . . . 3 (3,0)	ED 424 Methods and Materials in Secondary School Instruction . . . 3 (3,0)
MUS 210 Music Appreciation . . . 3 (3,0)	ED 498 Teaching Secondary School Reading . . . . . 3 (1,4)
Mathematics Elective† . . . . . 6	15
18	

131 Total Semester Hours

<sup>o</sup> 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	Second Semester
BOT 101 Plant Biology . . . . . 3 (3,0)	CH 102 or 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 106 Calculus of One Var. 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 103 College Algebra . . . . . 2 (2,0)	Elective . . . . . 1
MATH 104 Trigonometry . . . . . 2 (2,0)	16
Elective . . . . . 1	
17	



# 158 Degrees and Curricula

## SOPHOMORE YEAR

HIST 171 or 172 West. Civilization	3 (3,0)	CH 201 General Chemistry	4 (3,3)
Literature Requirement*	3 (3,0)	HIST 172 or 173 West. Civilization	3 (3,0)
PHYS 207 General Physics	4 (3,2)	Literature Requirement*	3 (3,0)
Science Elective	4	PHYS 208 General Physics	4 (3,2)
Elective	3	Elective	4
	17		18

## JUNIOR YEAR

ASTR 201 Solar System Astronomy	3 (3,0)	ASTR 202 Stellar Astronomy	3 (3,0)
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)
Social Science Elective†	3 (3,0)	PHYS 460 Contemporary Physics	3 (3,0)
Elective	3	for High School Teachers	3 (3,0)
	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	3 (3,0)
Elective	6	Secondary School Instruction	3 (3,0)
	15	ED 498 Teaching Secondary	3 (1,4)
		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 students should consult adviser. Ceramic Engineering students may take either Ch 102 or 112. Chemical Engineering students are required to take Ch 112. Mechanical Engineering students are required to take Ch 102.

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 twofold. 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:

	<i>Hours Credit</i>
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
	<hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 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 understanding.

† 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:

	<i>Hours Credit</i>
Basic Science (including 8 hours of physics) .....	16
Engineering Technology .....	42
Humanistic-Social Studies .....	24
Mathematics .....	12
Electives .....	34
	<hr style="width: 10%; margin-left: auto; margin-right: 0;"/> 128

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 160 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
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	19

**Second Semester**

AGE 212 Fund. of Mechanization . . . . .	3 (2,3)
EM 202 Engr. Mech. (Dynamics) . . . . .	3 (3,0)
MATH 208 Engineering Math. I. . . . .	4 (4,0)
Humanistic-Social Elective† . . . . .	3 (3,0)
Plant Science Elective† . . . . .	3
Elective . . . . .	1
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	17

**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 (2,2)
EM 304 Mechanics of Materials. . . . .	3 (3,0)
or EM 320 Fluid Mechanics . . . . .	3 (3,0)
Animal Science Elective† . . . . .	3
Engineering Science Elective† . . . . .	3
	<hr/>
	16

AGE 362 Energy Conv. in Ag. Sys. . . . .	3 (2,3)
AGE 364 Agric. Waste-Management Systems . . . . .	2 (2,0)
AGE 433 Design Criteria for Plant and Animal Environment . . . . .	2 (2,0)
AGE 465 Engr. Prop. of Biol. Mat. . . . .	2 (1,3)
PHYS 222 Optics and Mod. Phys. . . . .	3 (3,0)
Engineering Science Elective† . . . . .	3
Soils Elective† . . . . .	3
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	18

**SENIOR YEAR**

AGE 431 Agric. Structures Design . . . . .	3 (2,3)
AGE 471 Undergraduate Research . . . . .	1 (0,3)
ECON 200 Economic Concepts . . . . .	3 (3,0)
or ECON 201 Prin. of Econ. . . . .	3 (3,0)
Humanistic-Social Elective† . . . . .	3 (3,0)
Mathematics Elective† . . . . .	3 (3,0)
Elective . . . . .	3
	<hr/>
	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)
Engineering Science Elective† . . . . .	6
Elective . . . . .	3
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	18

138 Total Semester Hours

\* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.  
 † Electives to be selected in consultation with adviser.

## 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 in 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.

See page 160 for Freshman Year.

### SOPHOMORE YEAR

#### First Semester

CRE 201 Intro. to Ceramic Engr.	2 (2,0)
CRE 204 Laboratory Procedures..	1 (0,3)
Literature Requirement*	3 (3,0)
MATH 206 Calculus of Sev. Var.	4 (4,0)
PHYS 221 Thermal and Elec. Phen	3 (3,0)
Planned Elective	3
Elective	1
	<hr/>
	17

#### Second Semester

CRE 202 Ceramic Materials	3 (3,0)
Literature Requirement*	3 (3,0)
MATH 208 Engineering Math. I.	4 (4,0)
PHYS 222 Optics and Mod. Phys.	3 (3,0)
Planned Elective	4
Elective	1
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	18

### JUNIOR YEAR

CH 331 Physical Chemistry	3 (3,0)
CRE 304 Experiment Design	1 (0,3)
CRE 307 Thermal Process. of Cer.	3 (3,0)
EM 201 Engr. Mech. (Statics)	3 (3,0)
Planned Elective	7
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	17

CH 332 Physical Chemistry	3 (3,0)
CRE 302 Thermo-Chemical Cer.	3 (3,0)
CRE 309 Research Methods	2 (0,6)
E&CE 307 Basic Elec. Engr.	3 (2,2)
Planned Elective	3
Elective	3
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	17

### SENIOR YEAR

CRE 402 Solid State Ceramics	3 (3,0)
EM 304 Mechanics of Materials	3 (3,0)
Planned Elective	9
Elective	2
	<hr/>
	17

CRE 403 Glasses	3 (3,0)
ME 304 Heat Transfer I.	3 (3,0)
Planned Elective	12
	<hr/>
	18

138 Total Semester Hours

\* To be selected from the following: Engr 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 as follows:

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.

See page 160 for Freshman Year.

### 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
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	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 (4,0)
Elective . . . . .	1
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### 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 (2,2)
PHYS 222 Optics and Mod. Phys. . . . .	3 (3,0)
Humanistic-Social Elective . . . . .	3 (3,0)
Elective . . . . .	2
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	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)
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	18

## SENIOR YEAR

CHE 401 Transport Phenomena . . . . .	3 (3,0)	CHE 422 Process Dev., Design and	
CHE 407 Unit Op. Lab. II . . . . .	2 (0,6)	Optimiza. of Chem. Engr. Sys. II	3 (0,9)
CHE 421 Process Dev., Design and		CHE 453 Process Dynamics . . . . .	3 (3,0)
Optimiza. of Chem. Engr. Sys. I	3 (2,3)	CRE 419 Sci. of Engr. Materials . . . . .	3 (3,0)
CHE 430 Chem. Engr. Thermo. II	3 (3,0)	Humanistic-Social Elective . . . . .	6
CHE 440 Senior Inspection Trip . . . . .	0	Elective . . . . .	3
CHE 450 Chem. Engr. Kinetics . . . . .	3 (3,0)		18
Humanistic-Social Elective . . . . .	3 (3,0)		

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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.

See page 160 for Freshman Year.

### SOPHOMORE YEAR

First Semester	Second Semester
CE 206 Geometrics . . . . . 2 (1,3)	CE 205 Civil Engr. Methodology . . . 2 (1,3)
EM 201 Engr. Mech. (Statics) . . . 3 (3,0)	or EG 109 Engr. Graph. Com. . . 2 (0,6)
Literature Requirement* . . . . . 3 (3,0)	EM 304 Mechanics of Materials . . . 3 (3,0)
MATH 206 Calculus of Sev. Var. . . 4 (4,0)	EM 305 Mech. of Materials Lab. . . 1 (0,3)
PHYS 221 Thermal and Elec. Phen. . 3 (3,0)	Literature Requirement* . . . . . 3 (3,0)
Elective . . . . . 1	MATH 208 Engineering Math. I . . . 4 (4,0)
16	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 302 Structural Design I . . . . . 3 (2,2)
CE 320 Conc. and Bit. Materials . . 2 (1,3)	CE 310 Transportation Engr. . . . . 4 (3,2)
CRE 310 Intro. to Material Sci. . . . 3 (3,0)	ECON 201 Principles of Economics . . 3 (3,0)
EM 202 Engr. Mech. (Dynamics) . . . 3 (3,0)	E&CE Elective . . . . . 3 (3,0)
ESE 401 Environmental Engr. . . . . 3 (3,0)	Humanistic-Social Elective† . . . . . 3 (3,0)
Mathematics Elective† . . . . . 3	Elective . . . . . 2
17	18

### SENIOR YEAR

CE 330 Soil Mechanics . . . . . 3 (2,2)	CE 402 Structural Design II . . . . . 3 (2,2)
CE 424 Construction Methods . . . . 2 (2,0)	CE 425 Engineering Relations . . . . . 3 (3,0)
EM 320 Fluid Mechanics . . . . . 3 (3,0)	EM 421 Hydrology and Hyd. . . . . 2 (2,0)
EM 322 Fluid Mechanics Lab. . . . . 1 (0,3)	ME 311 Engineering Thermo. I . . . . 3 (3,0)
Earth or Life Science Elective† . . . 4-3	Technical Elective† . . . . . 3
Humanistic-Social Elective† . . . . . 3 (3,0)	Elective . . . . . 3
Technical Elective† . . . . . 3	17
19-18	

138 Total Semester Hours

\* To be selected from the following: Engr 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.

# 172 Degrees and Curricula

See page 160 for Freshman Year.

## SOPHOMORE YEAR

### First Semester

Literature Requirement <sup>o</sup> . . . . .	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 <sup>o</sup> . . . . .	3 (3,0)
MATH 208 Engineering Math. I . . . . .	4 (4,0)
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 System Design Workshop . . . . .	2 (0,4)
Humanistic-Social Elective† . . . . .	3 (3,0)
Technical Elective‡ . . . . .	9-8
	17-16

138 Total Semester Hours

<sup>o</sup> 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 or 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 of 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 160 for Freshman Year.

**SOPHOMORE YEAR**

**First Semester**

**Second Semester**

EM 201 Engr. Mech. (Statics)...	3	(3,0)
Literature Requirement <sup>o</sup> .....	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	
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EM 202 Engr. Mech. (Dynamics)	3	(3,0)
Literature Requirement <sup>o</sup> .....	3	(3,0)
MATH 208 Engineering Math. I ..	4	(4,0)
ME 202 Innovative Design II .....	3	(2,3)
PHYS 222 Optics and Mod. Phys. ..	3	(3,0)
Elective .....	1	
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	17	

**JUNIOR YEAR**

CRE 310 Intro. to Material Sci. ....	3	(3,0)
E&CE 307 Basic Elec. Engr. ....	3	(2,2)
EM 320 Fluid Mechanics .....	3	(3,0)
ME 301 Engr. Systems Analysis .....	3	(3,0)
ME 311 Engineering Thermo. I .....	3	(3,0)
Elective .....	3	
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	18	

E&CE 308 Electronics and Electromechanics .....	3	(2,2)
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 313 Instru. and Meas. ....	3	(2,3)
Humanistic-Social Elective .....	3	(3,0)
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	18	

**SENIOR YEAR**

ME 400 Dynamic System Analysis and Control .....	4	(3,3)
ME 401 Design of Machine Elem. ..	3	(3,0)
ME 405 Kinematics and Dynamics of Machinery .....	3	(3,0)
ME 412 Thermal Systems .....	3	(3,0)
ME 413 Thermal Systems Lab ..	1	(0,3)
or ME 414 Mech. Sys. Lab. ....	1	(0,3)
Technical Elective .....	3	
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	17	

ME 402 Innovative Design III ..	3	(2,3)
ME 414 Mech. Sys. Lab. ....	1	(0,3)
or ME 413 Thermal Sys. Lab. ..	1	(0,3)
Humanistic-Social Elective .....	3	(3,0)
Technical Elective .....	6	
Elective .....	3	
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	16	

138 Total Semester Hours

<sup>o</sup> To be selected from the following: Engrl 203, 204, 205, 206, 207, 208.  
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 resources and our 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.

2. The Wood Utilization curriculum prepares graduates for careers in the forest products and allied industries in the areas of production, utilization, and marketing of wood and allied products.
3. 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.

### FOREST MANAGEMENT

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.

#### 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 421 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 Identification . . . . .	2 (1,3)
Emphasis Area . . . . .	3	FOR 310 Silviculture . . . . .	4 (3,3)
Social Science Elective . . . . .	3 (3,0)		
	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 Amer. Natl. Govt. . . . .	3 (3,0)	FOR 416 Forest Policy and Admin. . . . .	2 (2,0)
Emphasis Area . . . . .	6	FOR 418 Forest Valuation . . . . .	3 (3,0)
	18	Elective . . . . .	6
			17

148 Total Semester Hours

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

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.

## WOOD UTILIZATION

The Wood Utilization curriculum combines a broad education in the sciences and humanities. Emphasis in the professional courses is placed on the role of wood as a basic forest resource. Graduates are employed by wood-using industries and their suppliers, research laboratories, trade associations, and state and federal organizations.

The core curriculum allows for emphasis in two areas of specialization: Wood Science and Wood Industries Management. Wood Science deals with the properties and processing of wood, wood fiber, and products derived from wood. Wood Industries Management prepares students for the managerial aspects of forest products industries, including marketing and technical services. Twelve credit hours, listed as Emphasis Areas in the core curriculum qualify a student as a participant in one of the two areas. The area of interest could be explored in more depth through use of the remaining elective credits.

Successful completion of the curriculum leads to a Bachelor of Science degree in Wood Utilization. Graduate programs leading to a Master of Science or Master of Forestry degree with a specialization in Wood Utilization are also offered.

### 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)	POL SC 101 Amer. Natl. Govt. . . . . 3 (3,0)
Elective . . . . . 1	Elective . . . . . 1
17	18

### SOPHOMORE YEAR

FOR 205 Dendrology . . . . . 4 (3,3)	CH 223 Organic Chemistry . . . . . 3 (3,0)
FOR 421 Wood Properties I . . . . . 3 (2,3)	CH 227 Organic Chem. Lab . . . . . 1 (0,3)
Literature Requirement* . . . . . 3 (3,0)	ECON 201 Principles of Economics . . . . . 3 (3,0)
PHYS 207 General Physics . . . . . 4 (3,2)	FOR 422 Wood Properties II . . . . . 3 (2,3)
Approved Elective . . . . . 3	Literature Requirement* . . . . . 3 (3,0)
Elective . . . . . 1	PHYS 208 General Physics . . . . . 4 (3,2)
18	18

### JUNIOR YEAR

COMP SC 205 Elem. Comp. Prog. . . . . 3 (3,0)	FOR 302 Forest Mensuration . . . . . 3 (2,3)
EX ST 301 Introductory Statistics . . . . . 3 (2,2)	FOR 304 Forest Economics . . . . . 3 (3,0)
FOR 305 Elements of Forestry . . . . . 2 (2,0)	FOR 306 Wood and Wood Fiber Identification . . . . . 2 (1,3)
FOR 307 Elements of Forestry Lab . . . . . 1 (0,3)	FOR 428 Wood Processing II . . . . . 3 (2,3)
FOR 427 Wood Processing I . . . . . 3 (2,3)	Emphasis Area . . . . . 6
Emphasis Area . . . . . 6	17
18	

### SENIOR YEAR

FOR 419 Senior Problems . . . . . 3 (1-3,0)	ENGL 301 Public Speaking . . . . . 3 (3,0)
FOR 420 Forest Products . . . . . 2 (2,0)	FOR 401 Logging and Milling . . . . . 3 (2,3)
FOR 425 Wood Chemistry . . . . . 3 (2,3)	FOR 411 Har. Forestry Prod. . . . . 3 (2,3)
FOR 429 Wood Design . . . . . 3 (2,3)	IM 304 Quality Control . . . . . 3 (3,0)
Approved Elective . . . . . 6	Approved Elective . . . . . 5
17	17

140 Total Semester Hours

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

**Notes:**

1. The emphasis areas are Wood Industries Management and Wood Science. The student selects one of these, and in consultation with his adviser schedules approved courses for that particular emphasis area.

2. A maximum of 5 credits in aerospace studies or military science may be taken in lieu of approved electives.

## 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 and Park Administration, Recreation Resource Management, and Rehabilitative Recreation.

## 180 Degrees and Curricula

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 degree is also offered by the Department.

### FRESHMAN YEAR

First Semester	Second Semester
BOT 101 Plant Biology . . . . . 3 (3,0)	ENGL 102 English Composition . . 3 (3,0)
ENGL 101 English Composition . . 3 (3,0)	POL SC 101 Amer. Natl. Govt. . . 3 (3,0)
HIST 102 American History . . . . 3 (3,0)	RPA 102 History and Principles of Outdoor Recreation . . . . . 3 (3,0)
MATH 101 Math. Analysis I . . . . 3 (3,0)	RPA 203 Personal and Community Health . . . . . 3 (3,0)
RPA 101 Introduction to Community Recreation . . . . . 3 (3,0)	ZOO 101 Animal Biology . . . . . 3 (3,0)
Elective . . . . . 1	Elective . . . . . 1
16	16

### SOPHOMORE YEAR

ECON 200 Economic Concepts . . . 3 (3,0)	ACCT 200 Managerial Accounting 3 (3,0)
Literature Requirement* . . . . . 3 (3,0)	Physical Science† . . . . . 4
Physical Science† . . . . . 4	PSYCH 211 Growth and Develop. 3 (3,0)
PSYCH 201 General Psychology . . . 3 (3,0)	RPA 205 Prog. Plan. for Rec. . . . 3 (2,3)
RPA 204 Sports in Recreation . . . 3 (2,3)	SOC 201 Introductory Sociology . . 3 (3,0)
Elective . . . . . 1	Elective . . . . . 1
17	17

### JUNIOR YEAR

RPA 302 Camp Org. and Admin. 3 (2,3)	ENGL 301 Public Speaking . . . . 3 (3,0)
RPA 306 Principles of Outdoor Education . . . . . 3 (3,0)	RPA 308 Leadership and Group Processes in Recreation . . . . . 3 (3,0)
Emphasis Area‡ . . . . . 6	Emphasis Area‡ . . . . . 6
Elective . . . . . 3	Elective . . . . . 3
15	15

### SUMMER

RPA 405 Field Training in Recreation . . . . . 8

### SENIOR YEAR

RPA 402 Recreation Administration 3 (3,0)	RPA 403 Facility and Site Plan. . . 3 (2,3)
RPA 409 Meth. of Rec. Research I 3 (3,0)	RPA 410 Meth. of Rec. Research II 3 (3,0)
Emphasis Area‡ . . . . . 8	Emphasis Area‡ . . . . . 6
Elective . . . . . 2	Elective . . . . . 3
16	15

135 Total Semester Hours

### EMPHASIS AREAS—REQUIRED COURSES

<b>Recreation and Park Administration</b>		<b>Recreation Resource Management</b>	
IM 307 Personnel Management . . 3 (3,0)		AGRON 403 Soil Gen. and Class. 2 (1,3)	
RPA 307 Park Maintenance and Operation . . . . . 4 (3,3)		FOR 305 Elements of Forestry . . 2 (2,0)	
SOC 331 Urban Sociology . . . . . 3 (3,0)		RPA 307 Park Maintenance and Operation . . . . . 4 (3,3)	
10		RPA 407 Methods of Environ- mental Interpretation . . . . . 3 (2,3)	
		11	

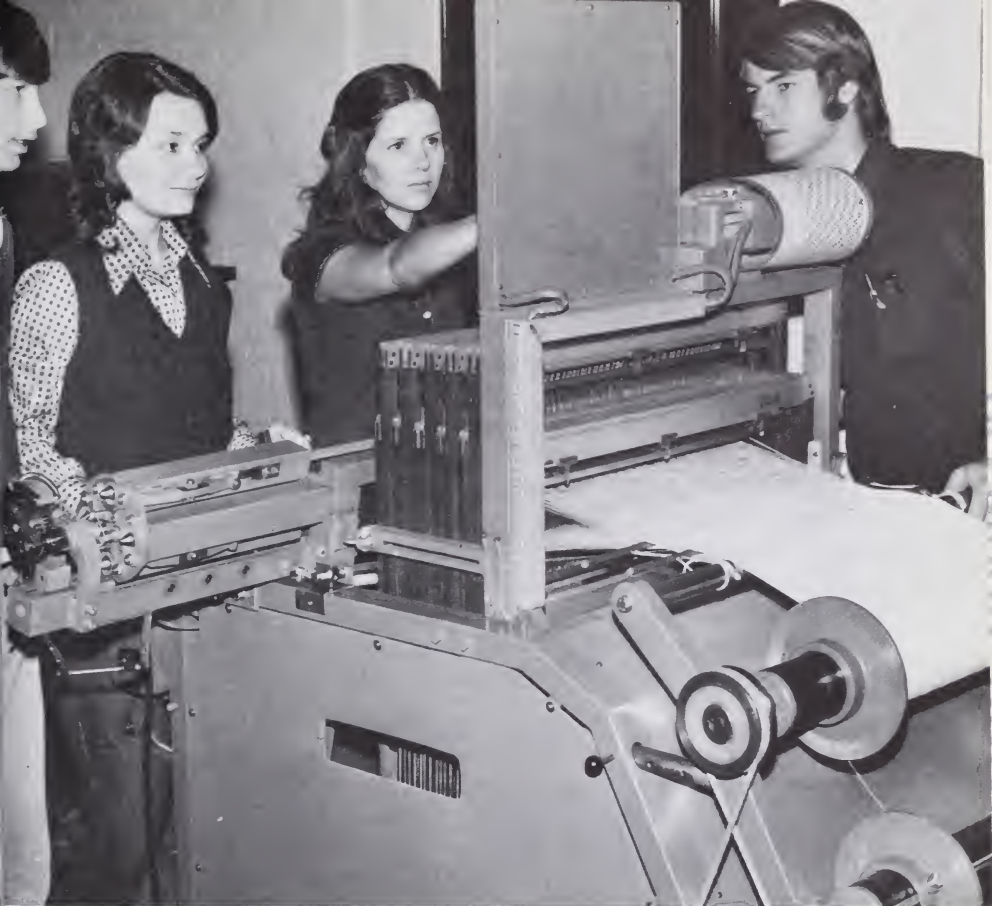
#### Rehabilitative Recreation

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



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

ECON 314 Inter. Econ. Theory . . . . . 3 (3,0)	ACCT 303 Cost Accounting . . . . . 3 (3,0)
ENGL 301 Public Speaking . . . . . 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 305 Income Taxation . . . . . 3 (3,0)	ACCT 405 Adv. Federal Taxes . . . . . 3 (3,0)
ACCT 410 Budgeting and Executive Control . . . . . 3 (3,0)	ACCT 407 Accounting Research . . . . . 1 (1,0)
ACCT 411 Advanced Accounting . . . . . 3 (3,0)	ACCT 415 Auditing . . . . . 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 program 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		Second Semester	
CH 101 General Chemistry . . . . .	4 (3,3)	CH 102 General Chemistry . . . . .	4 (3,3)
or PHY SC 101 Physical Sci. I	4 (3,2)	or PHY SC 102 Physical Sci. II	4 (3,2)
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)	POL SC 201 Intro. to Pol. Sci. . . .	3 (3,0)
POL SC 101 Amer. Natl. Govt. . . . .	3 (3,0)	Elective . . . . .	4
Elective . . . . .	1		17
	17		

## SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3 (3,0)	ACCT 202 Principles of Accounting	3 (3,0)
ECON 201 Principles of Economics	3 (3,0)	COMP SC 205 Elem. Comp. Prog.	3 (3,0)
Literature Requirement <sup>o</sup> . . . . .	3 (3,0)	ECON 202 Principles of Economics	3 (3,0)
MATH 203 Elem. Stat. Inference	3 (3,0)	IM 201 Intro. to Ind. Mgt. . . . .	3 (3,0)
SOC 201 Introductory Sociology . . .	3 (3,0)	PSYCH 201 General Psychology . . .	3 (3,0)
Elective . . . . .	1	SOC 202 Social Problems . . . . .	3 (3,0)
	16		18

## JUNIOR YEAR

ACCT 303 Cost Accounting . . . . .	3 (3,0)	IM 306 Corporation Finance . . . . .	3 (3,0)
ECON 301 Economics of Labor . . . .	3 (3,0)	IM 307 Personnel Management . . . .	3 (3,0)
IM 304 Quality Control . . . . .	3 (3,0)	IM 313 Commercial Law . . . . .	3 (3,0)
IM 308 Principles of Marketing . . . .	3 (3,0)	MGT SC 310 Intro. to Mgt. Sci. . . .	3 (3,0)
IM 312 Commercial Law . . . . .	3 (3,0)	POL SC 321 Gen. Public Admin. . . .	3 (3,0)
Elective . . . . .	1	or SOC 331 Urban Sociology . . . . .	3 (3,0)
	16	Elective . . . . .	1
			16

**SENIOR YEAR**

ACCT 410 Budgeting and Executive Control . . . . .	3 (3,0)	IM 401 Quant. Marketing Anal. . . . .	3 (3,0)
ENGL 304 Advanced Composition . . . . .	3 (3,0)	or IM 412 Marketing Mgt. . . . .	3 (3,0)
IM 402 Operations Planning and Control . . . . .	3 (3,0)	IM 404 Managerial Economics . . . . .	3 (3,0)
IM 405 Econ. of Transportation . . . . .	3 (3,0)	or MGT SC 414 Stat. Anal. . . . .	3 (3,0)
or IM 418 Mgt. Inf. Systems . . . . .	3 (3,0)	IM 407 Directed Research . . . . .	1 (1,0)
Elective . . . . .	3	or IM 410 Marketing Research I . . . . .	1 (1,0)
	<hr/>	IM 415 Managerial Dec. Making . . . . .	3 (3,0)
	15	IM 499 Computer Programming II . . . . .	1 (0,3)
		Elective . . . . .	6
			<hr/>
			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 (3,0)	HIST 172 or 173 West. Civilization 3 . . . . .	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
	<hr/>		<hr/>
	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
	<hr/>		<hr/>
	16		17

**JUNIOR YEAR**

ACCT 200 Managerial Acct. . . . .	3 (3,0)	ECON 407 National Income and Employment Analysis . . . . .	3 (3,0)
or ACCT 201 Prin. of Acct. . . . .	3 (3,0)	Humanities¶ . . . . .	3
ECON 314 Inter. Econ. Theory . . . . .	3 (3,0)	Major** . . . . .	3
Humanities¶ . . . . .	3	Minor** . . . . .	6
Major** . . . . .	3		
Minor** . . . . .	3		
	<hr/>		<hr/>
	15		15

**SENIOR YEAR**

Major .....	6	Major .....	6
Minor .....	6	Elective .....	11-10
Approved Elective** .....	4-3		<hr/>
	16-15	130 Total Semester Hours	17-16

\*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<br>202, 301, 302, 303, 410) | Mathematics       |
| Biological Science                                      | 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 †

Biochemistry  
Botany  
Genetics  
Microbiology  
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.

\* 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

ACCT 201 Principles of Accounting	3	(3,0)
ENGL 101 English Composition	3	(3,0)
HIST 173 Western Civilization	3	(3,0)
IM 201 Intro. to Ind. Mgt.	3	(3,0)
MATH 101 Math. Analysis I†	3	(3,0)
Elective	1	
	<hr/>	
	16	

Second Semester

ACCT 202 Principles of Accounting	3	(3,0)
ECON 201 Principles of Economics	3	(3,0)
ENGL 102 English Composition	3	(3,0)
MATH 102 Math. Analysis II†	3	(3,0)
POL SC 101 Amer. Natl. Govt.	3	(3,0)
Elective	1	
	<hr/>	
	16	

SOPHOMORE YEAR

ACCT 301 Intermed. Accounting	3	(3,0)
ECON 202 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	
	<hr/>	
	16	

ACCT 302 Intermed. Accounting	3	(3,0)
COMP SC 205 Elem. Comp. Prog.	3	(3,0)
Literature Requirement*	3	(3,0)
PSYCH 201 General Psychology	3	(3,0)
Elective	3	
	<hr/>	
	15	

JUNIOR YEAR

ECON 306 Risk and Insurance	3	(3,0)
ECON 314 Inter. Econ. Theory	3	(3,0)
ENGL 304 Advanced Composition	3	(3,0)
IM 308 Principles of Marketing	3	(3,0)
IM 312 Commercial Law	3	(3,0)
SOC 351 Industrial Sociology	3	(3,0)
	<hr/>	
	18	

ACCT 303 Cost Accounting	3	(3,0)
ECON 302 Money and Banking	3	(3,0)
IM 306 Corporation Finance	3	(3,0)
IM 307 Personnel Management	3	(3,0)
IM 313 Commercial Law	3	(3,0)
Elective	3	
	<hr/>	
	18	

SENIOR YEAR

ACCT 305 Income Taxation	3	(3,0)
ACCT 410 Budgeting and Executive Control	3	(3,0)
ECON 422 Monetary Theory and Policy	3	(3,0)
IM 415 Managerial Dec. Making	3	(3,0)
Elective	6	
	<hr/>	
	18	

ACCT 415 Auditing	3	(3,0)
ECON 412 International Trade	3	(3,0)
ENGL 301 Public Speaking	3	(3,0)
Elective	6	
	<hr/>	
	15	

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 liaison 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		Second Semester	
CH 101 General Chemistry . . . . .	4 (3,3)	CH 102 General Chemistry . . . . .	4 (3,3)
EG 103 Engineering Communica..	3 (1,6)	ENGL 102 English Composition..	3 (3,0)
ENGL 101 English Composition..	3 (3,0)	MATH 108 Cal. and Lin. Algebra	4 (4,0)
HIST 173 Western Civilization... 3	(3,0)	PHYS 122 Mech. and Wave Phen.	3 (3,0)
MATH 106 Calculus of One Var..	4 (4,0)	Elective . . . . .	3
	17		17

SOPHOMORE YEAR

ACCT 201 Principles of Accounting	3 (3,0)	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)
ECON 201 Principles of Economics	3 (3,0)	IM 201 Intro. to Ind. Mgt. . . . .	3 (3,0)
PHYS 221 Thermal and Elec. Phen.	3 (3,0)	IM 299 Computer Programming I	1 (0,3)
PHYS 223 Electron Physics Lab..	1 (0,3)	MATH 301 Statistical Theory	
SOC 201 Introductory Sociology..	3 (3,0)	and Methods I . . . . .	3 (3,0)
	16	Elective . . . . .	2
			15

JUNIOR YEAR

ACCT 303 Cost Accounting . . . . .	3 (3,0)	IM 304 Quality Control . . . . .	3 (3,0)
ECON 314 Inter. Econ. Theory..	3 (3,0)	IM 308 Principles of Marketing	3 (3,0)
IE 307 Survey of Engineering... 3	(3,0)	MGT SC 311 Intro. to Econometrics	3 (3,0)
IM 322 Legal Environment of		SOC 351 Industrial Sociology . . . .	3 (3,0)
Business . . . . .	3 (3,0)	Area Concentration† . . . . .	3
Literature Requirement* . . . . .	3 (3,0)	or Technical Elective . . . . .	3
Area Concentration† . . . . .	3	Elective . . . . .	1
or Elective . . . . .	3		16
	18		

SENIOR YEAR

ACCT 410 Budgeting and		IM 402 Operations Planning	
Executive Control . . . . .	3 (3,0)	and Control . . . . .	3 (3,0)
ENGL 304 Advanced Composition	3 (3,0)	IM 407 Directed Research . . . . .	1 (1,0)
IM 408 Work Simplification		or IM 410 Marketing Research I	1 (1,0)
and Standardization . . . . .	3 (3,0)	IM 415 Managerial Dec. Making.	3 (3,0)
IM 418 Management Inform. Sys.	3 (3,0)	IM 499 Computer Programming II	1 (0,3)
MGT SC 414 Statistical Analysis..	3 (3,0)	MGT SC 413 Management Science	3 (3,0)
Area Concentration† . . . . .	3	Area Concentration† . . . . .	3
or Technical Elective . . . . .	3	Elective . . . . .	1
	18		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    | Human Resources        |
| Ceramics              | Management             |
| Defense Studies       | Industrial Engineering |
| Economics             | Industrial Statistics  |
| Environmental Science | Management Science     |
| Health and Hospital   | Marketing Analysis     |
| Administration        | Regional Science       |
|                       | Textiles               |

## TEXTILE CHEMISTRY, TEXTILE SCIENCE, AND TEXTILE TECHNOLOGY PROGRAMS

The study of textiles is a fascinating combination of many fields. Textiles are found in every aspect of our daily lives, not only apparel, transportation and household uses, but also in medicine, space, personal safety, recreation and sports.

Clemson is located near many textile plants, and plant tours are an integral part of several courses.

The textile student studies the polymer synthesis of fibers by man or nature, the processes for converting these fibers into a textile structure, the science of the addition of coloring agents and finishes to improve the desirability, and the test methods for evaluating the performance of textile products.

The approximately 3,000 graduates of the Textile Department at Clemson enjoy positions of high esteem in the textile industry. In the textile and related industries they hold jobs with responsibilities in corporate management, sales, manufacturing management, design, research, development, technical service, quality control, and personnel management. They are involved in the decision-making area. They create new products and processes and solve problems. They create styles, patterns, textures, and colors for apparel, home, and industrial use as well as special application. They deal with computers, automation, product quality, plant performance, environmental control, and consumer safety. Job opportunities for graduates are excellent. The Textile Department maintains one of the best records in the University for placing graduates in good jobs.

The textile industry has a continuing need for technically trained men and women to help it meet sociologically desirable standards such as those required by the Occupational Safety and Health Act, the Consumer Product Safety Agency, and the Environmental Protection Agency. In addition, there is a need to reduce costs and increase exports, and to develop new fibers and fabrics to satisfy the whims of fashion.

If a person wishes to contribute to society, to have an adequate income, and to occupy a respected place in the community, he could well begin with a textile degree from Clemson. Clemson is vital to the textile industry as the textile industry is vital to South Carolina.

In the textile curricula a broad background is stressed, with as much as two-thirds of the courses coming from the large resources of the University outside the department. In addition, the 34 hours of electives permit the student to gain expertise in related fields. Such minor areas might be in industrial management, economics,



chemistry, physics, engineering, mathematics, visual studies, or the social sciences and humanities. In the second semester of his sophomore year, the student, with the advice and consent of 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.

The Textile Department offers three undergraduate degrees which differ in the content of science and business courses. The B.S. in Textile Chemistry and the B.S. in Textile Science are both based on the three sciences, chemistry, physics, and mathematics. With this firm base, the graduate is able to apply scientific knowledge to the solution of problems involving both chemical and physical principles. The graduates will be concerned with the conception, design, construction, and management of complete systems of labor, machinery and processes for the most efficient production of textiles or related chemicals. These two courses differ in that Textile Chemistry has a greater emphasis on chemistry and Textile Science has a greater emphasis on yarn and fabric formation. Both curricula prepare one for graduate study in textiles or other fields, or for entry into professional schools such as medicine or dentistry.

The Bachelor of Textile Technology program has as its core the desirable business and humanistic courses in economics, management, sociology, and psychology that prepare the graduate to begin a management career as a production manager in a textile mill. It is less well adapted to train a man for graduate work, but with proper choice of electives a student could prepare himself for graduate school in certain areas.

The Textile Department also offers advanced degrees as follows: Master of Science in Textile Chemistry, Master of Science in Textile Science, 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.

Textile courses also may be taken as a minor area or as free electives. Recommended groups of courses may consist of 3, 6, 12, or 20 credits.

#### BASIC FRESHMAN YEAR FOR TEXTILE CHEMISTRY AND TEXTILE SCIENCE PROGRAMS

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 173 Western 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)
TEXT 122 Introduction to Textiles 2 (1,3)	Elective . . . . . 2
Elective . . . . . 1	16
17	

\* Textile Science majors substitute Ch 102.

## TEXTILE CHEMISTRY

See page 190 for Freshman Year.

### SOPHOMORE YEAR

#### First Semester

CH 223 Organic Chemistry . . . . .	3 (3,0)
CH 225 Organic Chemistry Lab. . . . .	2 (0,6)
Literature Requirement* . . . . .	3 (3,0)
MATH 206 Calculus of Sev. Var. . . . .	4 (4,0)
PHYS 221 Thermal and Elec. Phen. . . . .	3 (3,0)
PHYS 223 Electron Physics Lab. . . . .	1 (0,3)
Elective . . . . .	1
	17

#### Second Semester

CH 224 Organic Chemistry . . . . .	3 (3,0)
CH 226 Organic Chemistry Lab. . . . .	2 (0,6)
MATH 208 Engineering Math. I. . . . .	4 (4,0)
PHYS 222 Optics and Mod. Phys. . . . .	3 (3,0)
PHYS 224 Modern Physics Lab. . . . .	1 (0,3)
Elective . . . . .	3
	16

### JUNIOR YEAR

CH 331 Physical Chemistry . . . . .	3 (3,0)
ECON 200 Economic Concepts . . . . .	3 (3,0)
TC 315 Introduction to Polymer Science and Engineering . . . . .	3 (3,0)
TC 317 Polymer and Fiber Lab. . . . .	1 (0,3)
Elective . . . . .	6
	16

CH 332 Physical Chemistry . . . . .	3 (3,0)
ENGL 304 Advanced Composition . . . . .	3 (3,0)
TC 316 Chemical Preparation of Textiles . . . . .	3 (2,3)
TEXT 306 Yarn Formation . . . . .	3 (3,0)
Elective† . . . . .	6
	18

### SENIOR YEAR

TC 457 Dyeing and Finishing I. . . . .	3 (3,0)
TC 459 Dyeing and Fin. Lab. I. . . . .	1 (0,3)
TEXT 313 Fabric Formation . . . . .	3 (3,0)
TEXT 321 Fiber Science . . . . .	3 (2,3)
Elective† . . . . .	6
	16

TC 458 Dyeing and Finishing II. . . . .	3 (3,0)
TC 460 Dyeing and Fin. Lab. II . . . . .	1 (0,3)
TEXT 322 Properties of Textile Structures . . . . .	3 (2,3)
Elective† . . . . .	9
	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

See page 190 for Freshman Year.

### 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)
PHYS 223 Electron Physics Lab. . . . .	1 (0,3)
TC 303 Textile Chemistry . . . . .	3 (3,0)
TC 305 Textile Chemistry Lab. . . . .	1 (0,3)
Elective . . . . .	1
	16

#### Second Semester

ECON 200 Economic Concepts . . . . .	3 (3,0)
MATH 208 Engineering Math. I. . . . .	4 (4,0)
PHYS 222 Optics and Mod. Phys. . . . .	3 (3,0)
PHYS 224 Modern Physics Lab. . . . .	1 (0,3)
TC 304 Textile Chemistry . . . . .	3 (3,0)
TC 306 Textile Chemistry Lab. . . . .	1 (0,3)
Elective . . . . .	1
	16

### JUNIOR YEAR

TEXT 301 Fiber Processing I . . . . .	3 (2,3)
TEXT 311 Fabric Development I . . . . .	3 (2,3)
TEXT 321 Fiber Science . . . . .	3 (2,3)
Elective† . . . . .	8
	17

ENGL 304 Advanced Composition . . . . .	3 (3,0)
TEXT 302 Fiber Processing II . . . . .	3 (2,3)
TEXT 312 Fabric Development II . . . . .	3 (2,3)
TEXT 322 Properties of Textile Structures . . . . .	3 (2,3)
Elective . . . . .	6
	18

### SENIOR YEAR

TC 315 Introduction to Polymer Science and Engineering . . . . .	3 (3,0)
TC 317 Polymer and Fiber Lab. . . . .	1 (0,3)
TEXT 403 Fiber Processing III. . . . .	3 (2,3)
TEXT 411 Fabric Development III . . . . .	3 (2,3)
Elective† . . . . .	6
	16

TC 458 Dyeing and Finishing II . . . . .	3 (3,0)
TC 460 Dyeing and Fin. Lab. II . . . . .	1 (0,3)
TEXT 414 Nonwoven and Knitted Structures . . . . .	3 (3,0)
Elective† . . . . .	9
	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

## 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

English  
History  
Modern Languages  
Political Science  
Psychology  
Sociology

#### Minor

Biological Science  
Chemistry  
"Cluster Minor"  
Economics  
English  
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
<u>16-17</u>	<u>16-17</u>

#### 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
<u>18</u>	<u>16</u>

#### JUNIOR YEAR

Major and Minor Areas . . . . . 9	Major and Minor Areas . . . . . 12
Approved Elective . . . . . 7-6	Approved Elective . . . . . 3
<u>16-15</u>	<u>15</u>

#### SENIOR YEAR

Major and Minor Areas . . . . . 9	Major and Minor Areas . . . . . 9
Approved Elective . . . . . 9-8	Approved Elective . . . . . 6
<u>18-17</u>	<u>15</u>

130 Total Semester Hours

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

† Bot 101, 103 and Zool 101, 103, or a two-semester sequence of the same science (astronomy, 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 405 and 409 or 436.

Group II—Six semester credits according to one of these plans:

- A. If Engl 203 and 204 have been completed, two of the following: Engl 422, 423, 424, 435, 447.
- B. If Engl 205 and 206 have been completed, Engl 461 and 462.
- C. If Engl 207 and 208 have been completed, Engl 423 and 461.

Group III—Four additional 400-level courses in different literary periods or genres, selected with the aid of the departmental adviser.\*

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; 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.

History majors become eligible to take Hist 499 when they have completed 96 semester hours and at least five courses in history at the 300-400 level.

\* English 332 may be included in this group by special arrangement with the Head of the Department of English.

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 languages consists of the courses stipulated in the basic Liberal Arts curriculum and 24 hours in the language arranged as follows:

- French: 303, 304, 305, and either 306, 307, or 308 plus 12 semester hours on the 400 level.
- German: 301, 302, 305, and either 306, 307, or 308 plus 12 semester hours on the 400 level.
- Spanish: 303, 304, or 305, 310, 311, and either 306, 307, or 308 plus 12 semester hours on the 400 level.

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

- French: 303, 304, 305, and either 306, 307, 308, or 309, plus 6 semester hours on the 400 level.
- German: 301, 302, 305, and either 306, 307, or 308 plus 6 semester hours on the 400 level.
- Spanish: 303, 304 (or 310-311), 305, and 306, 307, or 308 plus 6 semester hours on the 400 level.

**Secondary Language.** Twelve semester hours from courses on the 300 and 400 levels.

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, 474, 475, 476, 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, 453
6. Public Administration—Pol Sc 321, 422, 423, 425, 426, 428, 429
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 20 additional credits drawn from the following courses: Psych 301, 302, 303, 321, 331, 341, 343, 351, 361, 363, 380, 401, 402, 403, 411, 422, 425, 442, 471, 475, 482, 490, 493, 494, 495, 497, 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, 309, 311, 321, 322, 324, 331, 341, 351, 361, 381, 391, 393, 431, 433, 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.

**Biological Science.** A minor concentration in Biological Science 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

Group III—Administration \*

Accounting  
Economics  
Industrial Management

Group IV—Life Sciences †

Biochemistry  
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 409 or 436.

Group II—Three semester credits according to one of these plans:

- A. If Engl 203 and 204 have been completed, one of the following: 422, 423, 424.
- B. If Engl 205 and 206 have been completed, one of these: 461, 462.
- C. If Engl 207 and 208 have been completed, one of these: 423, 461, 462.

Group III—Six additional credits from English courses numbered higher than 400.

\* 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.

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

Visual Studies (all courses)

**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 drawn from 300 to 400 level history courses 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, 301; and one 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 on the 300 and 400 levels, 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 six credits from Phil 201, 202 (formerly 302), and 203 (formerly 211) and 15 semester credits from the following courses: Phil 303, 304, 309, 312, 318, 322, 325, 344, 422.

**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 (except for Sociology majors), and 15 semester credits from the following courses: Comp Sc 205, Psych 301, 302, 303, 321, 331, 341, 343, 351, 361, 363, 380, 401, 402, 403, 411, 422, 425, 442, 471, 475, 482, 490, 493, 494, 495, 497, 499.

**Sociology.** A minor concentration in Sociology requires Soc 201, 206 (except for Psychology majors), 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 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 programs 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**

**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 101 Math. Analysis I . . . . .	3 (3,0)	MATH 102 Math. Analysis II . . . . .	3 (3,0)
NURS 100 Orientation . . . . .	1 (1,0)	History Elective . . . . .	3 (3,0)
ZOOL 101 Animal Biology . . . . .	3 (3,0)		<hr/>
ZOOL 103 Animal Biology Lab. . . . .	1 (0,2)		13
	<hr/>	Option: Modern Language . . . . .	4 (3,1)
	15		
Option: Modern Language . . . . .	4 (3,1)		

**SOPHOMORE YEAR**

BIOCH 210 Elem. Biochemistry . . . . .	4 (3,3)	MATH 203 Elem. Stat. Inference. . . . .	3 (3,0)
Literature Requirement* . . . . .	3 (3,0)	NURS 207 Dynamics of Human Relations . . . . .	3 (2,3)
MICRO 305 General Microbiology . . . . .	4 (3,3)	PSYCH 211 Growth and Develop. . . . .	3 (3,0)
PSYCH 201 General Psychology . . . . .	3 (3,0)	SOC 201 Introductory Sociology . . . . .	3 (3,0)
ZOOL 220 Human Anatomy and Physiology I . . . . .	4 (3,3)	ZOOL 221 Human Anatomy and Physiology II . . . . .	4 (3,3)
	<hr/>		<hr/>
	18		16

**FIRST SUMMER SESSION**

NURS 208 Problem Solving in Nursing† . . . . .	3 (2,3)
SOC 202 Social Problems . . . . .	3 (3,0)
	<hr/>
	6

## JUNIOR YEAR

NURS 309 Human Values in Nurs.	3 (3,0)	NURS 310 Perspectives in Nursing Intervention	3 (3,0)
NURS 311 Nursing During Altera- tions in Life Patterns	5 (2,9)	NURS 312 Nursing of Acute and Chronically Distressed	5 (2,9)
NURS 313 Promotion of Health	3 (2,3)	NURS 314 Nursing in the Home	3 (2,3)
NUTR 451 Human Nutrition	3 (3,0)	SOC 311 The Family §	3 (3,0)
Elective	3	Elective†	3
	<hr/> 17		<hr/> 17

## SENIOR YEAR

NURS 417 Intensive Nursing	4 (1,9)	NURS 422 Cur. Research in Nurs.	3 (3,0)
NURS 419 Multiproblem Family	3 (2,3)	NURS 425 Independent Study in Nursing	7 (3,12)
NURS 421 Hist. and Phil. of Nurs.	3 (3,0)	PSYCH 302 Social Psychology	3 (3,0)
Elective†	3	Elective†	3
Elective‡	3		<hr/> 16
	<hr/> 16		

134 Total Semester Hours

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

† Select electives from the following: humanities, literature, philosophy, music, religion.

‡ The physical, biological, and social sciences, and mathematics courses scheduled for the freshman and sophomore years are prerequisite to Nurs 208.

§ Soc 309 may be taken in lieu of Soc 311.

¶ Select electives from courses numbered 201 and above.

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

## FIRST YEAR

First Semester		Second Semester	
ENGL 101 English Composition	3 (3,0)	ENGL 102 English Composition	3 (3,0)
NURS 100 Orientation	1 (1,0)	NURS 102 Fund. of Nursing II	6 (3,9)
NURS 101 Fund. of Nursing I	6 (3,9)	PSYCH 201 General Psychology	3 (3,0)
ZOOL 110 Integrated Science I	4 (3,3)	ZOOL 111 Integrated Science II	4 (3,3)
Elective	3		<hr/> 16
	<hr/> 17		

## SECOND YEAR

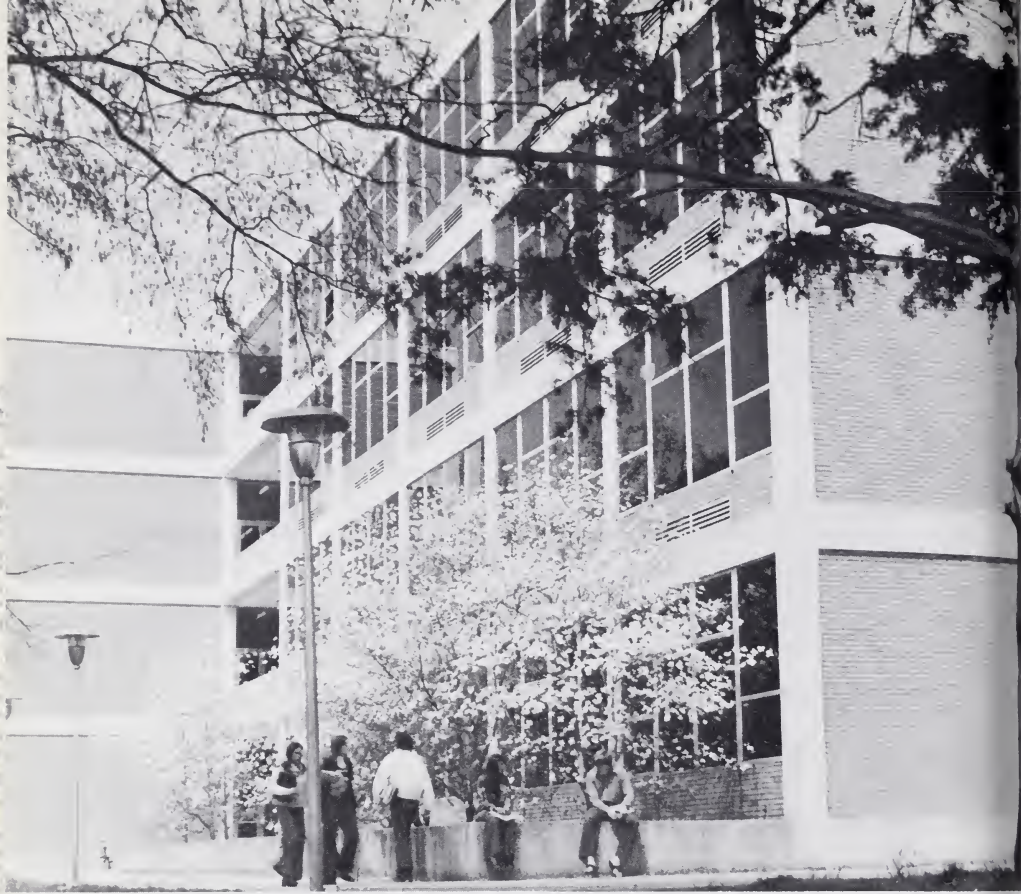
NURS 200 Maternal and Child Health Nursing	5 (3,6)	ENGL 301 Public Speaking	3 (3,0)
NURS 201 Major Health Prob. I	5 (3,6)	NURS 202 Major Health Prob. II	5 (3,6)
PSYCH 211 Growth and Develop.	3 (3,0)	NURS 203 Major Health Prob. III	5 (3,6)
SOC 201 Introductory Sociology	3 (3,0)	NURS 204 Nursing Seminar	1 (1,0)
	<hr/> 16	Elective*	3
			<hr/> 17

66 Total Semester Hours

\* Consult catalog or adviser for electives.

Note: A minimum grade of C is required for Nurs 100-204 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, the Bachelor of Arts degree is offered with a major emphasis in either Chemistry, Geology, Mathematics, or Physics.

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, engi-

neering, management, and others allows 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:

Biochemistry	Mathematics
Botany	Microbiology
Chemistry	Modern Languages
"Cluster Minor"	Philosophy
Economics	Physics
English	Political Science
Fine Arts	Psychology
Geology	Sociology
History	Zoology

The major concentration requires 24 semester hours, and the minor 15 semester hours above the sophomore level unless otherwise indicated. These fit into 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

### BASIC FRESHMAN YEAR FOR CHEMISTRY AND GEOLOGY PROGRAMS

For the Bachelor of Arts degree, Chemistry requires 130 semester hours, and Geology requires 128 semester hours.

First Semester	Second Semester
CH 101 General Chemistry . . . . . 4 (3,3)	CH 112 General Chemistry <sup>o</sup> . . . . . 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)
<u>15</u>	<u>15</u>

<sup>o</sup> Geology majors substitute Ch 102.

## CHEMISTRY

### SOPHOMORE YEAR

First Semester	Second Semester
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 <sup>o</sup> . . . . . 3 (3,0)	HIST 171 or 172 West. Civilization 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)	Literature Requirement <sup>o</sup> . . . . . 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)
<u>17</u>	<u>16</u>

### 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	<u>16</u>
<u>17</u>	

### SENIOR YEAR

Chemistry Elective . . . . . 4	Chemistry Elective . . . . . 4
Minor . . . . . 3	Minor . . . . . 3
Elective . . . . . 10	Elective . . . . . 10
<u>17</u>	<u>17</u>

130 Total Semester Hours

<sup>o</sup>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

### SOPHOMORE YEAR

First Semester	Second Semester
GEOL 101 Physical Geology . . . . . 4 (3,3)	GEOL 102 Historical Geology . . . . . 4 (3,3)
Literature Requirement <sup>o</sup> . . . . . 3 (3,0)	HIST 171 or 172 West. Civilization 3 (3,0)
MATH 206 Calculus of Sev. Var. 4 (4,0)	Literature Requirement <sup>o</sup> . . . . . 3 (3,0)
Modern Language . . . . . 3 (3,0)	Modern Language . . . . . 3 (3,0)
Elective . . . . . 3	Elective . . . . . 4
<u>17</u>	<u>17</u>

## 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		<hr/>
	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
	<hr/>	Elective . . . . .	3
	15		<hr/>
			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

COMP SC 205 Elem. Comp. Prog.	3 (3,0)
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)
Modern Language . . . . .	4 (3,1)
	<hr/>
	17

## Second Semester

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)
Modern Language . . . . .	4 (3,1)
Elective . . . . .	3
	<hr/>
	17

## SOPHOMORE YEAR

Literature Requirement*	3 (3,0)
MATH 206 Calculus of Sev. Var.	4 (4,0)
MATH 301 Statistical Theory and Methods I . . . . .	3 (3,0)
Modern Language . . . . .	3 (3,0)
Elective§ . . . . .	3
	<hr/>
	16

ECON 200 Economic Concepts . . .	3 (3,0)
Literature Requirement*	3 (3,0)
MATH 208 Engineering Math. I . . .	4 (4,0)
MATH 411 Linear Algebra . . . . .	3 (3,0)
Elective§ . . . . .	3
	<hr/>
	16

## JUNIOR YEAR

MATH 350 Intro. to Math. Models	3 (3,0)
Minor . . . . .	3
Natural Science Elective . . . . .	4
Social Science Elective . . . . .	3
Elective . . . . .	3
	<hr/>
	16

MUS 210 Music Appreciation . . . .	3 (3,0)
or AAH 303 Evol. of Visual Arts	3 (3,0)
Mathematics Elective . . . . .	3
Minor . . . . .	3
Natural Science Elective . . . . .	4
Social Science Elective . . . . .	3
	<hr/>
	16

## SENIOR YEAR

MATH 412 Intro. to Mod. Algebra	3 (3,0)
or MATH 419 App. Comb. Alg. I	3 (3,0)
MATH 453 Adv. Calculus I . . . . .	3 (3,0)
or MATH 463 Math. Analysis I	3 (3,0)
Minor . . . . .	6
Elective . . . . .	4
	<hr/>
	16

MATH 454 Adv. Calculus II . . . . .	3 (3,0)
or MATH 464 Math. Analysis II	3 (3,0)
Humanities . . . . .	3
Mathematics Elective . . . . .	3
Minor . . . . .	3
Elective§ . . . . .	4
	<hr/>
	16

130 Total Semester Hours

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

§ 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	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 171 or 172 West. Civilization 3 (3,0)	HIST 172 or 173 West. Civilization 3 (3,0)
MATH 106 Calculus of One Var. 4 (4,0)	MATH 108 Cal. and Lin. Algebra 4 (4,0)
PHYS 101 Current Topics in Modern Physics . . . . . 1 (0,2)	PHYS 132 General Physics I . . . . . 3 (3,0)
Elective . . . . . 1	Elective . . . . . 1
16	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 (4,0)
Modern Language . . . . . 4 (3,1)	Modern Language . . . . . 4 (3,1)
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**

PHYS 321 Mechanics I . . . . . 3 (3,0)	PHYS 322 Mechanics II . . . . . 3 (3,0)
Humanities . . . . . 3	PHYS 340 Elec. and Magnetism I 3 (3,0)
Minor . . . . . 3	Humanities . . . . . 3
Modern Language . . . . . 3 (3,0)	Minor . . . . . 3
Elective . . . . . 3	Modern Language . . . . . 3 (3,0)
15	15

**SENIOR YEAR**

PHYS 455 Quantum Physics I . . . 3 (3,0)	Minor . . . . . 3
Minor . . . . . 6	Physics Elective . . . . . 4
Physics Elective . . . . . 4	Social Science Elective . . . . . 3 (3,0)
Social Science Elective . . . . . 3 (3,0)	Elective . . . . . 6
16	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**

**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 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 as follows:

**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

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:

Biochemistry

Botany

Genetics

Microbiology

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

**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—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 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

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, 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, 301; and one 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.

**Philosophy.** The recommended program of study consists of 15 semester hours of coursework beyond Phil 201, 202—drawn from Phil 203, 303, 304, 309, 312, 318, 322, 344, 422.

**Physics.** A minor concentration in Physics requires Phys 122 and 15 additional semester credits in physics, including Phys 221, 222.

**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.** A minor concentration in Psychology requires Psych 201, 202, and 15 semester credits from the following courses: Comp Sc 205, Psych 301, 302, 303, 321, 331, 341, 343, 351, 361, 363, 380, 401, 402, 403, 411, 422, 425, 442, 471, 475, 482, 490, 493, 494, 495, 497, 499.

**Sociology.** A minor concentration in Sociology requires 15 semester hours beyond Soc 201, 202 to be selected from the following courses: RS 359, 401, Soc 306, 309, 311, 321, 322, 324, 331, 341, 351, 361, 381, 391, 393, 411, 421, 431, 433, 441, 451, 481, 499.

## 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

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)
CH 101 General Chemistry	4 (3,3)
ENGL 101 English Composition	3 (3,0)
MATH 103 College Algebra	2 (2,0)
MATH 104 Trigonometry	2 (2,0)
Elective	1

##### Second Semester

CH 102 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)
Elective	1
	16



## SOPHOMORE YEAR

ECON 201 Principles of Economics	3 (3,0)	BOT 202 Survey of Plant Kingdom	4 (3,3)
Literature Requirement <sup>o</sup>	3 (3,0)	Literature Requirement <sup>o</sup>	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
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## JUNIOR YEAR

BOT 331 Intro. Plant Taxonomy	3 (2,3)	BOT 421 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
	<hr/> 17		17

## SENIOR YEAR

BOT 451 Plant Anatomy	3 (2,3)	BOT 441 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
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134 Total Semester Hours

<sup>o</sup>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
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## 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 (4,0)
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)
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	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
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	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 Spectroscopy Lab . . . . .	2 (0,6)
Elective† . . . . .	9	Elective† . . . . .	10
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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 pro-

gram the student should be adequately prepared for employment or for graduate study in any field of geology.

### FRESHMAN YEAR

First Semester	Second Semester
CH 101 General Chemistry . . . . . 4 (3,3)	CH 102 or 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

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)
MATH 206 Calculus of Sev. Var. 4 (4,0)	Modern Language§ . . . . . 3 (3,0)
Modern Language§ . . . . . 3 (3,0)	PHYS 122 Mech. and Wave Phen. 3 (3,0)
17	16

### JUNIOR YEAR

BOT 101 Plant Biology . . . . . 3 (3,0)	EX ST 301 Introductory Statistics 3 (2,2)
BOT 103 Plant Biology Lab. . . . . 1 (0,2)	GEOL 309 Petrology . . . . . 3 (2,3)
GEOL 306 Mineralogy . . . . . 3 (2,3)	GEOL 313 Stratigraphy and Sed. 3 (3,0)
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)
Elective† . . . . . 4	ZOOL 101 Animal Biology . . . . . 3 (3,0)
15	ZOOL 103 Animal Biology Lab. . . 1 (0,2)
	17
Summer Geology Field Camp† . . . . . 6	

### SENIOR YEAR

GEOL 402 Structural Geology . . . 3 (2,2)	GEOL 310 Optical Mineralogy . . 3 (1,4)
GEOL 403 Invert. Paleontology . . 3 (2,3)	GEOL 404 Economic Geology . . . 3 (3,0)
Elective† . . . . . 11	Elective . . . . . 10
17	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 are required.

## MATHEMATICS

The Mathematics curriculum, carefully designed to possess a high degree of versatility, equips the student with the knowledge of mathematical concepts and methods that are applicable in the areas of 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 desired. In addition to containing the basic courses which provide the student with the mathematical skills necessary in the use of mathematics as it relates to other fields of knowledge, the curriculum allows the student in his junior year to select one of eight optional sets of courses, providing an introduction to an area where mathematics is applied. These options are Biology, Chemistry, Communications, Computer Science, Managerial Science, Operations Research, Physics, Psychology, and Statistics.

In addition to the overall goal of preparing the student to cope with the dynamics of any mathematical environment, the curriculum seeks to provide an adequate background for the student who plans to pursue graduate study in mathematics or 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.

**FRESHMAN YEAR**

**First Semester**

CH 101 General Chemistry . . . . .	4 (3,3)
COMP SC 205 Elem. Comp. Prog.¶	3 (3,0)
ENGL 101 English Composition . . .	3 (3,0)
HIST 172 or 173 West. Civ.¶ . . . .	3 (3,0)
MATH 106 Calculus of One Var. . . .	4 (4,0)
	17

**Second Semester**

CH 102 General Chemistry . . . . .	4 (3,3)
ECON 200 Economic Concepts¶ . . .	3 (3,0)
ENGL 102 English Composition . . .	3 (3,0)
MATH 108 Cal. and Lin. Algebra . . .	4 (4,0)
Elective¶ . . . . .	3
	17

**SOPHOMORE YEAR**

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)
Elective† . . . . .	3
	16

Literature Requirement* . . . . .	3 (3,0)
MATH 208 Engineering Math. I . . . .	4 (4,0)
MATH 411 Linear Algebra . . . . .	3 (3,0)
Elective† . . . . .	6
	16

**JUNIOR YEAR**

FR 101 Elementary French . . . . .	4 (3,1)
or GER 101 Elem. German . . . . .	4 (3,1)
MATH 350 Intro. to Math. Models . . .	3 (3,0)
MATH 453 Advanced Calculus I . . . .	3 (3,0)
or MATH 463 Math. Analysis I . . . .	3 (3,0)
Option . . . . .	3
Elective . . . . .	3
	16

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)
Option . . . . .	3
Elective . . . . .	3
	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)
Mathematics Elective† . . . . .	3 (3,0)
Option . . . . .	3
Elective† . . . . .	4
	16

Mathematics Elective† . . . . .	3
Option . . . . .	3
Elective† . . . . .	10
	16

**OPTIONS**

<b>A. Chemistry</b>	
CH 331 Physical Chemistry . . . . .	3 (3,0)
CH 332 Physical Chemistry . . . . .	3 (3,0)
CH 339 Physical Chemistry Lab. . . . .	1 (0,3)
CH 340 Physical Chemistry Lab. . . . .	1 (0,3)
CH 402 Inorganic Chemistry . . . . .	3 (3,0)
CH 435 Atomic and Mol. Struc . . . . .	3 (3,0)
CH 436 Spectroscopy Lab. . . . .	2 (0,6)
	16

**130 Total Semester Hours**

<b>B. Communications</b>	
E&CE 320 Electronics I . . . . .	2 (2,0)
E&CE 321 Electronics II . . . . .	2 (2,0)
E&CE 325 Elec. and Electro. Lab. . . .	1 (0,2)
E&CE 326 Elec. and Electro. Lab. . . .	1 (0,2)
E&CE 330 Systems I . . . . .	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)
	17



## 218 Degrees and Curricula

C. Computer Science		E. Operations Research	
COMP SC 409 Introduction to Numerical Analysis I . . . . .	3 (3,0)	COMP SC 409 Introduction to Numerical Analysis I . . . . .	3 (3,0)
COMP SC 410 Introduction to Numerical Analysis II . . . . .	3 (3,0)	or MATH 429 Num. Analysis . . . . .	3 (3,0)
COMP SC 421 Introduction to Assembler Language Prog. . . . .	3 (3,0)	IM 402 Oper. Plan. and Control . . . . .	3 (3,0)
COMP SC 422 Adv. Assembler Language Programming . . . . .	3 (3,0)	MATH 404 Intro. to Stoch. Proc. . . . .	3 (3,0)
or COMP SC 428 Algorithmic Languages and Compilers . . . . .	3 (3,0)	MATH 452 Linear Programming . . . . .	3 (3,0)
MATH 452 Linear Programming . . . . .	3 (3,0)	MATH 473 Intro. to Nonlin. Opt. . . . .	3 (3,0)
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D. Managerial Science**		F. Physics§	
IM 402 Oper. Plan. and Control . . . . .	3 (3,0)	PHYS 321 Mechanics I . . . . .	3 (3,0)
IM 404 Managerial Economics . . . . .	3 (3,0)	PHYS 322 Mechanics II . . . . .	3 (3,0)
or IM 418 Mgt. Inform. Sys. . . . .	3 (3,0)	or ASTR 404 Astroynamics . . . . .	3 (3,0)
MATH 452 Linear Programming . . . . .	3 (3,0)	or PHYS 441 Elec. and Mag. II . . . . .	3 (3,0)
MATH 473 Intro. to Nonlin. Opt. . . . .	3 (3,0)	PHYS 340 Elec. and Magnetism I . . . . .	3 (3,0)
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	12		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)
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\* To be selected from the following: Engl 203, 204, 205, 206, 207, 208.

\*\* Select the following 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.

§ Select the following elective sequence: Phys 221, 222, 223, 224.

¶ Those qualifying for advanced placement in languages or wanting to take languages the freshman year may take them in place of these courses.

## MATHEMATICS WITH BIOLOGY OPTION

### FRESHMAN YEAR

First Semester		Second Semester	
BOT 101 Plant Biology . . . . .	3 (3,0)	ECON 200 Economics Concepts . . . . .	3 (3,0)
BOT 103 Plant Biology Lab. . . . .	1 (0,2)	ENGL 102 English Composition . . . . .	3 (3,0)
COMP SC 205 Elem. Comp. Prog. . . . .	3 (3,0)	MATH 108 Cal. and Lin. Algebra . . . . .	4 (4,0)
ENGL 101 English Composition . . . . .	3 (3,0)	ZOOL 101 Animal Biology . . . . .	3 (3,0)
MATH 106 Calculus of One Var. . . . .	4 (4,0)	ZOOL 103 Animal Biology Lab. . . . .	1 (0,2)
PHYS 207 General Physics§ . . . . .	4 (3,2)	Elective . . . . .	3
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	18		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 (4,0)
MATH 301 Statistical Theory and Methods I . . . . .	3 (3,0)	MATH 411 Linear Algebra . . . . .	3 (3,0)
Elective . . . . .	3	PHYS 208 General Physics . . . . .	4 (3,2)
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	17		18

### 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 CER 102 Elem. German . . . . .	4 (3,1)
MATH 350 Intro. to Math. Models . . . . .	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
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	15		15

**SENIOR YEAR**

BOT 202 Survey of Plant King... 4 (3,3)	BOT 441 Plant Ecology . . . . . 3 (2,3)
or ZOOLOG 301 Comp. Vert. Anat. 3 (2,3)	or ZOOLOG 302 Vert. Embryology 4 (3,3)
MATH 412 Intro. to Mod. Algebra 3 (3,0)	ENGL 301 Public Speaking . . . . . 3 (3,0)
or MATH 419 App. Comb. Alg. I 3 (3,0)	HIST 172 or 173 West. Civilization 3 (3,0)
Mathematics Elective† . . . . . 3 (3,0)	Mathematics Elective† . . . . . 3 (3,0)
Elective‡ . . . . . 5-6	Elective . . . . . 3-2
15	15

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 in languages or wanting to take languages the freshman year may take them in place of these courses.

**MATHEMATICS WITH PSYCHOLOGY OPTION**

**FRESHMAN YEAR**

**First Semester**

CH 101 General Chemistry . . . . . 4 (3,3)
COMP SC 205 Elem. Comp. Prog. 3 (3,0)
ENGL 101 English Composition. . 3 (3,0)
HIST 172 or 173 West. Civ. ¶ . . . 3 (3,0)
MATH 106 Calculus of One Var. . . 4 (4,0)
17

**Second Semester**

CH 102 General Chemistry . . . . . 4 (3,3)
ECON 200 Economic Concepts ¶ . . 3 (3,0)
ENGL 102 English Composition. . 3 (3,0)
MATH 108 Cal. and Lin. Algebra 4 (4,0)
Elective† . . . . . 3
17

**SOPHOMORE YEAR**

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)
Elective . . . . . 3
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 (4,0)
MATH 411 Linear Algebra . . . . . 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 350 Intro. to Math. Models 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)
ZOOLOG 101 Animal Biology . . . . . 3 (3,0)
ZOOLOG 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 Psych. Test Eval. . . . . 3 (3,0)
Mathematics Elective† . . . . . 3
Elective . . . . . 9
15

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.

¶ Those qualifying for advanced placement in languages or wanting to take languages the freshman year may take them in place of these courses.

**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**

CH 101 General Chemistry . . . . .	4 (3,3)
ENGL 101 English Composition . . .	3 (3,0)
MATH 101 Math. Analysis I . . . . .	3 (3,0)
or MATH 106 Cal. of One Var. . . . .	4 (4,0)
MED TECH 101 Introduction to Medical Technology . . . . .	1 (1,0)
ZOOL 101 Animal Biology . . . . .	3 (3,0)
ZOOL 103 Animal Biology Lab. . . . .	1 (0,2)
Elective . . . . .	1

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**Second Semester**

CH 112 General Chemistry . . . . .	4 (3,3)
ENGL 102 English Composition . . .	3 (3,0)
MATH 102 Math. Analysis II . . . . .	3 (3,0)
or MATH 108 Cal. and Lin. Alg. . . . .	4 (4,0)
Modern Language . . . . .	4 (3,1)
History Elective . . . . .	3 (3,0)
Elective . . . . .	1

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**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)
PHYS 207 General Physics . . . . .	4 (3,2)	ECON 201 Principles of Economics . .	3 (3,0)
Modern Language . . . . .	4 (3,1)	MICRO 305 General Microbiology . .	4 (3,3)
History Elective . . . . .	3 (3,0)	PHYS 208 General Physics . . . . .	4 (3,2)
Elective . . . . .	3	Elective . . . . .	3

18

18

**JUNIOR YEAR**

CH 313 Quantitative Analysis . . . .	3 (3,0)	GEN 302 Genetics . . . . .	4 (3,3)
CH 317 Quantitative Anal. Lab. . . .	1 (0,3)	Literature Requirement <sup>o</sup> . . . . .	3 (3,0)
ECON 202 Principles of Economics . .	3 (3,0)	PSYCH 201 General Psychology . . .	3 (3,0)
Literature Requirement <sup>o</sup> . . . . .	3 (3,0)	Elective† . . . . .	6
Biological Science Elective† . . . . .	4		
Elective . . . . .	2		

16

16

**SENIOR YEAR**  
(52 Weeks)

				<i>Credit Hours</i>	<i>Lecture Hours</i>	<i>Seminar Hours</i>	<i>Clinical Practice Hours</i>
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 407	Urinalysis	.....		2	10	8	102
MED TECH 408	Chemistry	.....		10	40	50	470
MED TECH 409	Radioisotopes	.....		1	2	0	7
				<hr/>			
				32			

134-136 Total Semester Hours

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

† Electives to be approved by adviser.

‡ To be selected from 300 or 400 level courses in biological sciences, chemistry, education, or management areas or with approval of adviser.

## 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.



## 222 Degrees and Curricula

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	Second Semester
BIOL 100 Intro. to the Biological Sciences . . . . . 1 (1,0)	CH 112 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)
or ZOOL 101 Animal Biology . . . 3 (3,0)	MICRO 100 Microbes and Human Affairs . . . . . 1 (1,0)
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 103 College Algebra . . . . . 2 (2,0)	and BOT 103 Plant Biology Lab. 1 (0,2)
MATH 104 Trigonometry . . . . . 2 (2,0)	
<u>16</u>	<u>16</u>

### SOPHOMORE YEAR

CH 223 Organic Chemistry . . . . . 3 (3,0)	BIOCH 301 Molecular Biology . . . . 3 (3,0)
CH 227 Organic Chemistry Lab. . . 1 (0,3)	CH 224 Organic Chemistry . . . . . 3 (3,0)
Literature Requirement* . . . . . 3 (3,0)	CH 228 Organic Chemistry Lab. . . 1 (0,3)
MICRO 305 General Microbiology 4 (3,3)	Literature Requirement* . . . . . 3 (3,0)
Mathematics or Science Elective 3-4	Mathematics or Science Elective 4-3
Social Science Elective . . . . . 3 (3,0)	Microbiology Elective† . . . . . 3
<u>17-18</u>	<u>17-16</u>

### JUNIOR YEAR

ENGL 301 Public Speaking . . . . . 3 (3,0)	GEN 302 Genetics . . . . . 4 (3,3)
MICRO 401 Adv. Bacteriology . . . 4 (2,6)	MICRO 412 Bacterial Physiology. 4 (3,3)
Physics Elective† . . . . . 4-3	Physics Elective† . . . . . 4
Elective† . . . . . 7-8	Social Science Elective . . . . . 3 (3,0)
<u>18</u>	Elective† . . . . . 3
	<u>18</u>

### SENIOR YEAR

Social Science Elective . . . . . 3 (3,0)	MICRO 411 Path. Bacteriology . . . 4 (3,3)
Elective† . . . . . 13	Elective† . . . . . 12
<u>16</u>	<u>16</u>

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 122 or 207; and second semester either Phys 208 or 221, 223.

‡ A minimum of 15 credits must be selected from the following courses: Bot 413, 451, Micro 400, 402, 404, 410, 413, 414, 415, 416, 491, Pl Pa 456, PS 458, Zool 403, 456.

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.

## MICROBIOLOGY WITH MOLECULAR BIOLOGY OPTION

See Microbiology curriculum for Freshman Year.

### SOPHOMORE YEAR

First Semester	Second Semester
CH 223 Organic Chemistry . . . . . 3 (3,0)	BIOCH 301 Molecular Biology . . . . 3 (3,0)
CH 227 Organic Chemistry Lab. . . 1 (0,3)	CH 224 Organic Chemistry . . . . . 3 (3,0)
Literature Requirement* . . . . . 3 (3,0)	CH 228 Organic Chemistry Lab. . . 1 (0,3)
MATH 108 Cal. and Lin. Algebra 4 (4,0)	GEN 302 Genetics . . . . . 4 (3,3)
MICRO 305 General Microbiology 4 (3,3)	Literature Requirement* . . . . . 3 (3,0)
Social Science Elective . . . . . 3 (3,0)	Microbiology Elective† . . . . . 3
<u>18</u>	<u>17</u>

## JUNIOR YEAR

ENGL 301 Public Speaking . . . . .	3 (3,0)	CH 330 Intro. to Physical Chem. 3 (3,0)	
MICRO 401 Adv. Bacteriology . . . . .	4 (2,6)	or PHYS 417 Intro. to Biophys. I 3 (3,0)	
MICRO 414 Basic Immunology . . . . .	3 (2,3)	MICRO 411 Path. Bacteriology . . . . .	4 (3,3)
Physics Elective† . . . . .	4-3	MICRO 412 Bacterial Physiology. 4 (3,3)	
Elective . . . . .	4-5	Physics Elective† . . . . .	4
	18	Elective . . . . .	3
			18

## SENIOR YEAR

BIOCH 423 Prin. of Biochemistry 3 (3,0)	BIOCH 424 Prin. of Biochem. . . . .	3 (3,0)
MICRO 415 Microbial Genetics . . . . .	MICRO 491 Special Problems . . . . .	2 (0,6)
MICRO 416 Introductory Virology 3 (3,0)	Social Science Elective . . . . .	3 (3,0)
Social Science Elective . . . . .	Elective§ . . . . .	7
Elective . . . . .		15
		16

134 Total Semester Hours

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

† To be selected from the following course sequences: Either Phys 207 and 208 or Phys 122 and 221, 223.

‡ To be selected from the following courses: Bot 413, 451; Micro 400, 402, 404, 410, 413; Pl Pa 456; PS 458; Zool 403, 456.

§ Should include one of the following courses: Ch 313, 317; Comp Sc 205; Ex St 301.

Note: Recommended electives in addition to those listed above are: Bioch 425, 426; BioE 401; Math 206; Phys 471, 473; Zool 460.

This option provides 17 semester hours of open approved electives. Military science or aerospace studies may be elected if desired.

## PHYSICS WITH OPTIONS IN THE PHYSICAL AND MATHEMATICAL SCIENCES

Physics is a fundamental experimental science. The questions physicists ask cannot be answered by thought alone; they require experimentation. The questions physicists ask are fundamental; the answers once found are expected to have universal and timeless validity. For example, "Is the charge on the proton equal to that on the electron?" Experimentation is required to answer the question. We expect the answer to be the same whether the experiment is done on earth, on another planet in the solar system or even in another galaxy. We expect the answers to be the same for all time to come.

The physics curricula are designed to inform the student of the questions that have been asked which have led to such answers. To discuss these concepts it is necessary that students develop a broad and general educational background. Courses which contribute to this background are grouped mostly in the first two years. The final two years are used to specialize in one of eight areas listed below, although many hours of elective courses are provided with which the student may pursue a secondary interest. A strong working knowledge of the tools of theoretical and experimental physics are required along with a full appreciation of their applicability to technology.

After completing one of these curricula the student is prepared for positions in industry or government (*e.g.*, aircraft, electronics, petroleum, textiles, pharmaceuticals, space science). In particular, completion of the Biophysics program is excellent preparation for

## 224 Degrees and Curricula

medical school. Those students who finish the Mathematical Physics or Physics option 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
	<hr/>		
	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 <sup>o</sup> . . . . .	3 (3,0)	Literature Requirement <sup>o</sup> . . . . .	3 (3,0)
MATH 206 Calculus of Sev. Var. . .	4 (4,0)	MATH 208 Engineering Math. I . . .	4 (4,0)
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
	<hr/>		<hr/>
	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
	<hr/>		<hr/>
	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		<hr/>
Approved Elective† . . . . .	3		15
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	15		

#### 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)
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	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)
	<hr/>
	12

#### 128 Total Semester Hours

#### C. Electronics

E&CE 320 Electronics I . . . . .	2 (2,0)
E&CE 325 Elec. and Electro. Lab I	1 (0,2)
E&CE 330 Systems I . . . . .	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)
	<hr/>
	14

#### D. 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)
	<hr/>
	13

E. Computer Science	F. Mathematical Physics
COMP SC 205 Elem. Comp. Prog. 3 (3,0)	MATH 457 Applied Math. I ... 3 (3,0)
COMP SC 409 Numerical Analysis 3 (3,0)	MATH 458 Applied Math. II ... 3 (3,0)
COMP SC 421 Introduction to	PHYS 456 Quantum Physics II ... 3 (3,0)
Assembler Language Prog. .... 3 (3,0)	Mathematics (as approved) .... 3 (3,0)
COMP SC 428 Algorithmic	12
Language and Compilers .... 3 (3,0)	G. Physics
or MATH 429 Numerical Anal. 3 (3,0)	PHYS 446 Solid State Physics .. 3 (3,0)
or PHYS 446 Solid State Phys. 3 (3,0)	PHYS 456 Quantum Physics II .. 3 (3,0)
12	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 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	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)
PHYS 101 Current Topics in	PHYS 132 General Physics I .... 3 (3,0)
Modern Physics .... 1 (0,2)	Biophysics Elective .... 3
Biology Elective .... 3	Elective .... 1
Elective .... 1	18
16	

### 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 (4,0)
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 Statistical Mechanics† . . . . .	3 (3,0)	Biophysics Elective . . . . .	4
Biophysics Elective . . . . .	4	Approved Elective† . . . . .	8
Elective . . . . .	5		<u>15</u>
	<u>15</u>		

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 the M.D. de-

gree 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 their graduating class, and have a predicted grade-point ratio of 2.8 or better in their 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 the 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:

	<i>Hours</i>	<i>Credit</i>
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	
	<hr/>	
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 languages, 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)
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#### 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)
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	17

### SUMMER

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)
	<hr/>		<hr/>
	7		7

### SECOND YEAR

ECON 201 Principles of Economics . . . . .	3 (3,0)	HIST 172 or 173 West. Civilization . . . . .	3 (3,0)
ENGL 217 Vocabulary Building . . . . .	3 (3,0)	PHYS 221 Thermal and Elec. Phen. . . . .	3 (3,0)
HIST 171 or 172 West. Civilization . . . . .	3 (3,0)	PHYS 223 Electron Physics Lab. . . . .	1 (0,3)
MICRO 305 General Microbiology . . . . .	4 (3,3)	Concentration . . . . .	6
PHYS 122 Mech. and Wave Phen. . . . .	3 (3,0)	Elective . . . . .	6
Elective . . . . .	3		<hr/>
	19		19

### SUMMER

Concentration . . . . .	3	Optional (A period in which the student may rest, work, make up deficiencies, or take additional course work.)	
Elective . . . . .	3		
	<hr/>		
	6		

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

BOT 101 Plant Biology . . . . .	3 (3,0)
BOT 103 Plant Biology Lab. . . . .	1 (0,2)
CH 101 General Chemistry . . . . .	4 (3,3)
ENGL 101 English Composition . . . . .	3 (3,0)
HIST 171 or 172 West. Civilization . . . . .	3 (3,0)
MATH 103 College Algebra . . . . .	2 (2,0)
MATH 104 Trigonometry . . . . .	2 (2,0)
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	18

#### 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 106 Calculus of One Var. . . . .	4 (4,0)
ZOOL 101 Animal Biology . . . . .	3 (3,0)
ZOOL 103 Animal Biology Lab. . . . .	1 (0,2)
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	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
	<hr/>		<hr/>
	16		18

70 Total Semester Hours

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



**ZOOLOGY 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 127.

**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)	<hr style="width: 100%;"/>
Elective . . . . . 1	18
<hr style="width: 100%;"/>	
17	

**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)	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)	ZOOL 202 Vertebrate Zoology . . . . . 4 (3,3)
or ZOOL 202 Vertebrate Zoology 4 (3,3)	or ZOOL 201 Inverte. Zoology . . . . . 4 (3,3)
Elective . . . . . 1	Elective . . . . . 1
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
16	16

**JUNIOR YEAR**

ENGL 301 Public Speaking . . . . . 3 (3,0)	BIOCH 301 Molecular Biology . . . . . 3 (3,0)
GEN 302 Genetics . . . . . 4 (3,3)	Option and Elective . . . . . 13
ZOOL 302 Vertebrate Embryology 4 (3,3)	<hr style="width: 100%;"/>
Botany Elective . . . . . 3	16
Elective† . . . . . 3	
<hr style="width: 100%;"/>	
17	

**SENIOR YEAR**

ZOOL 411 Animal Ecology . . . . . 3 (2,3)	Option and Elective . . . . . 16
ZOOL 460 General Physiology . . . . . 4 (3,3)	<hr style="width: 100%;"/>
Option and Elective . . . . . 12	16
<hr style="width: 100%;"/>	
19	

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

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

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

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 option 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. A. Turner, Jr., J. M. Wannamaker

*Assistant Professors:* M. R. Allen, R. V. Calvasina

*Instructors:* H. Pierce, Shirley F. Pierce

*Visiting Instructor:* F. H. Tarbert, Jr.

*Visiting Lecturer:* Alison C. Drews

#### 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.



## 234 Description of Courses

### 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-subsidary 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

### 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 GROWTH AND DEVELOPMENT OF AEROSPACE POWER

1 cr. (1 and 1)

This course examines the growth and development of various concepts, doctrine, technology, and organization of aerospace power during the first forty-seven years of the twentieth century. It begins with the development of the airplane and ends with establishment of the U.S. Air Force as a separate military department. Corps Training laboratory provides experience in guiding, directing, and controlling an Air Force unit.

### AS 210 A QUARTER-CENTURY OF AEROSPACE POWER 1 cr.

(1 and 1)

A continuation of the study of growth and development of aerospace power, placing special emphasis on the contributions of the U.S. Air Force in a variety of events and elements in the history of aerospace power and their impact on strategic thoughts during the period from 1948 to the present. Corps Training laboratory provides experience in guiding, directing, and controlling an Air Force unit.

### AS 309 CONTEMPORARY NATIONAL SECURITY POLICY 3 cr.

(3 and 1)

An analysis of the role and function of the professional military officer in a democratic society and the complex relationships involved in civil-military interactions. Corps Training laboratory provides experience in guiding, directing, and controlling an Air Force unit.

### AS 310 CONTEMPORARY NATIONAL SECURITY POLICY 3 cr.

(3 and 1)

An examination of the environmental context in which American defense policy is formulated. Special themes include political, economic, and social constraints upon the national defense structure; and the impact of technological and international developments on the defense policy-making process. Corps Training laboratory provides experience in guiding, directing, and controlling an Air Force unit.

### 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

## 236 Description of Courses

private enterprise. Flight instruction and ground school for pilot candidates. Corps Training provides cadets experience in the guiding, directing, and controlling of an Air Force unit.

### AG 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. Jobs, III, C. S. Thompson

### 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 or permission of instructor.

### 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.



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- 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 CONTEMPORARY 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 3)

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 3)

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.

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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)

## 240 Description of Courses

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:* C. L. Barth, J. T. Craig, C. E. Hood, Jr., E. B. Rogers, Jr.

*Visiting Professor:* D. N. Baker

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)

Digital and analog techniques are used to solve agricultural engineering problems, including simulation of biological systems. Hybrid and advanced digital computational methods are studied. *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 364 AGRICULTURE WASTE-MANAGEMENT SYSTEMS 2 cr.  
(2 and 0)

Agriculture's role in maintaining high standards of quality in soil, water, and air resources is the central theme. Planning and design of waste-management systems which employ physical, biological, and chemical processes for the treatment and utilization of agricultural production wastes is emphasized. Solid, liquid, and gaseous wastes are considered. Presentation is relevant to current agricultural practices and legal and social restraints.

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NOTE: Agricultural Engineering is jointly administered by the College of Agricultural Sciences and the College of Engineering.

## 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.

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, '75 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 2 cr. (2 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:* Course in animal science or plant science, or permission of instructor.

AGE 442, 642 AGRICULTURAL PROCESS ENGINEERING 3 cr.  
(2 and 3) S, '76 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 2 cr. (1 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.

## 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



## 242 Description of Courses

independent pursuit of detailed investigations. Admission to HONORS section by invitation.

AGE 781 SPECIAL PROBLEMS 1-3 cr.

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 871 SELECTED TOPICS IN AGRICULTURAL ENGINEERING 1-3 cr.

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 771 SELECTED TOPICS IN AGRICULTURAL MECHANIZATION  
1-3 cr. (1-3 and 0)

## AGM 781 SPECIAL PROBLEMS 1-3 cr. (1-3 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. H. Wiley, W. P. Williams, Jr.

*Associate Professors:* J. B. Cooper, J. C. Hite, M. W. Jutras, B. J. Skelton, C. R. von Tungeln, J. R. Woodruff

*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.

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### 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 302 ORGANIC FARMING AND GARDENING 2 cr. (2 and 0)

This course will involve examination and interpretation of scientific facts concerning the use of natural organic materials as alternatives to current practices of using concentrated mineral fertilizers and chemical control of weeds, insects and disease organisms in food production. Part of the course goals will be to examine current practices used in food production. Students will be assigned outside reading.

### 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. (With permission of instructor the course may be repeated for a total of two credits.)

### 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 Professors:* E. F. McClain, B. R. Smith

#### 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



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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, '76 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 1-3 cr. (0 and 3-9)  
 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

(See courses listed under Animal Science, Dairy Science, Entomology, Poultry Science, and Zoology)

*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

- AN PH 301 PHYSIOLOGY AND ANATOMY OF DOMESTIC ANIMALS  
 3 cr. (2 and 3)

A study of the physiology and associated anatomy of the body systems, including nervous, skeletal and muscular, respiratory, digestive, circulatory, urinary, reproductive, and endocrine systems. This course is designed primarily for students in Animal Science, Dairy Science, Poultry Science, and Pre-veterinary Medicine. *Prerequisite:* Zool 101, 103.

- 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.

\* On leave.

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- 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.

### Animal Science

*Professors:* J. R. Hill, Jr., G. C. Skelley, Jr., R. F. Wheeler, *Head*

*Associate Professors:* R. L. Edwards, D. L. Handlin

*Assistant Professors:* A. R. Ellicott, J. C. McConnell, Jr.

- AN SC 202 INTRODUCTION TO ANIMAL SCIENCE 3 cr. (2 and 3)

This course deals with basic principles concerning the breeding, feeding, management, and marketing of beef cattle, swine, and horses. The laboratory is designed to demonstrate the basic elements of livestock breeding, feeding, and management. Beef cattle, swine, 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 202 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 202 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 202.

- 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 202.

- 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 202.

## 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 202.

## 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, '75 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, P. R. Lee,  
W. A. Phillips, K. J. Russo, J. R. Washburn, G. B. Witherspoon, *Head*

*Assistant Professor:* D. L. Collins

*Instructors:* R. L. Chartier, G. W. Patterson

*Visiting Professors:* M. L. Cetto, C. Fera

*Visiting Associate Professor:* M. A. Clark

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 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 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 553 ARCHITECTURAL DESIGN VII 9 cr. (3 and 18)

City planning design and the development of complex building solutions.

ARCH 554 ARCHITECTURAL DESIGN VIII 9 cr. (3 and 18)

The programming and solution of complex building design problems including interior and site development.

ARCH 559 TERMINAL PROJECT IN ARCHITECTURE 9 cr. (1 and 24)

The student will select an appropriate architectural problem, conduct adequate research, prepare a comprehensive program, and make a complete oral, written, and visual presentation of his solution.

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 859 TERMINAL PROJECT 3-15 cr.

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

*Assistant Professor:* 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. *Prerequisite:* AAH 216.

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.



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### 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 Technological 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 Technological 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 interest 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. *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. *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 Professors:* D. M. Henricks, G. L. Powell

*Assistant Professors:* J. J. Jen, J. K. Zimmerman

*Adjunct Professor:* J. H. Keffer

*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 leads to a fuller understanding of the chemical properties of proteins, carbohydrates, lipids, and nucleic acids that make 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, W. E. Castro

*Associate Professors:* F. W. Cooke, *Head;* J. S. Wolf

*Assistant Professors:* D. C. Amoss, J. J. Klawitter, J. S. Love, Jr., D. D. Moyle,  
B. W. Sauer, M. Spector, A. M. Weinstein

*Adjunct Professors:* J. S. Dusenbury, Jr., T. S. Hargest, E. M. Lunceford, Jr.,  
R. R. Moore, J. R. Pruitt, F. H. Stelling, R. G. Topazian

BIOE 233 INTRODUCTION TO ENGINEERING IN SPORTS 3 cr.  
(3 and 0)

Organized sports activities are growing rapidly both in the number of different sports and in the number of participants. Engineers are now actively involved in almost all sports, designing equipment for play and protection as well as in the analysis of injuries. This course will focus on the application of engineering conceptual methods in the areas of competitive and recreational sports, such as the design criteria for helmets, athletic shoes, pads, and artificial playing surfaces. In addition to the various aspects of equipment design, biomechanical engineering analyses will be presented concerning sports injuries and rehabilitation. Lectures will be supplemented with demonstrations, medical films, and guest lecturers. *Prerequisite:* Sophomore standing or permission of instructor.



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### 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, 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); prostheses; 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 permission 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 of 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 1-4 cr.  
(0-4 and 12-0)

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 880 APPLIED HEALTH ENGINEERING LABORATORY 1 cr.  
(0 and 3)

BIOE 891 RESEARCH. Credit to be arranged.

BIOE 980 INTERNSHIP 1-5 cr. (5-0 and 0-4)

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, C. J. Umphlett, *Head*; J. B. Whitney, Jr.

*Associate Professor:* N. D. Camper

*Assistant Professors:* C. R. Dillon, L. A. Dyck, J. E. Fairey, III, T. M. Mc-Innis, Jr.

### BOT 101 PLANT BIOLOGY 3 cr. (3 and 0)

Studies of basic biological concepts and principles as exemplified by classical 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 appreciation 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 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:* Zool 101, 103, or permission of instructor.

### BOT 411, 611 INTRODUCTORY MYCOLOGY 3 cr. (2 and 3)

An introduction to all the groups of fungi and some related organisms with considerations of the morphology, cytology, growth, reproduction, and culture of selected forms. (Offered fall, even-numbered years.) *Prerequisite:* Bot 202 or Zool 201, or permission of instructor.

### BOT 413, 613 PHYCOLOGY 3 cr. (2 and 3)

The taxonomy, morphology, and ecology of freshwater algae with emphasis on the local flora. *Prerequisite:* Bot 101 or permission of instructor.

## BOT 421, 621 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. *Prerequisite:* Bot 101, Ch 101, 102, Phys 207, or 221, and 223.

## BOT 441, 641 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. *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 PLANT ANATOMY 3 cr. (2 and 3)

Studies of the origin, development, and comparative structures of tissues, systems, and organs of higher plants. *Prerequisite:* Bot 101, 202, or permission of instructor.

## 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 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 3 cr. (2 and 3)

## BOT 702 MODERN BOTANICAL CONCEPTS FOR TEACHERS 3 cr. (3 and 0)

## BOT 805 SPECIAL PROBLEMS IN BOTANY. Credit to be arranged.

## BOT 807 SEMINAR 1 cr. (1 and 0)

## BOT 811 ADVANCED MYCOLOGY I 4 cr. (3 and 3)

## BOT 812 ADVANCED MYCOLOGY II 4 cr. (3 and 3)

## BOT 815 PHYCOLOGY COLLOQUIUM 3 cr. (3 and 0)

## BOT 821 INORGANIC PLANT METABOLISM 4 cr. (3 and 3)

## BOT 822 ORGANIC PLANT METABOLISM 3 cr. (3 and 0)

## BOT 823 PLANT GROWTH AND DEVELOPMENT 3 cr. (3 and 0)

## BOT 824 MODE OF ACTION OF GROWTH SUBSTANCES 4 cr. (3 and 3)

## BOT 826 PHYSIOLOGY OF THE FUNGI 3 cr. (3 and 0)

## BOT 831 ADVANCED PLANT TAXONOMY 3 cr. (2 and 3)

## BOT 891 RESEARCH. Credit to be arranged.

## BOT 991 DOCTORAL RESEARCH. Credit to be arranged.



## Building Science

*Professor:* J. L. Clark

*Associate Professors:* L. H. Brown, R. D. Eflin, M. D. Egan, R. E. Knowland,  
*Head;* M. G. Melaragno

*Instructor:* C. L. Addison

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, 632 CONSTRUCTION EQUIPMENT AND FORMWORK  
3 cr. (3 and 0)

The study of construction equipment and the design and erection of concrete formwork. *Prerequisite:* 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 475, 675 BUILDING EQUIPMENT AND SYSTEMS 3 cr. (3 and 0)**

The investigation of special topics in mechanical, electrical, illumination, and acoustical systems for buildings. *Prerequisite:* BldSc 301.

**BLDSC 476, 676 BUILDING EQUIPMENT AND SYSTEMS 3 cr. (3 and 0)**

Continuation of BldSc 475.

**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 student 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.

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,



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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 school 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, and 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 112.

- 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.

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### 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 general 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 mechanisms 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 temperatures, and expected future applications of cryogenic technology. *Prerequisite:* 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. *Prerequisite:* 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 homogeneous and heterogeneous reactions, batch and flow reaction systems, catalysis, and design of industrial reactors. *Prerequisite:* Senior standing in chemical engineering or permission of department head.

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



## 270 Description of Courses

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:* F. B. Brown, J. C. Fanning, J. H. Hobson, J. W. Huffman, F. J. Lindstrom, N. P. Marullo, 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, Muriel B. Bishop, J. F. Geldard, O. J. Jacobus, K. S. Landers, J. R. Salley, Jr., J. L. von Rosenberg, Jr.

*Assistant Professor:* G. B. Park

### 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

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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 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



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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 SPECTROSCOPY LABORATORY 2 cr. (0 and 6)

A survey of modern spectroscopic techniques and instrumentation used to determine molecular structure. Emphasis is placed on precise interpretation of data. The student utilizes several spectral investigations to identify a compound and determine its geometry. Nuclear magnetic resonance; ultraviolet, infrared and mass spectroscopy; optical rotatory dispersion; and circular dichroism investigations are available. *Prerequisite:* Organic chemistry and registration in Ch 435.

### 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 IN ELEMENTARY SCHOOL-CHEMISTRY 3 cr. (2 and 3)

### CH 701 REVIEW OF GENERAL CHEMISTRY 3 cr. (3 and 0)

### CH 702 CHEMISTRY FOR HIGH SCHOOL TEACHERS 3 cr. (2 and 3)

### CH 703 SPECIAL PROBLEMS IN CHEMISTRY FOR SECONDARY SCHOOL TEACHERS 3-6 cr.

- CH 805 THEORETICAL INORGANIC CHEMISTRY 3 cr. (3 and 0)
- 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 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 840 TECHNIQUES OF EXPERIMENTAL CHEMISTRY 3 cr.  
(1 and 6)
- CH 851 SEMINAR 0-2 cr.
- CH 861 PRINCIPLES OF BIOCHEMISTRY 3 cr. (3 and 0)
- CH 891 RESEARCH. Credit to be arranged.
- CH 906 SPECIAL TOPICS IN INORGANIC CHEMISTRY 1-4 cr.
- 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

*Professor:* E. L. Falk

*Associate Professors:* M. G. Melaragno, G. E. Varenhorst, *Acting Head*

*Visiting Instructor:* J. D. Jacques

- 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. *Prerequisite:* Permission of instructor or department head.

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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. *Prerequisite:* Permission of instructor or department head.

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. *Prerequisite:* Permission of instructor or department head.

CRP 441, 641 HISTORY OF PLANNING 3 cr. (3 and 0)

The development of the urban plan from ancient to modern times. *Prerequisite:* Permission of instructor or department head.

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. *Prerequisite:* Permission of instructor or department head.

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:* Permission of instructor or department head.

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. *Prerequisite:* Permission of instructor or department head.

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 IV 3-9 cr.

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., P. F. Rad, F. L. Roberts

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

\* On leave.



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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 photographs; 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 stereocomparograph and multiple 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

## 280 Description of Courses

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 II 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:* C. W. Ahlers, Claire R. Aucoin, W. H. Ford, R. A. Lewallen, J. C. Peck, R. S. Schouest

*Lecturers:* Ande M. Fedele, Elizabeth P. Jones

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. FORTRAN language will be used.

\* On leave.





## 282 Description of Courses

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.

COMP SC 440, 640 LIST PROCESSING 3 cr. (3 and 0)

Basic concepts of data lists and related structures, list processing languages, storage allocation and garbage collection, recursive procedures, applications of list processing. *Prerequisite:* Comp Sc 205 or equivalent.

COMP SC 460, 660 PERIPHERALS AND FILE DESIGN 3 cr. (3 and 0)

An indepth study of the functional characteristics of computer hardware and data management facilities will be used to gain insight into the design of systems for processing data and designing data bases. Traditional data processing applications will be analyzed and reviewed, in terms of theoretical through-put expectations, for effectiveness. The student will be expected to complete assignments using classical file organization and access techniques in COBOL language. *Prerequisite:* Comp Sc 308.

COMP SC 462, 662 DESIGN OF DATA-MANAGEMENT SYSTEMS  
3 cr. (3 and 0)

This course will introduce to the student, with a basic knowledge of COBOL programming, advanced topics of data-base creation and maintenance. Problems involving structuring and accessing multiple-user data bases will be presented and solutions developed. Comparison of several commercially available data-base management systems will be made. *Prerequisite:* Comp Sc 308.

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, J. W. Kelly, 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, '76 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, '76 and alternate years.

The organization and operation of dairy and food plants and the coordination 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, '75 and alternate years.

Special research problems in production and manufactures are studied. Individual 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, '76 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, S

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 comparative anatomy and histology of the male and female reproductive organs; semen collection, evaluation and processing; techniques of artificial insemination, 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., B. R. Skelton, W. C. Whitten, Jr.

*Associate Professors:* R. D. Shannon, T. B. Yandle, Jr., *Head*

*Assistant Professors:* D. W. Blair, R. T. Byrns, II, R. D. Elliott, R. F. Hebert, H. H. Ulbrich, P. M. Zipin

*Instructors:* Janet J. Glocker, R. H. Mabry, L. E. Nordquist, A. Velez

## ECON 200 ECONOMIC CONCEPTS 3 cr. (3 and 0)

A comprehensive course including both micro- and macro-economic concepts 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.



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### 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. Admission 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, taxation, 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.

### 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 economic 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 underdeveloped 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.

## 288 Description of Courses

### 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, G. W. Gray, M. A. King, *Head*; H. F. Landrith,  
M. A. Packer

*Associate Professors:* S. L. Buckner, W. O. Corder, J. A. Hash, O. R. Lumpkin,  
J. E. Matthews, T. H. Parry, W. W. Pennscott, B. L. Sandberg

*Assistant Professors:* I. Carolyn Briscoe, A. D. Brooks, Ruth A. Ezzard, H. J.  
Feldman, Elizabeth B. Galloway, J. V. Hamby, D. F. Keller, J. M. Neal,  
E. F. Olive, R. K. Peden, Barbara M. Raetsch, F. C. Raetsch, J. H. Walker

*Instructors:* J. H. Adair, Teryle W. Carpenter, Virginia B. Stanley

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 read-  
ing 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 techni-  
cal vocabulary. Individual diagnosis provides an individual program devel-  
oped under the direction of the reading instructor.



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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

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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 curriculum development and evaluation.

ED 466 CURRICULUM FOR EARLY CHILDHOOD EDUCATION 3 cr. (3 and 0)

Critical study of early childhood curriculum for nursery schools, kindergarten 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 handicapped. *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 emphasized. *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 permission 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)



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- 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. E. Bennett, J. A. Chisman, T. L. Drake, L. T. Fitch, B. E. Gilliland, C. P. Goodin, J. J. Komo, H. V. Poe, R. W. Snelsire, I. S. Tolins, W. T. Zink

*Assistant Professors:* D. C. Amoss, J. K. Bryan, J. N. Gowdy, T. L. Kane

*Instructors:* C. W. Malstrom, J. M. Murray

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. (2 and 2)

A first course in electrical engineering to provide non-Electrical Engineering majors with a general knowledge of electrical circuit theory, electronics, and energy conversion devices. The two-hour workshop consists of lectures, problem sessions, demonstrations, and laboratory exercises designed to help the student relate practice to theory. *Prerequisite:* Math 206, Phys 221.

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, dc motors and generators, and ac motors and generators. These characteristics are compared with those of the mathematical models. *Prerequisite:* E&CE 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. *Corequisite:* E&CE 325, 331.

**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. *Corequisite:* E&CE 326.

**E&CE 325 ELECTRONICS LABORATORY I 1 cr. (0 and 2) F, S**

Laboratory projects dealing with instrumentation and measurement procedures associated with solid-state electronic devices. *Corequisite:* E&CE 320.

**E&CE 326 ELECTRONICS LABORATORY II 1 cr. (0 and 2) F, S**

Experimentation in electronics circuits design and electronic systems analysis, including integrated circuits. *Prerequisite:* E&CE 325. *Corequisite:* E&CE 321.

**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, Bernoulli 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-port 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, dc 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



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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 ac and dc machine parameters, analog computer simulation with emphasis on control. *Corequisite:* 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 ac and dc 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

A continuation of E&CE 321. Consideration of the frequency response of electronic devices and systems with and without feedback, oscillator fundamentals, and principles of modulation.

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, 350.

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

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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. Transducer 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. *Corequisite:* 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

A study of the theoretical and practical aspects of transmission lines, waveguides, plane electromagnetic waves, and antennas. Smith chart applications and impedance matching considerations are included. *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. *Corequisite:* 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 individual and creative thinking as well as team effort. *Prerequisite:* E&CE 411. *Corequisite:* 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 469 COMPUTER APPLICATIONS FOR NONENGINEERS 2 cr. (2 and 0)

Introduction to applications of digital, analog, and hybrid computation, utilizing the facilities of the Engineering Computer Laboratory. Innovative applications of computers in educational technology, behavioral sciences, humanities, agriculture, and other fields. Modeling and simulation. (Not open to engineering majors.)

E&CE 802 ANALYSIS OF LINEAR SYSTEMS 3 cr. (3 and 0)

E&CE 803 SEMINAR 1 cr. (1 and 0)



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- 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  
 1-3 cr. (1-3 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 Professor:* C. W. Carter

### 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. Dimensioning 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 drawing, 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 communication. 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 engineering systems. Creative functional design, introduction to graphical kinematics 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 solution of equations, nomography, and the graphical calculus to the solution of problems in engineering and science. Graphical solution of differential equations. *Prerequisite:* EG 109, Math 106 or equivalent.

## Engineering Management

*Professors:* C. C. Davis, F. R. Himsworth, E. A. LaRoche, H. H. Macaulay, Jr., B. J. Todd, C. H. Whitehurst, Jr.

*Associate Professors:* C. L. Dyer, C. O. Shuler, C. R. Smith, J. M. Wannamaker

*Assistant Professors:* E. E. Burch, Jr., E. L. Powers, R. F. Zant

**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., W. E. Castro, R. W. Moorman, *Head*

*Associate Professors:* 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



## 306 Description of Courses

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 free-

dom 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

*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.

## 308 Description of Courses

### 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:* ET 351, Phys 208.

### ET 312 ELECTRICAL CIRCUITS II 3 cr. (3 and 0)

Continuation of ET 311. 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:* ET 351, Phys 208.

### 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, T. E. Douglass, A. J. Fear, H. B. Hannah,\* 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

*Assistant Professors:* R. E. Barfield, Jr., R. F. Barton, H. B. Bryant, R. L. Cross, F. L. Day, D. N. Griffin, N. M. Guild, R. W. Hill, G. W. Koon, R. P. Recktenwald, A. L. Recoulley, III, R. O. Rogers, V. A. Rudowski, Roberta C. Schwartz, J. B. Simms, B. N. Skardon, R. A. Underwood, C. H. Woodell

*Instructors:* S. K. Eisiminger,\* Virginia L. Ganim,\* H. K. Herlong, R. F. Lunsford,\* Barbara M. Montgomery, C. L. Montgomery, Jr., G. Poster, III, Janice L. Sargent,\* Sylvia F. Titus, M. S. Van Hoy

*Lecturers:* Jean D. Brubeck, Joan T. Cross

*Visiting Professor:* J. O. Bailey

*Part-time Instructors:* Lillian F. Andron, Miriam B. Mandel

**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.

\* On leave.



## 310 Description of Courses

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)

Translations from the Neo-Classical and Modern Worlds, with emphasis on major writers. Proficiency in composition must be demonstrated. *Prerequisite:* 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 Ass*, 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 223 FOLKLORE 3 cr. (3 and 0)

An introduction to folklore, with emphasis on the folk traditions and ballads of the British Isles and America. *Prerequisite:* Engl 101, 102.

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 practical skills in argumentative speech. The role of the advocate in contemporary society and an analysis of selected significant debates in U.S. history. *Prerequisite:* Permission of instructor.

## ENGL 308 PRINCIPLES OF ACTING 3 cr. (3 and 0)

Acting for the stage, basic techniques of characterization, audition procedures, 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 supervise other theatre activities for educational institutions or civic organizations. *Prerequisite:* Engl 308 or 310.

## 312 Description of Courses

### 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 313 DISCUSSION AND GROUP LEADERSHIP 3 cr. (3 and 0)

Techniques of small group communication; the role of leadership in parliamentary and other deliberative bodies. *Prerequisite:* Permission of instructor.

### ENGL 331 CREATIVE WRITING 3 cr. (3 and 0)

The technique of nonexpository writing—narration, description, dramatization. *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 instructor.

### 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:* Sophomore 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 414, 614 MEDIEVAL DRAMA 3 cr. (3 and 0)

The origins and development of drama before Shakespeare; analysis of mystery, miracle, and morality plays with emphasis upon Biblical analogues. *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.



## 314 Description of Courses

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 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 448, 648 AMERICAN HUMOR 3 cr. (3 and 0)

Native American humor of the nineteenth and twentieth centuries. *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)

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- 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 825 STUDIES IN LITERARY GENRES 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. L. Holloway, Gayle P. Noblet, R. Noblet, 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 SPECIAL PROBLEMS IN ENTOMOLOGY AND ECONOMIC ZOOLOGY 1-3 cr.

Research problems in selected entomological and economic zoology areas to provide the student with experiences in research planning, techniques of development and presentation of research results. *Prerequisite:* Consultation with and permission of the appropriate staff member.

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



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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:* A. R. Abernathy, R. F. Borgman, A. W. Snell, W. P. Williams, Jr.

*Associate Professor:* C. L. Barth

*Assistant Professor:* M. G. Johnson

- EN SC 431, 631 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 1 cr. (1 and 0)

## Environmental Systems Engineering

*Professors:* A. R. Abernathy, J. F. Andrews, J. H. Austin, *Head*; L. G. Rich

*Associate Professors:* B. C. Dysart, III, T. M. Keinath

*Assistant Professor:* E. S. Iracki

### ESE 401, 601 ENVIRONMENTAL ENGINEERING 3 cr. (3 and 0)

An introduction to the field of environmental engineering. Topics include environmental phenomena, impact of pollutants in the aquatic environment, solid-waste management, air-pollution control, radiological health, and simple water-treatment systems. *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 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, 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.

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- ESE 701 SPECIAL PROBLEMS 1-4 cr. (1-4 and 0)
- ESE 802 PRINCIPLES OF WATER-TREATMENT SYSTEMS 4 cr.  
(4 and 0)
- ESE 803 LABORATORY IN PRINCIPLES OF WATER-TREATMENT  
SYSTEMS 1 cr. (0 and 3)
- ESE 804 DESIGN AND OPERATION OF WATER-TREATMENT  
SYSTEMS 4 cr. (4 and 0)
- ESE 805 LABORATORY IN DESIGN AND OPERATION OF WATER-  
TREATMENT SYSTEMS 1 cr. (0 and 3)
- ESE 806 INTEGRATED PROBLEMS IN WATER-TREATMENT  
SYSTEMS 2 cr. (2 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 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  
1-4 cr.
- ESE 884 SELECTED TOPICS IN ENVIRONMENTAL ENGINEERING  
1-4 cr.
- ESE 891 RESEARCH. Credit to be arranged.
- ESE 991 DOCTORAL RESEARCH. Credit to be arranged.

## Experimental Statistics

*Professor:* W. P. Byrd

*Associate Professors:* J. R. Holman, W. E. Johnston, J. S. Lytle

*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 201 MAN AND HIS FOOD 2 cr. (2 and 0)

A study of food and food products with emphasis on nutrients, nutrient needs, and the relationship between nutrient intake and health. Also discussed are food additives, nutritional awareness (to include nutrition labeling), product development, food protection, food resources, and the influence of processing on nutritional quality of food.

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 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 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, 620 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.

FD SC 425, 625 NUTRITION AND DIETETICS 3 cr. (3 and 0)

A course designed to acquaint the student with the nutritional values of foodstuffs, the influence of food preparation upon these values, and the formulations of diets to meet human nutritional requirements. Emphasis will be upon applications in the home and in institutional feeding, although the nutritional values of various types of restaurant foods will be discussed.

FD SC 431 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:* Physics and organic chemistry or biochemistry.

FD SC 432 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 433 FOOD PROCESSING LABORATORY 2 cr. (1 and 3)

Laboratory exercises dealing with equipment and processes used in food manufacture.

FD SC 434 FOOD PROCESSING LABORATORY 2 cr. (1 and 3)

A continuation of Fd Sc 433.

## Forestry

*Professors:* R. M. Allen, *Head*; B. M. Cool, D. D. Hook, W. H. D. McGregor, 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:* B. A. Dunn, G. D. Kessler, S. A. Marbut, A. E. Miller, L. E. Nix, L. D. Reamer, G. E. Sabin

*Instructor:* A. T. Shearin

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 or permission of instructor.

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### 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 forest 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, or permission of instructor.

### 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, or permission of instructor.

### 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, or permission of instructor.

### 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 or permission of instructor.

### 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 Forest Management 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, Forestry Summer Camp, or permission of instructor.

## 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, or permission of instructor.



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### 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 or permission of instructor.

### 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. Not open to Forestry majors. *Prerequisite:* Senior standing.

### 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, or permission of instructor.

### FOR 428 WOOD PROCESSING II 3 cr. (2 and 3) S

Machining and preparation of wood for processing; wood adhesives; wood finishes. *Prerequisite:* For 427 or permission of instructor.

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 427, 428, or permission of instructor.

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 Professors:* J. A. Dean, R. R. McGregor, Jr.

*Assistant Professors:* D. Y. Brannock, Jr., Jo A. McNatt,<sup>o</sup> J. B. Macy

*Instructors:* D. J. Calvez, Marguerite A. Kirsch, Gladys A. Strader, E. L. Wall, R. Willingham

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.

<sup>o</sup> On leave, first semester only.

## 328 Description of Courses

### 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. 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 indepth 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 Professors:* E. F. McClain, J. S. Rice

GEN 301 GENETICS 3 cr. (3 and 0) S

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) S, '76 and alternate years.

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

### GEOLOG 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.

### GEOLOG 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.

### GEOLOG 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 Forest Management or permission of instructor.

### GEOLOG 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.

### GEOLOG 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.

## 332 Description of Courses

### 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 1-3 cr. (0 and 3-9)

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.<sup>o</sup> 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.

<sup>o</sup> On leave.

## 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 301 TWENTIETH CENTURY GERMAN DRAMA 3 cr. (3 and 0)

Selected works from major German-speaking dramatists of the twentieth century, including Hauptmann, Brecht, Dürrenmatt, and Frisch. *Prerequisite:* Ger 202.

GER 302 TWENTIETH CENTURY GERMAN PROSE AND POETRY  
3 cr. (3 and 0)

Selected prose and poetry from major twentieth century German-speaking authors, including Kafka, Hesse, Rilke, Böll, and Grass. *Prerequisite:* Ger 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 407 EARLY GERMAN LITERATURE 3 cr. (3 and 0)

The period from 800 to 1750 with particular emphasis on Hartmann, Wolfram, Gottfried, and Walther. *Prerequisite:* Ger 301 or 302.

## GER 408 GERMAN CLASSICISM 3 cr. (3 and 0)

A study of the great German classical period from 1749 to 1832 with major emphasis on Goethe and Schiller. *Prerequisite:* Ger 301 or 302.

## GER 409 THE GERMAN NOVELLE 3 cr. (3 and 0)

The development of the German novelle at the hands of German, Austrian, and Swiss authors from Tieck to Thomas Mann. *Prerequisite:* Ger 301 or 302.

## GER 410 GERMAN ROMANTICISM AND REALISM 3 cr. (3 and 0)

A study of the two major contrasting movements of German literature in the nineteenth century. Readings will include works from Novalis, Tieck, Heine, Hebbel, and Grillparzer. *Prerequisite:* Ger 301 or 302.

## GER 498 INDEPENDENT STUDY 1-3 cr. (1-3 and 0)

Independent indepth 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.



## Graduate Studies

GS 799 COMPREHENSIVE STUDIES 1-15 cr.

### History

*Professors:* C. W. Bolen, R. S. Lambert, *Head*; E. M. Lander, Jr.

*Associate Professors:* J. L. Arbena, Patricia K. Hill, J. V. Reel, Jr.

*Assistant Professors:* H. D. Adams, 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., T. M. Verich

*Instructors:* Elizabeth D. Carney, A. D. McClare, W. L. Pippin, Jr.

*Lecturer:* E. M. Anson

*Part-time Lecturer:* J. H. Dennis, Jr.

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.

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.

## 336 Description of Courses

### 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, 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 of instructor.

### 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 of instructor.

### 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 of instructor.

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 of instructor.

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 of instructor.

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 of instructor.

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 functioning 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 of instructor.

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 of instructor.

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)



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- 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., G. E. Stembridge,  
L. O. Van Blaricom

*Associate Professors:* J. P. Fulmer, J. R. Haun, W. S. Jordan, H. J. Sefick,  
B. J. Skelton, F. W. Thode

- 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 vegetative growth and reproduction of horticultural plants. Production practices, harvesting, storage and marketing of the principal fruit, vegetable and ornamental 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 perishable 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, harvesting, 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 landscape 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 instruction 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.

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### 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 turfgrasses 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 413, 613 ADVANCED TURFGRASS CULTURE 3 cr. (3 and 0)

Principles of turfgrass adaptation, development and cultural requirements. Study of interacting influences of atmospheric and soil environment factors as related to selection, establishment and cultural practices. Discussion of specific management systems for various areas of turfgrass utilization. *Prerequisite:* Hort 412.

### HORT 414 RETAIL FLOWER BUSINESS 1 cr. (1 and 0)

Studies of the retail flower business with relation to financing, floor plan, equipment, personnel, supplies, salesmanship, advertising, and other important areas.

### HORT 416 FLORAL DESIGN 1 cr. (0 and 3)

Floral designing for the home and retail trade, including table arrangements, funeral and wedding designs, and corsage construction.

### 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 461, 661 PROBLEMS IN LANDSCAPE DESIGN 3 cr. (2 and 3) F

Landscape planning for larger residential properties, schools, industrial plants, real estate developments; detailed finished plans; further study of materials used; original problems; field study. *Prerequisite:* Hort 308 or 407.

### HORT 462, 662 LANDSCAPE DESIGN IMPLEMENTATION 3 cr. (2 and 3) S

Implementation of landscape plans, including interpretation of specifications, bidding, planting methods, construction materials and installation methods, irrigation, lighting, and allied landscape specialties. Also studied—maintenance contracts, equipment, methods, materials and labor management. *Prerequisite:* Hort 461.

### 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 POST-HARVEST 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.



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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:* D. E. Maurer, A. F. Newton, *Head*

*Associate Professors:* P. C. Caley, J. P. Crouch, H. E. Morgan, Jr., W. E. West

*Assistant Professors:* F. A. Bosdell, D. H. Pate

*Instructor:* B. L. Smith

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 dc and ac fundamentals, including instrumentation, power sources, circuit analysis, motors, construction wiring, and electronic principles and components. (Formerly In Ed 303.) *Prerequisite:* In Ed 101.

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 photography as activities for vocation and avocation. Sufficient laboratory experiences are provided to assure confidence in the use of photographic techniques. The tools and materials of image preparation are also used in conjunction 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

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students and keeping of proper records and reports. (Offered in Summer Sessions only.)

### IN ED 312 METAL PROCESSES 3 cr. (2 and 3)

Exploration of metal removal and shaping processes. Basic and precision measurement, inspection techniques and quality control. Layout procedures, workholding devices, and proper set-up methods. *Prerequisite:* In Ed 101.

### IN ED 313 ARTS AND CRAFTS 3 cr. (1 and 6)

A study of the art and craft of designing and making well-designed and useful objects. Emphasis on the development of skill and knowledge in the industrial crafts dimension of the Industrial Arts curriculum. Included will be laboratory activity involving the processes and tools needed to work with wood, metal, ceramic, plastic, textile, paper, and leather materials. *Prerequisite:* In Ed 101.

### 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 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 school 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 415 CONSTRUCTION PRACTICES 3 cr. (2 and 3)

This course is a study of those industrial practices affecting man, materials, and equipment employed by the construction industry. The activities in the course are directed to developing a working knowledge of construction technology and an instructional framework for the incorporation of instruction about the construction industry into the Industrial Arts curriculum of the secondary school. *Prerequisite:* In Ed 101 or Graduate standing.

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.



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### IN ED 421 VOCATIONAL COOPERATIVE PROGRAMS 2 cr. (2 and 0)

A study of the developments, objectives and principles of industrial cooperative 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 INDUSTRIAL METALWORKING PRACTICES 3 cr. (2 and 3)

A continuation of In Ed 203 which will enable advanced studies in welding, foundry, and structural metals. A portion of the course will be devoted to studying corporate practices in the manufacture of goods and on developing and using curriculum materials for teaching metalworking concepts. Field trips to metal industries will be taken. *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 4 cr. (2 and 4)

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, full color reproduction and advanced platemaking; process stripping, and color offset presswork. *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 460 CAREER EDUCATION 3 cr. (3 and 0)

An introduction to the concepts and philosophical basis for career education with emphasis on the applications of career education as an integrating force within the total school curriculum. This course is designed for all students preparing to teach or those seeking to improve their teaching competencies. *Prerequisite:* Ag Ed 201, Ed 100, In Ed 101, or Graduate standing.

## 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)

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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.

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 or consent of instructor.

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 nonengineering 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.

## Industrial Management

*Professors:* C. V. Aucoin, C. C. Davis, F. R. Himsworth, E. A. LaRoche, H. H. Macaulay, Jr., B. J. Todd, C. H. Whitehurst, Jr., *Head*; S. M. Willis

*Associate Professors:* Susan H. Brown, C. L. Dyer, F. R. Gray, J. L. Richardson, C. B. Russell, C. O. Shuler, C. R. Smith, J. A. Turner, Jr., J. M. Wannamaker

*Assistant Professors:* M. R. Allen, E. E. Burch, Jr., R. V. Calvasina, E. L. Powers, G. L. Waddle, T. H. Wilson, R. F. Zant

*Instructors:* H. Pierce, Shirley F. Pierce

*Visiting Professors:* R. L. Brown, R. E. Toomey

*Visiting Assistant Professor:* H. G. Robbins, Jr.

*Visiting Instructors:* J. D. Acker, F. H. Tarbert, Jr.

*Visiting Lecturer:* Alison C. Drews

*Visiting Part-time Lecturers:* T. W. Mitchell, 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 introductory course designed to familiarize the student with the various capabilities of mini-computers and interactive computing. The use of computers to solve management problems will be stressed. *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.



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### 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.

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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:* C. V. Aucoin, F. R. Himsworth, E. A. LaRoche, B. J. Todd, C. H. Whitehurst, Jr.

*Associate Professors:* Susan H. Brown, C. L. Dyer, C. B. Russell, C. R. Smith, J. M. Wannamaker

*Assistant Professors:* E. E. Burch, Jr., E. L. Powers, 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 experiments 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

*Associate Professors:* F. W. Cooke, J. S. Wolf

*Assistant Professors:* J. J. Klawitter, D. D. Moyle, M. Spector, A. M. Weinstein

### 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 polydispersity. 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 applied 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 processes 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)

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- 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, W. R. Hare, Jr., R. E. Haymond, A. T. Hind, Jr., J. W. Kenelly,\* *Head*; S. M. Lukawecki, *Acting Head*; W. H. Ruckle, A. F. Sobczyk, B. J. Todd, K. T. Wallenius \*

*Associate Professors:* K. Alam, M. C. Bell, W. R. Boland, A. K. Bose, A. S. Cover, C. L. Dyer, J. L. Flatt, J. D. Fulton, J. C. Harden, Jr., P. T. Holmes, C. E. Kirkwood, Jr., J. W. LaGrone, Renu C. Laskar, D. R. LaTorre, J. K. Luedeman, M. C. Palmer, E. Park, T. G. Proctor, J. A. Reneke, L. A. Rife, C. B. Russell, K. Seo, J. R. Sullivan

*Assistant Professors:* C. W. Ahlers, Claire R. Aucoin, Sue K. Dunkle, R. E. Fennell, C. F. Fennemore, W. H. Ford, C. B. Garcia, Jeuel G. LaTorre, A. J. Lemoine, R. A. Lewallen, J. H. Nicholson, J. C. Peck, R. S. Schouest

*Instructors:* Eugenie V. Bartmess, Louise G. Fulmer, Iris B. Ibrahim, Katherine R. Watson

*Lecturers:* Ande M. Fedele, Elizabeth P. Jones

*Visiting Professor:* S. Karamardian

*Visiting Associate Professor:* R. F. Ling

*Visiting Assistant Professor:* R. Constantine, Jr.

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.

\* On leave.

**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 permission 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. (Not open to those receiving credit for Math 106.) *Prerequisite:* Math 101 or permission of instructor.

**MATH 103 COLLEGE ALGEBRA 2 cr. (2 and 0)**

Algebraic processes, functions, equations, inequalities, mathematical induction, theory of equations, determinants, and logarithms.

**MATH 104 TRIGONOMETRY 2 cr. (2 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 permission 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. (Open only to Elementary Education majors.) *Prerequisite:* 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. (Open only to Elementary Education majors.) *Prerequisite:* Math 115 or permission 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 permission 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



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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. (4 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. (Open only to Elementary Education majors.) *Prerequisite:* Math 116 or permission of instructor.

### MATH 216 GEOMETRY FOR ELEMENTARY SCHOOL TEACHERS 3 cr. (3 and 0)

An informal treatment of the basic concepts of geometry. (Open only to Elementary Education majors.) *Prerequisite:* Math 116 or permission of instructor.

### 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 350 INTRODUCTION TO MATHEMATICAL MODELS 3 cr. (3 and 0)

A study of the modeling process which will include the translation of practical problems into mathematical models, the solution of the mathematical

models, and the interpretation of the solution back into practical problems. Examples will be chosen from the physical, biological, social, and management sciences. *Prerequisite:* Comp Sc 205, Math 208, 301.

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 ratio 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. Principal 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.

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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 206.

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, homomorphisms, 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 permission 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 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.





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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 206.

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 815 DATA STRUCTURES 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)
- MATH 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)

## 364 Description of Courses

- 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 850 COMPUTATIONAL PROBLEMS IN DISCRETE STRUCTURES 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 865 CALCULUS OF FINITE DIFFERENCES 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 DYNAMIC SYSTEMS 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 COMBINATORIAL 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 989 SPECIAL TOPICS IN INFORMATION PROCESSING  
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, 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 pro-



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totype, at least of critical parts, is the consummation of the design. Non-technical aspects of engineering such as cost, market, contracts and ethics are stressed. *Corequisite:* Phys 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 3 cr. (2 and 3)

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. Error analysis, dimensional analysis, experimental plan, and data analyses. *Prerequisite:* E&CE 307, ME 311.

### ME 400 DYNAMIC SYSTEM ANALYSIS AND CONTROL 4 cr. (3 and 3)

Principles of dynamic system response with emphasis on the determination of mathematical models for electromechanical, fluid, and thermal systems. Differential equations are developed from a consideration of physical laws, system arrangement, and constraints. The Lagrangian state function and Lagrange's equations are introduced. Transient and steady-state analyses make use of Laplace transforms and frequency response techniques. Computers are used extensively. *Prerequisite:* EM 202, Math 208, Phys 221.

### 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 3 cr. (2 and 3)

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. A substantial portion of the design problem will involve the theory and applications of engineering economics. *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:* E&CE 307, 308, ME 400.

## 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 analysis 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 algebraic 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.

## 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 combustion 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 412 THERMAL SYSTEMS 3 cr. (3 and 0)

The principles of thermodynamics, fluid mechanics, and heat transfer are applied in an integrated fashion to typical thermal systems such as cryogenic systems, energy conversion systems, industrial-process heat, and electric power systems. *Prerequisite:* EM 320, ME 304, 312.

ME 413 THERMAL SYSTEMS LABORATORY 1 cr. (0 and 3)

Experimental investigations in such areas as internal combustion engines, air-conditioning, refrigeration, steam turbines, steam condensers, etc. *Prerequisite:* ME 304, 312, 313. *Corequisite:* ME 412.

ME 414 MECHANICAL SYSTEMS LABORATORY 1 cr. (0 and 3)

Emphasis on independent analysis and experimentation of mechanical systems which include concepts such as force balancing, strain, and frequency response. Written and oral reports are required. *Corequisite:* ME 405.

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 400, 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. *Prerequisite:* ME 312.

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 protection 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)



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- 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

*Director:* Muriel B. Bishop

### Anderson

*Lecturers:* J. W. Black, R. E. Jones, Jr., J. H. Keffer, Kaye Little,  
N. L. Long

### Greenville

*Lecturers:* F. Cantrell, E. C. Cox, E. A. Dreskin, D. G. Kilgore, Jr., B.  
Ludwigsen, J. H. McCarter, Patricia Thompson, W. M. Waters

### Greenwood

*Lecturers:* R. G. Harris, 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 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.

Note: First figure represents lecture hours, second figure represents seminar hours, and the third figure represents clinical practice hours.

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### 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

*Professor:* R. K. Guthrie

*Associate Professors:* Ann W. Baxter, J. H. Bond, B. V. Bronk, M. J. B. 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, 103 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, or permission of the department head.

## 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)



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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. J. L. Mooneyhan, Lt. Col. C. S. Simpson, Jr., Lt. Col. D. G. Williams, Maj. W. S. Chapman, Maj. O. L. Ellis, Jr., Capt. G. J. Berry, Capt. K. W. Boatman, Capt. R. W. House, 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 marksmanship 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 positions during field training exercises, drills, reviews, inspections, and ceremonies. Cadets will enroll in one three-hour elective offered by other departments in the University outside the student's major academic discipline. This elective must be approved by the PMS and be of particular value in furthering the professional qualifications of the student as a prospective commissioned officer in the U.S. 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. Cadets will enroll in one three-hour elective offered by other departments in the University outside the student's major academic discipline. This elective must be approved by the PMS and be of particular value in furthering the professional qualifications of the student as a prospective commissioned officer in the U.S. 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

*Professor:* J. H. Butler, *Head*

*Assistant Professors:* B. F. Cook, E. A. Freeman

*Instructors:* Edith B. Card,<sup>o</sup> Lillian U. Harder, E. W. Winston

*Lecturer:* J. E. Jackson

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)

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. *Prerequisite:* 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.

<sup>o</sup> On leave.

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### 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 HISTORY 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, Sharon R. Monahan, Sara T. Stokes, Mary A. Teklits

*Visiting Instructor:* Worthlyn A. White

**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 health needs of all people, sick and well. Concepts and scientific principles of the bio-socio-psychological sciences that are applicable in the nursing practices common to all patients are studied. 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.

**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 nor-



## 378 Description of Courses

mal 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 Nurs 102, Zool 111.

### 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-economic aspects, legislative and health care issues.

## Nursing

(Baccalaureate Degree Program)

*Professor:* Geraldine Labecki, *Director*

*Associate Professors:* Arline M. Duvall, Gwendolen Lee

*Assistant Professors:* Lucy A. Fenton, Opal S. Hipps, Suzanne L. Parks, Regina Thompson, Mary M. Wagner

*Instructors:* Jeanette C. Bernhardt, Mary J. Campbell, Jane B. Carroll, Claudia B. Hubbard, Carolyn J. Kelley, Cynthia A. Leahy, Ann M. Mullen, Sharon W. Thompson

*Lecturer:* D. K. Freeman, Jr.

*Visiting Instructors:* Edythe J. Crowe, Jessie Drew, Carolyn J. Keller, Ann R. Lukawecki, Esther B. Privette

### 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 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.

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### NURS 425 INDEPENDENT STUDY IN NURSING 7 cr. (3 and 12)

Opportunity for indepth study in an area of special interest in clinical nursing. Laboratory experience arranged. *Prerequisite:* Nurs 422.

## Nutrition

(See courses listed under Animal Science, Biochemistry, Dairy Science, Food Science, and Poultry Science)

*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 Professors:* R. G. Bursey, J. C. McConnell, Jr.

### 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 PHILOSOPHIC PROBLEMS 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 202 INTRODUCTION TO 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 203 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 303 PHILOSOPHY OF RELIGION 3 cr. (3 and 0)

A critical consideration of the meaning and justification of religious beliefs. Representative topics are: The Nature and Existence of God; Religious Knowledge; Religious Language; The Problem of Evil.

- PHIL 304 MORAL PHILOSOPHY 3 cr. (3 and 0)

A study of moral problems, their origin in conflicts between duty and desire, and alternative solutions proposed by classical and contemporary writers.

- PHIL 309 ORIENTAL PHILOSOPHIES AND RELIGIONS 3 cr.  
 (3 and 0)

A study of the philosophical and religious teachings of Hinduism, Buddhism, 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, particularly existentialism and analytical philosophy. The object is to acquire sufficient background for reading current philosophical or philosophically influenced literature.



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### PHIL 322 SYMBOLIC LOGIC 3 cr. (3 and 0)

The fundamentals of modern symbolic logic. Leading topics are: Translation from Ordinary Language to Logical Form; Rules of Inference for the Logic of Sentences and the Logic of Predicates; Tests of Validity. *Prerequisite:* Phil 202, or Math 108, or a computer programming course.

### PHIL 325 PHILOSOPHY OF SCIENCE 3 cr. (3 and 0)

A study of the logic of the sciences: laws, theories, scientific methods; and of the relevance of science to other human interests.

### PHIL 344 CURRENT ETHICAL THEORY 3 cr. (3 and 0)

An intensive study of a currently prominent moral problem. Readings are selected from recent work at the frontiers of ethical thought. *Prerequisite:* Phil 304 or permission of instructor.

### PHIL 422 MATHEMATICAL LOGIC 3 cr. (3 and 0)

A study of the model theory and proof theory of first order logic, leading to proofs of completeness and incompleteness, and decidability and undecidability. *Prerequisite:* Phil 322 or 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 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.

### 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.

### PHY SC 301 CONCEPTS IN THE PHYSICAL SCIENCES FOR ELEMENTARY SCHOOL TEACHERS 3 cr. (3 and 0)

A survey of concepts in the physical sciences designed for prospective elementary school teachers. Apparatus and techniques for demonstrations and experiments will constitute the major part of the course. (Open only to Education majors.) *Prerequisite:* Two semesters of a physical science.

## Physics

*Professors:* P. B. Burt, 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, J. L. Ging, F. J. Keller, A. L. Laskar, J. R. Manson, 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. T. Rompala, 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, ele-

mentary 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.

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.

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### 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 WEATHER 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 247 SCIENCE AND SOCIETY 2 cr. (2 and 0)

The implications to mankind of the results of physical and quantitative science as applied by modern technology are considered. Particular examples of problems in which political decisions should be based on scientific background (*e. g.*, possible sources of energy, antipollution laws, etc.) will be discussed by means of lectures as well as seminars.

### 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. Experimental 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.



## 386 Description of Courses

### 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 457, 657 BASIC HEALTH AND RADIOLOGICAL PHYSICS I 3 cr. (3 and 0)

The physical aspects of radiation as related to their use in health physics are discussed. Topics include a survey of nuclear and radiation physics, interaction of radiation with matter, biological effects of high and low energy radiation, and uses of radiation for therapy and diagnosis. *Prerequisite:* Phys 321, 340, or equivalent.

### PHYS 458, 658 BASIC HEALTH AND RADIOLOGICAL PHYSICS II 3 cr. (3 and 0)

A continuation of Phys 457. Topics include dosimetry and radiation protection, ultraviolet radiation effects, shielding calculations, thermal effects and calculations, tracer use and kinetics, ultrasonics, other uses of physics in medicine and health sciences. *Prerequisite:* Phys 457 or equivalent.

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 of instructor.

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 700 PHYSICAL SCIENCE IN ELEMENTARY SCHOOLS—  
PHYSICS 3 cr. (3 and 0)

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)

## 388 Description of Courses

- 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*; F. H. Smith, W. Witcher

*Associate Professors:* N. D. Camper, G. C. Kingsland

*Assistant Professors:* O. W. Barnett, S. A. Lewis, 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, 421, 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, '76 and alternate years.

Plant viruses with emphasis on their morphology, biochemistry, purification and transmission; symptoms resulting from virus infection; virus-vector rela-

tionships; 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, '75 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*: H. E. Albert, E. M. Coulter, C. W. Dunn, *Head*; W. H. Owens, Jr., J. E. Tuttle

*Assistant Professors*: H. W. Fleming, Jr., Mary R. Martz, M. W. Slann

*Instructor*: M. R. Pilo

*Visiting Instructor*: M. R. Cline

POL SC 101 AMERICAN NATIONAL GOVERNMENT 3 cr. (3 and 0)

An introduction to American National Government and politics with an emphasis on the functions of governmental organizations, the behavior of political parties and personalities, and the role of public opinion.

POL SC 201 INTRODUCTION TO POLITICAL SCIENCE 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.



## 390 Description of Courses

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 administrative 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 POLITICS 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 TOTALITARIAN POLITICAL SYSTEMS 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 THE AMERICAN CONGRESS 3 cr. (3 and 0)

An examination of the behavior and processes of decision making in the American Congress together with an analysis of the interaction between Congress and the executive and judicial branches of the national government.

POL SC 405 THE 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 425 GOVERNMENTAL BUDGETARY PROCESS 3 cr.  
(3 and 0)

Examination of the budgetary structures and processes at the national, state, and local levels of government. Special emphasis is devoted to the Office of Management and Budget in the national government and to the political elements of the budgetary process at all levels of government.

POL SC 426, 626 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, 628 AMERICAN DEFENSE POLICY ANALYSIS 3 cr.  
(3 and 0)

A study of the possibilities 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 429 AMERICAN POLITICS AND EDUCATION 3 cr. (3 and 0)

A consideration of the political context for the making of public policy for education and for educational administration in the United States. Selected educational issues will be analyzed in the framework of modern political science. *Prerequisite:* Pol Sc 101, 302, 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.

## 392 Description of Courses

### 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 453 AMERICAN POLITICAL THOUGHT 3 cr. (3 and 0)

American political philosophy from the seventeenth century to the present with an emphasis on political and social developments since the 1770's. *Prerequisite:* Pol Sc 101, 201.

### 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 474 COMPARATIVE ASIAN GOVERNMENTS 3 cr. (3 and 0)

Major emphasis on China, India, and Japan. A study of the adaptation of three classic Asian cultures to the Western nation state system, and the particular solutions sought or found by each to the problems of modern government. Each country's foreign policy will also be examined. *Prerequisite:* Pol Sc 101, 201, or permission of instructor.

POL SC 475 POLITICAL SYSTEMS OF LATIN AMERICA 3 cr.  
(3 and 0)

An examination of political processes in Latin America from both institutional and national perspectives. *Prerequisite:* Pol Sc 101, 201, or permission of instructor.

POL SC 476 POLITICAL SYSTEMS OF THE MIDDLE EAST 3 cr.  
(3 and 0)

A comparative examination of the political processes of the Middle East, emphasizing a socio-cultural approach to the problems of political development. The overview of the course concentrates upon the Arab and non-Arab states of Jordan, Lebanon, Syria, the United Arab Republic, Iran, Israel, and Turkey. *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. Barnett, *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, incubation, 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.

\* On leave.



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PS 355, 655 POULTRY PRODUCTS GRADING AND TECHNOLOGY  
3 cr. (2 and 3) F, '75 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, '75 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 environmental 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.

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, '76 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) F, '74 and alternate years.

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:* B. Caffrey, *Head*; S. N. Cole, J. D. Davenport, D. J. Senn

*Assistant Professors:* L. Berger, Carol F. Brainerd, W. R. Fowler, Jr., D. J. Marx, Laurretta I. Park, J. M. Vacher

*Instructor:* Nina T. Elliott

*Visiting Instructor:* E. G. Brainerd, 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)

An introduction to the study of behavior. An analysis of the biological bases of behavior, learning, thinking, motivation, perception, human development, social behavior and the application of basic principles to more complex phenomena such as education, personal adjustment, and interpersonal relations.

### 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.

### 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)

A survey course analyzing human social behavior from the perspective of the individual as a participant in social relationships. The major emphasis is on the scientific study of such contemporary social processes as attitude formation and change, interpersonal relations, conformity, conflict resolution, aggression and violence, social communication, and group phenomena. *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 included in the 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.

## 396 Description of Courses

### 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 THE PSYCHOLOGY OF PERCEPTION 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)

The study of the physiological, psychological and sociological factors involved in such behavioral disorders as transient situational disturbances, personality disorders, psychoneuroses, psychoses, and psychosomatic disturbances. Special emphasis is placed on the advantages and disadvantages of particular conceptual models in labeling and describing behaviors as either normal or abnormal. *Prerequisite:* Psych 201.

**PSYCH 403 PERSONALITY 3 cr. (3 and 0)**

An examination of the contributions of psychological theories and current research to the study of personality. Major topics include: stress and psychological trauma, frustration and aggression, adaptive personality changes, conflict and defensive reactions, and personality development. *Prerequisite:* Psych 201 and one other course in psychology.

**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 PSYCHOLOGICAL TEST EVALUATION 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 tests, including those of scholastic achievement, mental ability, scholastic aptitude, 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 ATTITUDES AND PERSUASIVE COMMUNICATION 3 cr. (3 and 0)**

A review of current research and major theoretical positions concerning the processes involved in attitude formation, attitude organization, and attitude change. Primary emphasis will be on the role of attitudes in modern society, the structure and composition of persuasive communication, and the application of techniques of persuasion to the alteration of social attitudes. *Prerequisite:* Psych 201, 302, or permission of instructor.

**PSYCH 485 EXPERIMENTAL SOCIAL PSYCHOLOGY 3 cr. (3 and 0)**

An exploration of the methodology used in studying social psychology. Topics include effects of evaluation apprehension, experimenter bias and re-



## 398 Description of Courses

active measures, the volunteer subject; dissonance and equity theories. *Prerequisite:* Psych 302 or permission of instructor.

### PSYCH 487 PRACTICUM IN APPLIED PSYCHOLOGY 3 cr. (1 and 4)

This course is designed to give the student practical experience in the application of psychology in industry. The student will be expected to begin a project which will aid in the solution of industrial problems within the area of Clemson University. Specifically, problems to be studied include labor turnover, coordination of managerial and staff decision making, motivation, and organizational development. *Prerequisite:* Psych 301, 302 or 401, or permission of instructor.

### PSYCH 490, 690 SPECIAL TOPICS IN CLINICAL PSYCHOLOGY 3 cr. (3 and 0)

Selected aspects of clinical psychology related to counseling, psychotherapy, psychological assessment and its relationship with psychiatry, social work, and other mental health disciplines. *Prerequisite:* Psych 201, 202, plus nine hours of 300-400 level psychology courses, 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 494 TOPICAL SEMINAR IN SOCIAL PSYCHOLOGY 3 cr. (3 and 0)

A topical seminar on current theory and research in a selected subject area of social psychology. The specific seminar topic will change from semester-to-semester. Topics will be announced prior to each semester's registration. *Prerequisite:* Psych 201, 302, and 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 497 DIRECTED STUDIES IN PSYCHOLOGY 2 cr. (2 and 0)

Study of a particular topic area in psychology under the direction of a faculty member selected by the student. Specific program is to be organized by the student and faculty member and submitted to the department head for approval. *Prerequisite:* Psych 201, 202, and permission of instructor and department head.

### PSYCH 499, 699 SEMINAR IN CURRENT RESEARCH IN PSYCHOLOGY 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. McLellan, J. L. Stevenson

*Assistant Professors:* H. J. Grove, B. E. Trent, C. R. White

*Instructor:* P. B. Hamel

*Lecturer:* J. R. Vaughn, Jr.

*Visiting Assistant Professor:* Sarah A. Fletcher

*Part-time Lecturer:* R. A. Parker

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.

## 400 Description of 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.

### 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 includes 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.

### RPA 308 LEADERSHIP AND GROUP PROCESSES IN RECREATION 3 cr. (3 and 0)

Leadership is analyzed through experience-based learning. Various styles of leadership and communication and their probable consequences are examined.

Techniques for planning of large and small group meetings are considered. Examination is made of literature in the field of leadership and group processes.

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.

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.



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- 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 RELIGIONS 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.

## 404 Description of Courses

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

*Professor:* F. A. Burtner

*Associate Professor:* W. C. Capel, Jr.

*Assistant Professors:* Helen M. Fleishman, R. J. Knapp, L. G. Peppers

*Instructors:* Sue G. Garrett, Allie F. Jones, P. J. Wadsworth

*Visiting Instructors:* Frances H. Hambrick, R. H. Hingers, G. A. Lurie

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 permission of instructor.

SOC 309 AMERICAN MARRIAGE AND FAMILY 3 cr. (3 and 0)

An analysis of American family life; development of the modern family, courtship, family formation, problems, and effects of changing cultural pat-

terns. The institutions of marriage and the family in urban and rural contemporary settings form the core of the course. *Prerequisite:* Soc 201.

**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. (For Sociology majors and minors.) *Prerequisite:* Soc 201, 206.

**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.



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### 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 up to and including 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 433 SOCIOLOGY OF AGING 3 cr. (3 and 0)

The role of the elderly in society is stressed beginning with a historical and cross-sectional review and proceeding to a consideration of aging in the United States. Theories of aging and the social impact of aging populations on social institutions such as schools, retirement systems, pensions and the like are considered. Special attention is given to changing perceptions of the role of the aged. Alternative systems to those in practice are considered along with special problems of the early retirement. *Prerequisite:* Junior standing.

### 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

*Visiting Lecturer:* Carey I. Stacy

### 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. *Prerequisite:* 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.

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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 or 310 or 311.

SPAN 402 CONTEMPORARY SPANISH DRAMA 3 cr. (3 and 0)

The Spanish theater from Benavente to the present. *Prerequisite:* Span 303 or 304 or 310 or 311.

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 or 310 or 311.

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 or 310 or 311.

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 303 or 304 or 310 or 311.

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 303 or 304 or 310 or 311.

SPAN 498 INDEPENDENT STUDY 1-3 cr. (1-3 and 0)

Independent indepth 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 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)



## 410 Description of Courses

- 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, E. A. Vaughn  
*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 reaction 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 with 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)

## 412 Description of Courses

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, E. A. Vaughn

*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 assemblies 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



## 414 Description of Courses

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 construction 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

*Assistant Professor:* 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.

## 416 Description of Courses

### 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 experience 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. *Prerequisite:* Vis 318.
- VIS 418, 618 ADVANCED CERAMIC ARTS 3 cr. (0 and 9)  
Continuation of Vis 417. *Prerequisite:* Vis 417.



## 418 Description of Courses

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

*Associate Professor:* B. C. Dysart, III, *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.

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 appli-

cations 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 Professors:* J. D. Hair, 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.

## 420 Description of Courses

- 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:* S. A. Gauthreaux, Jr., Ruth L. Hays,\* A. S. Tombes, W. K. Willard

*Assistant Professors:* E. D. Brodie, Jr., Doris R. Helms, B. R. Ingram, H. A. Loyacano, Jr., Gayle P. Noblet, E. B. Pivorun, R. F. Walker

*Lecturer:* H. J. Kania

*Visiting Assistant Professor:* D. P. Yu

- ZOOL 100 THE BIOLOGY OF HUMAN SURVIVAL 1 cr. (1 and 0)

A biological overview of those aspects of contemporary life which constitutes 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 3)

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 3)

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.

\* On leave.

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, 202.

ZOOL 302, H302 VERTEBRATE EMBRYOLOGY 4 cr. (3 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, 202.

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)

A study of the tissues and their organization into organs and organ systems in animals.

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 ecosystems 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



## 422 Description of Courses

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 4 cr. (3 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 MAMMALOLOGY 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.

## ZOOLOGY 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.

## ZOOLOGY 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 echinodermata. *Prerequisite:* Zool 201.

## ZOOLOGY 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.

## ZOOLOGY 480, 680 DEVELOPMENTAL BIOLOGY 4 cr. (3 and 3)

Fundamentals and theoretical considerations central to cellular differentiation and development with emphasis on the control of genetic expression, nucleocytoplasmic interactions, cell—cell interactions and cell-environment interactions. *Prerequisite:* Bioch 301, Gen 302, Zool 302, or permission of instructor.

## ZOOLOGY 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.

## ZOOLOGY 700 MODERN DEVELOPMENTS IN ZOOLOGY FOR HIGH SCHOOL TEACHERS 3 cr. (3 and 0)

## ZOOLOGY 701 MAN'S IMPACT ON ECOLOGY 3 cr. (3 and 0)

## ZOOLOGY 702 FIELD METHODS IN ZOOLOGY FOR HIGH SCHOOL TEACHERS 3 cr. (2 and 3)

## ZOOLOGY 801 ANIMAL HISTOLOGY 3 cr. (2 and 3)

## ZOOLOGY 802 HISTOLOGICAL TECHNIQUES 3 cr. (1 and 6)

## ZOOLOGY 803 POPULATION DYNAMICS 4 cr. (2 and 6)

## ZOOLOGY 807 USE OF RADIOISOTOPES IN BIOLOGICAL RESEARCH 3 cr. (2 and 3)

## ZOOLOGY 808 RADIOBIOLOGY 3 cr. (2 and 3)

## ZOOLOGY 810 BEHAVIORAL ECOLOGY 3 cr. (3 and 0)

## ZOOLOGY 812 SEMINAR 1 cr. (1 and 0)

## ZOOLOGY 813 EVOLUTION 3 cr. (3 and 0)

## ZOOLOGY 815 PHYSIOLOGICAL ECOLOGY 4 cr. (3 and 3)

## ZOOLOGY 830 HISTOCHEMISTRY-CYTOCHEMISTRY 3 cr. (2 and 3)

## ZOOLOGY 840 COMPARATIVE ANIMAL PHYSIOLOGY I 4 cr. (3 and 3)

## ZOOLOGY 841 COMPARATIVE ANIMAL PHYSIOLOGY II 4 cr. (3 and 3)

## ZOOLOGY 845 ADVANCED CELL PHYSIOLOGY 4 cr. (3 and 3)

424 Description of Courses

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

## COLLEGE OF EDUCATION

### Office of Educational Services

Myrton A. Packer, Ed.D., *Coordinator*

Joseph H. Adair, M.Ed.  
Hugh W. Agee, Ph.D.  
Curtis P. Bell, Ph.D.  
John H. Bond, M.S.  
Dorothy P. Brandt, Ph.D.  
Ida C. Briscoe, Ed.D.  
DeWayne D. Brooks, Ed.D.  
Joseph A. Browde, Ed.D.  
Maurice B. Brown, Ph.D.  
Margaret B. Buckley, Ph.D.  
Sam L. Buckner, Ed.D.  
Paul C. Caley, Ph.D.  
Spurgeon N. Cole, Ph.D.  
Keith Conner, Ph.D.  
Claude H. Cooler, Ph.D.  
William O. Corder, Ed.D.  
James F. Cummings, Ed.D.  
Frank S. Elliott, Ed.D.  
William R. Elmore, Ph.D.  
Jack H. Feldman, Ph.D.  
Vikary E. Finns, M.Ed.  
James L. Flatt, Ph.D.  
Chester R. Freeze, Ed.D.  
Elizabeth B. Galloway, Ed.D.  
Gordon W. Gray, Ed.D.  
Robert A. Hagerman, Ph.D.  
George O. Hallman, Ed.D.  
Jackie R. Harris, Ed.D.  
Edward D. Huthnance, Ph.D.

Thomas E. Jennings, Ed.D.  
Lewis P. Jones, Ph.D.  
Jones C. Koontz, Ph.D.  
Ernest M. Lander, Ph.D.  
Richard E. Linhardt, Ph.D.  
Imogene F. Lipscomb, Ph.D.  
Stanley M. Lukawecki, Ph.D.  
Oliver R. Lumpkin, Ph.D.  
Michael L. Mahaffey, Ph.D.  
John P. Martin, Jr., Ed.D.  
James E. Matthews, Ed.D.  
Albert P. Mature, Ph.D.  
Jerry M. Neal, Ed.D.  
Edward F. Olive, Ed.D.  
Robert A. Palmatier, Ph.D.  
Thomas H. Parry, Ed.D.  
Ralph K. Peden, Ed.D.  
William W. Pennscott, Ed.D.  
David H. Prince, Ph.D.  
Phillip N. Racine, Ph.D.  
Barbara M. Raetsch, Ph.D.  
Frederick T. Raetsch, Ph.D.  
Robert P. Recktenwald, M.A.  
Bruce L. Sandberg, Ph.D.  
James E. Seegars, Ph.D.  
Gilbert E. Shearron, Ed.D.  
Malcolm O. Usrey, Ph.D.  
John H. Walker, Ph.D.  
William E. West, 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 through the fall semester 1973.



## 426 Public Service Activity

### ABBEVILLE COUNTY

- Spring Ed 605 Principles of Guidance  
 Fall Ed 804 Advanced Methods of Teaching in the Elementary School

### ANDERSON COUNTY

- Spring Ed 698 Teaching Secondary School Reading  
 Ed 802 Human Development: Psychology of Learning  
 Ed 862 Clinical Research in Reading  
 Summer °Ed 632 Elementary School—  
 Teaching Mathematics  
 °Ed 633 Current Problems in Education—  
 Teaching Reading in Content Areas  
 Fall °Ed 632 Elementary School—  
 Teaching Mathematics  
 °Ed 634 Current Problems in Education—  
 Practicum for Teachers of Exceptional Children  
 Teaching Reading in Content Areas

### COLLETON COUNTY

- Summer °Ed 632 Elementary School—  
 Teaching Mathematics  
 Teaching Reading  
 °Ed 633 Secondary School—  
 Teaching Mathematics  
 Teaching Reading  
 °Ed 634 Current Problems in Education—  
 Providing for Disadvantaged Learners  
 Teaching Strategies

### GREENVILLE COUNTY

- Spring Ed 605 Principles of Guidance  
 °Ed 632 Elementary School—  
 Introduction to Special Education  
 Teaching Reading  
 Ed 660 Curriculum Development in the Elementary School  
 Ed 662 Reading Diagnosis and Remediation  
 Ed 673 Teaching the Mentally Retarded  
 Ed 694 School and Community Relationships  
 Ed 698 Teaching Secondary School Reading  
 Ed 802 Human Development: Psychology of Learning  
 Ed 808 Educational Tests and Measurements  
 Ed 861 Organization and Supervision of Reading Programs  
 Ed 871 Interpersonal and Group Relationships  
 °In Ed 610 Topics in Industrial Education—  
 World of Manufacturing  
 Math 701 Number Systems  
 Math 783 Theory of Numbers  
 Fall Ed 605 Principles of Guidance  
 Ed 662 Reading Diagnosis and Remediation  
 Ed 801 Seminar in Human Growth and Development  
 Ed 808 Educational Tests and Measurements  
 Math 761 Probability and Statistics

### GREENVILLE TECHNICAL EDUCATION CENTER

- Fall °In Ed 610 Topics in Industrial Education—  
 Appalachian Guidance Institute on Career Education

### LAURENS COUNTY

- Spring °Ed 634 Current Problems in Education—  
 Behavior Modifications  
 Summer Ag Ed 726 Agricultural Mechanization for Inservice Teachers

### OCONEE COUNTY

- Spring °Ed 631 Early Childhood Education—  
 Methods and Materials  
 °Ed 632 Elementary School—  
 Reading Methods

### PICKENS COUNTY

- Spring °Ed 634 Current Problems in Education—  
 Educational Procedures for Learning Disabilities  
 Group and Interpersonal Relations

° Special Institute Course. (Subject areas organized according to Institute needs.)

## PIEDMONT TECHNICAL EDUCATION CENTER

Spring	Ed 605	Principles of Guidance
	Ed 660	Curriculum Development in the Elementary School
	Ed 662	Reading Diagnosis and Remediation
	Ed 665	Secondary School Curriculum
	Ed 694	School and Community Relationships
	Ed 698	Teaching Secondary School Reading
	Ed 801	Seminar in Human Growth and Development
	Ed 802	Human Development: Psychology of Learning
	Ed 808	Educational Tests and Measurements
	Ed 810	Techniques of Counseling
	Engl 751	Children's Literature for Teachers
Summer	Math 701	Number Systems
	Ed 662	Reading Diagnosis and Remediation
	Ed 801	Seminar in Human Growth and Development
	Ed 802	Human Development: Psychology of Learning
	Ed 808	Educational Tests and Measurements
	Ed 830	Techniques of Supervision: The Public Schools
	Ed 862	Clinical Research in Reading
Fall	Engl 603	Composition for Teachers
	Math 701	Number Systems
	Math 783	Theory of Numbers
	Ed 605	Principles of Guidance
	Ed 660	Curriculum Development in the Elementary School
	Ed 662	Reading Diagnosis and Remediation
	Ed 665	Secondary School Curriculum
	Ed 694	School and Community Relationships
	Ed 801	Seminar in Human Growth and Development
	Ed 802	Human Development: Psychology of Learning
	Ed 803	Advanced Methods of Teaching in the Secondary School
Ed 804	Advanced Methods of Teaching in the Elementary Grades	
Ed 808	Educational Tests and Measurements	
Ed 809	Analysis of the Individual	
Ed 810	Techniques of Counseling	
Ed 863	Practicum in Reading	
Hist 719	U.S. History Since 1900	
Math 703	Geometric Concepts	
Math 761	Probability and Statistics	

## STATE DEPARTMENT OF EDUCATION

## Blackville

Fall Ag Ed 815 Teaching Agricultural and Power Mechanics

## Florence

Spring °Ed 634 Current Problems in Education—  
Advanced Methods of Teaching Farm Mechanics

## Walterboro

Fall Ag Ed 815 Teaching Agricultural and Power Mechanics

## Winnsboro

Fall Ag Ed 815 Teaching Agricultural and Power Mechanics

## Columbia College

Spring Ed 672 Psychology of Mental Retardation  
 Summer Ed 605 Principles of Guidance  
 Ed 606 History and Philosophy of Education  
 Ed 697 Audio-Visual Aids in Education

## Erskine College

Summer Ed 606 History and Philosophy of Education

## Newberry College

Spring °Ed 633 Secondary School—  
Linguistics  
 Summer °Ed 633 Secondary School—  
Linguistics  
 Teaching Mathematics  
 °Ed 635 Curriculum—  
Law Enforcement Education  
 Ed 662 Reading Diagnosis and Remediation  
 Ed 698 Teaching Secondary School Reading

° Special Institute Course. (Subject areas organized according to Institute needs.)

## 428 Public Service Activity

### Presbyterian College

- |        |         |   |
|--------|---------|---|
| Spring | °Ed 633 | Secondary School—<br>Practicum and Internship in Guidance and Counseling  |
|        | °Ed 634 | Current Problems in Education—<br>Principles and Procedures of Counseling<br>Vocational and Occupational Information  |
| Summer | Ed 671  | The Exceptional Child   |
|        | Ed 673  | Teaching the Mentally Retarded  |
|        | °Ed 633 | Secondary School—<br>Practicum and Internship in Guidance and Counseling  |
|        | °Ed 634 | Current Problems in Education—<br>Behavior Management in the Classroom<br>Clinical Problems in the Education of Exceptional Children<br>Organization and Supervision of Reading<br>Practicum for the Education of Exceptional Children<br>Principles and Procedures of Counseling<br>Tests and Measurements |
|        | Ed 671  | The Exceptional Child   |
| Fall   | Ed 673  | Teaching the Mentally Retarded  |
|        | Ed 698  | Teaching Secondary School Reading   |
|        | Ed 672  | Psychology of Mental Retardation  |

### Wofford College

- |        |          |   |
|--------|----------|---|
| Summer | Ed 606   | History and Philosophy of Education                       |
|        | °Ed 632  | Elementary School—<br>Methods and Concepts of Mathematics |
|        | °Ed 634  | Current Problems in Education—<br>Psychology of Education |
|        | Ed 672   | Psychology of Mental Retardation                          |
|        | Hist 613 | United States History, 1890-1933                          |

### TRI-COUNTY TECHNICAL EDUCATION CENTER

- |        |           |                                    |
|--------|-----------|------------------------------------|
| Summer | In Ed 310 | Methods of Trade Teaching          |
|        | In Ed 405 | Course Organization and Evaluation |

° Special Institute Course. (Subject areas organized according to Institute needs.)

# Student Register





**GRADUATES OF 1973**  
**ASSOCIATE AND BACHELORS' DEGREES CONFERRED**  
**MAY 11, 1973**

**COLLEGE OF AGRICULTURAL SCIENCES**

*Luther Perdee Anderson, Dean*

**BACHELOR OF SCIENCE**

**Agricultural Economics**

John Bee Barnes ----- Pelzer	Robert Gregory Miller, Jr. ----- Pauline
Larry James Boyleston ----- Williston	Robert Paul Parris ----- Chesnee
Sidney Marvin Brown, Jr. ----- Sumter	*Stephen Robert Pettigrew ---- Calhoun Falls
Vincent McCoy Cox, Jr. ----- Denmark	Raleigh Oriole Ward ----- Effingham
William Thomas McLees ----- Westminster	

**Animal Science**

Jesse Adams III ----- McColl	Farris Candler Parker ----- Edgefield
*William Thomas Borders ----- Rock Hill	Franklin Lewis Smith ----- Ware Shoals
David Wayne Bunch ----- North Charleston	Connie Elaine Wells ----- Tillman
*Gwynn Lloyd Hardee ----- Loris	Ronnie Alton Williams ----- Seneca
Marion Delmar Jenkinson III ---- Summerton	James Horace Winburn, Jr. -- Galivants Ferry
Dianne Adele Kassab ----- Florence	Roy Chambless Zeigler ----- Orangeburg
Lee Shirley Keese ----- Westminster	

**Biology**

Robert Paul West ----- Anderson	Norman Ambrose Williams ----- Columbia
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**Dairy Science**

Henry Cromley Forrest ----- Johnston	James Gerard Piotrowsky
Gene Shirley Lucas ----- Clinton	----- Glen Gardner, N. J.

**Food Science**

Theresa Ann Blessing ----- Kingsport, Tenn.	Jaue Hwa Wang ----- Taipei, Taiwan
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**Horticulture**

Samuel Ray Bolick ----- Blair	William Harrington Leach, Jr.
John Allen Connell ----- Sumter	----- Drexel Hill, Pa.
Wayne Scott Crosby ----- Cottageville	Millard Christian Monnen, Jr.
*Susan Eggleston ----- Columbia	----- Alexandria, Va.
Dennis Calvin Gainey ----- Hartsville	Richard Steven Peigler ----- Greenville
Gary John Gosztonyi ----- Kintnersville, Pa.	*David Alexander Price ----- Columbia
John Douglas Griffin ----- Pomaria	George Gerald Smith, Jr. ----- Cheraw
Dickson Browne Guile, Jr. -- Huntington, N. Y.	Joseph Gregg Taylor ----- Gilbert
Arthur Holland Howle, Jr. -- Statesville, N. C.	Mark Nichols Taylor ----- East Bend, N. C.
*Christina Klaas ----- Columbia	

**COLLEGE OF ARCHITECTURE**

*Harlan Ewart McClure, Dean*

**BACHELOR OF ARTS**

**Pre-Architecture**

Jon Leslie Bourne ----- Conway	Erik Hans Rhodin ----- Bronxville, N. Y.
Christopher Earle Coffin ----- Columbia	David Hubert Ross ----- Greenville
Herbert Joseph Githens --- Cinnaminson, N. J.	Scott Winfield Rumph III ----- Sumter
*Charles Ross Holroyd ----- Rock Hill	Michael Wayne Spivey ----- Charleston
Robert John Hutnik -- Greenwood Lake, N. Y.	Stephen Andrew Usry ----- Florence
William Bleckley Karst, Jr. ----- Greenville	John William Walters ----- Greenville
*William Andrew Kay ----- Columbia	Michael Stroud Watson ----- Simpsonville
Martin Edward Meek ----- Spartanburg	*Curtis Dean Wilson ----- Towson, Md.
Jeffrey Guy Nuovo -- New Hyde Park, N. Y.	Mark Allen Wright ----- Havertown, Pa.

**BACHELOR OF SCIENCE**

**Building Construction**

Thomas Jay Burleson --- Johnson City, Tenn.	Timothy Clark Hackett ----- Atlanta, Ga.
Robert Clinton Coleman ----- Greenville	Douglas Alan Hambrecht
*George Randel Cook ----- Orlando, Fla.	----- Huntington Station, N. Y.
Jacob Martin Cope, Jr. ----- Cope	John Edwin Jones ----- Pineville, N. C.
Nicholas Joseph DiIorio	*Hugh Dennis Mason, Jr. ----- Seneca
----- North Haledon, N. J.	Ronald Wheater Oakley --- Oxon Hill, Md.
*James Harvey Edwards ----- Saluda	

**Pre-Architecture**

\*Donald Alfred Jones ----- Endicott, N. Y.

**BACHELOR OF ARCHITECTURE**

Thomas Carl Conner --- Charleston, W. Va.	Donald McDonald Law ----- Aiken
Charles Allan Graham, Jr. ----- Spartanburg	

**COLLEGE OF EDUCATION**

*Harold Fochone Landrith, Dean*

**BACHELOR OF ARTS**

**Early Childhood Education**

Anne Marie Bischoff ----- Mt. Pleasant	*Janis Lynn Schiesser --- Jericho, L. I., N. Y.
*Roxanna Candler ----- Heath Springs	Anne Marie Skinner ----- Anderson
Kathy Ruth Chapman ----- Little Mountain	Peggy June Slaton ----- Pendleton
*Patricia McClain Childress --- Apex, N. C.	Margaret Elizabeth Summey ----- Anderson
Denise More Dias ----- Anderson	Sara Lee Thompson ----- Sumter
Martha Jean Gravley ----- Greenville	**Margaret Hanahan Ward ----- Columbia
Katherine Elizabeth McLendon --- Winnsboro	*Thelma Louise White ----- Greenville
**Janis Diane Pruitt ----- Anderson	

## 432 Student Register

### Elementary Education

Joan Marie Albenesius -----	Charleston	*Loes Boone McAlister -----	Anderson
Patricia Carol Alexander -----	Rock Hill	Patricia Russell Moody -----	Cayce
Elizabeth Williams Bryant --	Pensacola, Fla.	*Pamela Annette Moorhead -----	Anderson
*Cherie Gilreath Callahan ---	Travelers Rest	*Angela Neely -----	Pelzer
Carol Lillian Causey -----	Anderson	**Linda Lorene Oglevee -----	Greenwood
Cynthia Jeanne Coburn -----	Isle of Palms	*Jean Gleason Palmer -----	Townville
*Janet Lynn Cook -----	Spartanburg	*Rebecca Ann Reid -----	Greenville
Betty Cook Crumpton -----	Greenville	*Carla Sue Reitz -----	Greenwood
Cheryl Faye Culbertson -----	Greenville	Gail Jean Schubert -----	Lutherville, Md.
*Sara Patricia Davis -----	Clinton	Deborah Virginia Schwiars -----	Pelzer
*Mary Elaine Dodgens -----	Easley	Gayle Douglass Smith -----	Pickens
Tempie Gayle Fulmer -----	Simpsonville	Emma Jean Stephens -----	Greer
Vicki Shaw Galloway -----	Pelzer	Thomas Barkstell Stoddard ----	Gray Court
Vicki Elaine Garren -----	Clemson	Phyllis Anne Stroup -----	Gastonia, N. C.
Phillip Edward Gebert -----	Taylors	Ann Reid Taylor -----	Laurens
Delphine Kay Griffin -----	Spartanburg	Stephanie Gayle Threatt -----	Kershaw
Lynne Jones Griffin -----	Clemson	Laura Melville Troutman -----	Sumter
**Barbara Doles Harman -----	Lexington	**Valerie Arden Turner -----	Central
Judith Maryann Hawkins -----	Seneca	*Peggy Cann Ur -----	Seneca
**Jimmie Haynie -----	Anderson	*Laura Sue Welsh -----	Walhalla
*Janet Cann Jennings -----	Easley	Candice Keith Wheeler -----	Spartanburg
*Deborah Jane King -----	Anderson	Jacquelyn Cordell White -----	Greenville
Larry Russell Knighton -----	Simpsonville	Debbie Whitman Williams -----	Anderson
Susan Annette Lollis -----	Easley	*Allison Lynn Wilson -----	Greer
Dawn Irmiter Martin -----	Clemson	Felicia Spencer Young -----	Clemson

### Secondary Education

Ronald Scott Abrams -----	Whitmire	**Lynn Grooms Hoover -----	Ridgeville
Paula Marie Albert -----	Clemson	Linda Irene Hopkins -----	Central
**Kathy Brown Barnett -----	Pendleton	**Robert Barry Kane -----	Columbia
*Dorothy Cox Barnett -----	Greer	Mary Cecile Kennerty -----	Charleston
**Deborah Barker Belcher -----	Seneca	Kenneth Lee Lawhon -----	Hartsville
*Gloria Mae Bolt -----	Townville	Mark Douglas Lee III -----	Spartanburg
*Walter Dennis Chamberlain ---	Greenville	*Connie Price Leslie -----	Atlanta, Ga.
Sandra Edith Charles -----	Hockessin, Del.	Daniel William Lundeen -----	Temple Terrace, Fla.
*Jolinda Harper Chastain -----	Easley	*Michele Rhea Mize -----	Easley
Willia Linwood Pauline Cox -----	Clinton	Andera Julia Murphree -----	Walhalla
*Jane Coyle -----	Greenville	Roland Edison Nettles -----	Moncks Corner
Billy Thomas Daniel -----	Iva	Linda Lee Reed -----	Greenville
Rebecca Lynn Reed Demori -----	Hanahan	*John Steven Sanders -----	Seneca
Mary Elizabeth DeWitt -----	Greenville	Mary Louise Simpson -----	Clinton
Dianne Cecile Dotson -----	Lancaster	*Ann Epps Skipper -----	Myrtle Beach
Jared Calvin Evatt -----	Central	Linda Claire Stanley -----	McLean, Va.
Cyndy Ella Fins -----	Columbia	Nancy Marie Stein -----	Anderson
Linda Ann Fleming -----	Greer	Beth Diane Sutker -----	Columbia
Lillian Elizabeth Floyd -----	Greenwood	*Tanis Dale Thompson -----	Anderson
Shirley Raie Gorske -----	Greenville	Randolph Morgan Tiller, Jr. ----	Florence
Marion Esther Greene -----	Landrum	Edward Jay Turner -----	Succasunna, N. J.
Linda Sue Grubb -----	Seneca	Nancy Lynne VanHoy -----	Summerville
Judson Elam Hair, Jr. -----	Clemson	Priscilla Anne Weaver -----	Greenville
James Harvey Harrold, Jr. -----	Spartanburg	**Nancy Lou Williams -----	Seneca
Barbara Spencer Hathaway ----	Charleston	*Robert Theodore Williams -----	Cayce
William Parker Holland -----	Anderson		

### BACHELOR OF SCIENCE

#### Agricultural Education

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

Claudius Ray Boland, Jr. -----	Ballentine	John William Rush -----	Olanta
**Michael Fletcher Burnett ----	Spartanburg	Rodney John Saylor -----	St. Matthews
James Thurmon Carroll -----	Conway	Dale Tommie Todd -----	Loris
Fred Murray Johnson, Jr. -----	Sumter	Leroy Todd, Jr. -----	Marion
George Randale King -----	Pelzer	Samuel Boyd White -----	Timmonsville
**John Richard Lindler -----	Irmo		

**Industrial Education**

Stephen Richard Anderson ----- Allendale  
 James Atkinson Bruorton III ----- Conway  
 Hamilton Lafayette Campbell  
 ----- Hendersonville, N. C.  
 \*Stanley John Cantrell, Jr. ----- Taylors  
 Edgar Stuart Coffey, Jr. ----- Columbia  
 Broughton Eugene Cooper ----- Greenville  
 Claude Robert Dalton ----- Pendleton  
 Danny Lamar Erskine ----- Anderson  
 William Lester Freeman ----- Easley  
 David Barry Godfrey ----- Raleigh, N. C.  
 James Robert Henderson, Jr.  
 ----- Asheville, N. C.  
 Steven Wayne Holcombe ----- Easley  
 Alan Clark King ----- Greenville  
 Johnny Thompson King ----- Gray Court  
 Roger Gentry Kivett, Jr. -- Chattanooga, Tenn.  
 Keith Daniel Lake ----- Prosperity

Arthur Dwayne Lyerly ----- Johnsonville  
 Michael Terry Martin ----- Travelers Rest  
 Roger Wyatt Mills ----- Georgetown  
 Michael Anderson Monteith ----- Columbia  
 Ernest Raymond Nelson, Jr. ----- Charleston  
 Stephen Lynn Parker ----- Abbeville  
 Lawrence Eugene Rush III  
 ----- Lindenwold, N. J.  
 Robert Marion Sellars ----- Pauline  
 Stephen Sintal ----- Lynbrook, N. Y.  
 Michael Gene Stephens ----- Taylors  
 Michael Blake Taylor ----- Greeleyville  
 Charles McClelland Todd  
 ----- Massapequa, N. Y.  
 \*Furman Douglas Vickery ----- Central  
 Frank William Wirth ----- Schnecksville, Pa.  
 James Eugene Young ----- Easley

**Science Teaching**

Thomas George Bartlett ----- Arlington, Va.  
 Glenn Aaron Blackwell ----- Mauldin  
 \*\*Jeannie Sandlin Browne ----- Greer  
 \*Paula Rebecca Chastain ----- Columbia  
 Emily DuPre Donaldson ----- Mt. Pleasant  
 \*\*Thomas Eugene Edwards, Jr. -- Greenville

Edna Faye Hawkins Johnson ----- Central  
 \*\*Sandra Fields Rogers ----- Honea Path  
 \*Anna Taylor Smith ----- Spartanburg  
 Dennis Peter Somerville ----- Easley  
 \*\*Sarah Holleman Tompkins ----- Summerville  
 James Kenneth Westbury, Jr. -- St. Matthews

**COLLEGE OF ENGINEERING**

*Lyle Chester Wilcox, Dean*

**BACHELOR OF SCIENCE**

**Agricultural Engineering**

(Agricultural Engineering is jointly administered by the College of Agricultural Sciences and the College of Engineering.)

Ted Howard Shuler ----- Santee

\*Leslie R. Zielke ----- Paulding, Ohio

**Ceramic Engineering**

Steven Douglas Bellavita ----- Charleston  
 \*\*\*James Philip Bennett ----- Augusta, Ga.  
 Terry Leon Brooks ----- Rock Hill  
 Debora Duke ----- Charleston  
 George Ernest Giger ----- Pittstown, N. J.  
 Robert Wayne Green ----- Mauldin

John Michael Horton ----- Central  
 John Kermit Jenkins, Jr. ----- Erie, Pa.  
 \*Thomas Earl Landon ----- Spartanburg  
 Marvin Richardson Myers, Jr. -- Simpsonville  
 Terrell Mack Peace ----- Easley  
 Fred Guy Wilson III ----- Laurens

**Chemical Engineering**

Donald William Baxter, Jr. ----- Columbia  
 \*Russell Pearce Bridges ----- Summerville  
 Kenneth Oren Clontz ----- Lancaster  
 \*Gene Lynn Dinkins ----- Columbia  
 Rebecca Jeannette Dwyer  
 ----- Wappingers Falls, N. Y.  
 Claude Daniel Epting ----- Rock Hill  
 Robert Lone Grahl ----- Greenville  
 \*Jeffrey John Gude ----- Clemson  
 James Kelly Jennings ----- Spartanburg  
 Herbert Charles Jung, Jr. -- Wyomissing, Pa.

Gregory Glenn Langston ----- Florence  
 Robert Michael Lindler ----- Columbia  
 \*\*John McGregor McSwain ----- Winnsboro  
 \*\*\*Albert Augustus Ramage III ----- Kinards  
 Richard Wyman Rentz ----- Burton  
 William Terry Rogers ----- Anderson  
 \*Philip Booth Ross, Jr. ----- Florence  
 \*Steven Ira Simpson ----- Rock Hill  
 William Phillip Turner ----- Seneca  
 Thomas Herbert Watson ----- Camden



## Civil Engineering

Robert Walker Ballard .....	Chester	*George Edward Landreth ....	Augusta, Ga.
James Robert Berry .....	Bowman	Gordon Keith McLeod, Jr. ....	Timmons ville
*Terry Austin Bragg .....	Greenville	William Eugene Moore .....	Charleston
Gerard Allen Brangenberg ..	Absecon, N. J.	*Perry Cooper Patrick, Jr. ....	Greenville
**Phillip Michael Brooks .....	Saluda	William Earle Rettew II .....	Greenville
Michael Driscoll .....	Brevard, N. C.	Ned Elliott Riddle .....	Blacksburg
Arthur Allan Fau .....	Nutley, N. J.	Willie Thomas Sinclair .....	Bishopville
George Alexander Galleher ..	Washington, D. C.	Raymond Eugene Sistare .....	Spartanburg
.....		Kenneth James Stewart .....	Timonium, Md.
***Stephen Franklin Howler .....	Sumter	Stephen Tucker Sutterfield ....	Atlanta, Ga.
Charles Joseph Johnson .....	Beech Island	John Norman Warren, Jr. ....	Startex
***James Willis Johnson, Jr. ....	Sumter	Lee Edward Wheatley .....	Augusta, Ga.
John Lloyd Johnson .....	Florence		

## Electrical Engineering

James Russell Bach .....	Encino, Cal.	**Robert Alan Johnson .....	Clemson
Ronnie Dale Banks .....	Ninety Six	*Robert Davis McCraw .....	Gaffney
**Allison Trent Brown .....	Waldorf, Md.	William David Mixon .....	Varnville
**William Earl Brown .....	Spartanburg	Richard Hamilton Mixson, Jr. ....	Allendale
*Lee Hunt Clippard .....	Charlotte, N. C.	Robert Willis Osment .....	Gaffney
**John Holloway Drummond ....	Ninety Six	**Francis David Ramsey, Jr. ....	Sumter
*Wales Dale Edwards .....	Waihalla	Stephen Alfred Sefick .....	Clemson
Dale Sheldon Fisher .....	Pittsburgh, Pa.	*Donald Dean Snow .....	Simpsonville
James Timothy Garrett .....	Halifax, Va.	Barry Lee Stewart .....	Greenwood
Thomas Nelson Glenn .....	Spartanburg	*Wallace Arnold Storey, Jr. ....	Spartanburg
†*George Oliver Halstead, Jr. ....	Charleston	James Edward Sykes, Jr. ....	Gaffney
**Donald Joseph Healy ...	College Park, Ga.	*Kenneth James Weathers .....	Fountain Inn
**Jerry Robert Hinson .....	Pelzer	George Richard Weaver .....	Greenville
*Everett Ernest Hite III .....	Spartanburg	James Erskine West .....	Simpsonville
*Rush Winslow Hood, Jr. ....	Anderson	*Mark Robert Williams .....	Greenville
George Eugene Jamieson .....	Macon, Ga.	Thomas Lee Wright .....	Duncan
**Michael Wayne Jenkins .....	Lancaster		

## Engineering Analysis

Carlos Santiago Anquizola .....	Panama, Panama	Jerry Andrew Meehan .....	Pendleton
.....		Arnold Douglas Wilson .....	Lancaster, Pa.
David Cooper Jennings .....	Spartanburg		

## Engineering Technology

Henry Kelly Arnette .....	Conway	Raymond Lamar Ledford .....	Chattanooga, Tenn.
James Neely Ashe, Jr. ....	Lockhart	.....	
Edmund Keith Buchanan ..	Randallstown, Md.	*Mary Ann MacIntyre .....	York, Pa.
Robert Edward Copeland .....	Ehrhardt	Reginald Douglas Mahn .....	Hartsville
Berry Graham Davenport .....	Williamston	*William Leonard McPherson ....	Laurens
John William Flatley .....	Belvedere	William Lee Moore .....	Anderson
Randall Owen Foote ....	Charleston Heights	Albert Earl Parsons, Jr. ....	Andrews
Richard Paul Garrison .....	Easley	David Dwane Peeples .....	Sumter
George Lupton Haselden, Jr. ....	Charleston	Russell William Perdue .....	Greenville
Fred Stevon Kay .....	Belton	*Carl Bruce Smith .....	Mountville
Rembert Michael Keith .....	Lugoff	Daniel Murray St. Andre .....	Macon, Ga.
Albert Ray Koon, Jr. ....	Chapin		

## Mechanical Engineering

Robert Ralph Adams .....	Clinton, Md.	*David Alan Player .....	Westhampton Beach, N. Y.
Ronald Terry Bannister .....	Augusta, Ga.	.....	
**David Dwight Browne ..	Charleston Heights	Norman Smith Richards .....	Elko, Ga.
John Leonard Casey .....	Slater	Larry Stephen Satterfield .....	Easley
James King Chu .....	Kowloon, Hong Kong	*John Michael Stokes .....	Miami, Fla.
*Jackson Manning Copeland ....	Greenville	*Vernon Andrew Trammell, Jr. ....	Clinton
*James Arthur Dickenson .....	Belvedere	Robert Carlton Truesdale ....	West Columbia
Julian Thomas Dickerson .....	York	Charles Stuart Vann .....	Jacksonville, Ala.
James Robert Ferguson .....	Rock Hill	Preston Howard Weeks, Jr. ....	Aiken
William Thomas Lavender, Jr. ....	New Zion	*Edgar Gettys Williams .....	Rock Hill
Douglas Plowden Macdonald .....	Sumter	Floyd Edward Yelton .....	Ruckersville, Va.
*Benjamin Wayne Mooring .....	Columbia		

**COLLEGE OF FOREST AND RECREATION RESOURCES**

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Charles Carraway Gaston -----	Suffolk, Va.	*Terry Ronald Pierce -----	Slater
William Michael Hood -----	Williamston	Donald Wayne Robinson -----	Clover
*William Brunson Hoole, Jr. -----	Florence	William Wesley Satcher -----	Camden
Christopher Wayne Huber -----	Hartsville	Stephen Keith Steed -----	Jackson
***William Brennan Jenkins ----	Summerville		

**Recreation and Park Administration**

David Edgar Angel, Jr. -----	Rock Hill	Richard Wayne Moore -----	Fort Mill
*Iris Anne Bailey -----	Greenwood	John Randall Nixon -----	Central
James Kenneth Bell -----	Sumter	Larry Lynn Orr -----	Gaffney
John Robert Brooks -----	Newberry	Lawrence Dean Owens -----	Ft. Meade, Md.
Patricia Jean Campbell -----	Edison, N.J.	Gail Lynette Ozbolt -----	Walterboro
Warren Eugene Cook -----	Summerville	Ben Gamewell Patterson -----	Gaffney
William Edward Copeland, Jr. --	Orangeburg	Phillip Gordon Powell -----	Pawleys Island
George Leonard Crosgrove ---	Boothwyn, Pa.	Neil Barnes Ratcliff -----	Bethune
Alton Benjamin Cumbie III -----	Central	John Robert Richardson -----	Marion
Martin Hale Durham -----	Anderson	Pamela Hayes Sarvis -----	Tabor City, N. C.
Paul Barmore Ellis III -----	Fort Mill	Timothy John Scheibel -----	Stratford, Conn.
Robert Clyde Fowler -----	Mullins	Van Abram Stickles -----	Abbeville
Jack Worrell Gillette, Jr.		Ben Gamewell Watson -----	North Augusta
-----	Edwards AFB, Cal.	Calvin Robert Weeks, Jr. ---	Savannah, Ga.
Lindsay Blanton Graham ----	Timonium, Md.	Frank Carroll Whiteside, Jr. ---	Spartanburg
Wilbur Rexford Graves -----	Winnboro	John Laurence Williams	
Philip West Jones -----	Florence	-----	Albuquerque, N. M.
Mary Elizabeth Kossler -----	Charleston	Travis Ted Williams -----	Anderson
Roger Dale McJunkin -----	Pickens		

**COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE**

*Wallace Dabney Trevillian, Dean*

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**Arts and Sciences**

**Susan Joan Maile Adams -----	Clemson	Gordon Blackwell Johnson -----	Newberry
Kathy Gay Barton -----	Greenville	Alan Perry Jordan -----	Mauldin
Christopher Lawrence Brooks ----	Greenville	Lucian Reames Lee, Jr. -----	Taylors
Lee Norris Foster, Jr. -----	Greenville	Thomas Edward Reynolds -----	Sumter
Frank Marion Gibson -----	Greenville	Christopher Craig Rhodes -----	Tyrone, Pa.
*Michael Randy Gilliam -----	Whitmire	Harry Arthur Thomas -----	Carlisle
Arnold Johnston Hite -----	Florence	Chris Nicholas Trivelas -----	Charleston

**BACHELOR OF SCIENCE**

**Accounting**

Edward Rufus Bryant, Jr. ----	Pensacola, Fla.	David William Holt -----	Orangeburg
Stanley Joseph Clifford --	Minnetonka, Minn.	Richard Byron Skelton -----	Greenville
*Marvin Boyce Fuller, Jr. -----	Joppa, Md.	Clark Wilson Webb -----	Greenville
Raymond Francis Higgins --	Amityville, N. Y.	Ernest Ralph Wessinger, Jr. -----	Columbia

## Administrative Management

George Woodruff Anderson, Jr. -----	Gastonia, N. C.	Paul Edward Lewis, Jr. ----	North Charleston
Stephen Michael Bridges -----	Greenville	Steven Eugene Madden -----	Anderson
*Roger Curtis Brown -----	Greenville	John Worce Martin III -----	McBee
William Marvin Brown -----	Holly Hill	Richard Smith Matthews -----	Blackville
*Larry Roberts Bruorton -----	Charleston	Gary Leon Nelson -----	Greenville
Richard John Bukowsky -----	Towson, Md.	Joseph Martin Price -----	Greer
Francis Marion Cisa -----	Mt. Pleasant	Johnny Hugh Purser -----	Clemson
Will Newton Crouch -----	Griffin, Ga.	Maxie Roy Putnam -----	Greenville
William James Donald -----	Seneca	*Carlos Quintero -----	Greenville
Thomas Daniel Efland, Jr. -----	Clemson	Wally Dean Saine -----	Vale, N. C.
Thomas George Fuduric -----	Greenville	Gary Luther Shank -----	Dover, Del.
Charles David Gallardo --	Balboa, Canal Zone	George Roland Shelley II -----	Conway
Marcus Donald Harwood -----	Charleston	Ted Douglas Smith -----	Greenville
Lewis Frontis Holmes -----	Trenton	Lud Wilson Vaughn -----	Gaffney
Armistead Claiborne Leigh ----	McLean, Va.	James Mason Von Hollen, Jr. -----	Greenville
		Glenn Eugene Wall -----	Timmonsville

## Financial Management

Samuel Henry Edmunds -----	Sumter	Lee Otis Holloway -----	Sumter
Thomas Andrew Harbin -----	Anderson	Ronald Dale Nicholson -----	Salem
**Thomas Cecil Harman -----	Lexington	William George Tate -----	Greenville
Robert Newton Harper -----	Greenwood	*Neal Anthony White -----	Greenville

## Industrial Management

Johnny Steven Bailey -----	Greenville	James Claude Mixson, Jr. -----	Allendale
**Andrew Joseph Belger, Jr. -----	Varnville	Otis Clifford Phillips, Jr. -----	Newberry
Robert Lyles Blackwell -----	Gaffney	Wilson Keith Rembold -----	Gambrills, Md.
Bobby Jay Bogan -----	Greenville	*Larry Bruce Reynolds -----	Sumter
William Pearson Bond -----	Clinton	Don Dewey Rice III -----	Gastonia, N. C.
William Buchanan Calhoun ----	Greenwood	James Bennett Runion -----	Greenville
Douglas Lee Carlson -----	Charlotte, N. C.	Reginald Kirkland Smith -----	Greenville
*Phillip Leon Chartier -----	Greenville	*Ronald James Smith -----	Asheville, N. C.
Joseph Edwin Cheek -----	Anderson	*Samuel Howard Tolbert -----	Greenwood
*James Sansbury Childers -----	Florence	George Allen Toole, Jr. -----	Williston
James Carroll Cox -----	Greenville	Giles Pearson Toole -----	Williston
Collings Shreve Davis, Jr. -----	Haddonfield, N. J.	John Ferdinand Tucker -----	Greenville
James Monroe Hamilton III -----	Perry, Ga.	William Edward Twilley, Jr. --	North Augusta
David Ashley Holloway -----	Florence	Douglas Lee Walpole -----	North Augusta
Edward Craig Hunnicutt -----	Columbia	Walter Jerald Watkins ----	North Charleston
Daniel Burlin Hunt -----	Isle of Palms	*Walter David West -----	Easley
Charles Daniel Kennedy -----	Greenville	William Townes Wiley -----	Appleton, Wis.
*Donn Richard Laden ----	Morristown, N. J.	Wayne Everett Williams -----	Miami Springs, Fla.
Charlie Michael Lark -----	Easley	*Woodrow Cecil Young -----	Duncan
*Harrell Wilson Ligon -----	Greenville		

## Textile Chemistry

**William Charles McNeill, Jr. -----	Florence	**James Chesley Watson -----	Florence
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## Textile Science

**Thomas Scott Cox -----	Greenville	Merrell Quincy Garvin -----	Pendleton
Almas Feroz -----	Karachi, Pakistan		

## Textiles

James Phillip Acquaviva, Jr. -- Boonton, N. J.

## COLLEGE OF LIBERAL ARTS

*Headley Morris Cox, Dean*

## BACHELOR OF ARTS

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**Benjamin Waldrep Anderson II	Edgefield	-----	North Kingstown, R. I.
**Frederick Wilhelm Andrea III	Aiken	David Lafayette Lyle, Jr.	Travelers Rest
Timothy Winston Barrineau	Mullins	**Garnett Milton Martin III	Pineville, N. C.
Victoria Elizabeth Beasley	Greenwood	Dorothy Gasparro Massie	Parlin, N. J.
*John Bradley Bessent	Spartanburg	Larry Clyde McAdams	Easley
**Anne Mary Biggerstaff	Charleston	Margaret McAdams	Clemson
Betty Jean Black	Easley	Martha Jean McClellan	Iva
John Arthur Bolt	Greenville	Elizabeth Adams McGee	Annapolis, Md.
Paul Hall Bolt	Anderson	**Mary Janet McNair	Gable
Mary Alice Borgman	Clemson	Robert Sturgis McRackan	Sumter
Anthony Oneal Bowers	Greenville	Charles Calvin Michaels, Jr.	Gaffney
Wilson Harvey Brockinton	Charleston	David Joseph Mitchell	Folsom, Pa.
James Albert Bull IV	Ballentine	*Juliette Sims Moore	
Edwin Patterson Burton	Honea Path	-----	Signal Mountain, Tenn.
Janet Taylor Busch	Clemson	Kenneth Wayne Moore	Clemson
Timothy Louis Chestnut	Columbia	Paul Scott Newton	Clemson
Charles Donald Clark	Easley	Anne Wrinn O'Dell	Liberty
John Eliot Collins	Westbrook, Conn.	Lillie Ann Osteen	Anderson
Carolyn Rose Conley	Atlanta, Ga.	*James Henry Owen, Jr.	Clover
Colin Weatherly Covington	Norway	Thales Parker	McCormick
Charles David Crumpton	Taylors	Claude Edward Porter, Jr.	Newberry
Pamela Gayle Cummings	Newberry	Oscar Christopher Rebula	Stamford, Conn.
Robert Augustus Davis	Bowman	Kenneth Gerald Rice	Clinton
*Ann Elizabeth Dickson	Camden	Teresa Jane Robinson	Greenwood
James Edward Dobson	Greenville	Michael Edward Rowe	Charleston
Donald Radge Duncan	Central	*Donald Anthony Sansone	Greenville
Lawrence Amery Dunn	Ambridge, Pa.	**Olga George Savitsky	Clemson
*Johnnie Terrell Epting, Jr.	Columbia	Paul Kaufman Schwieger	
Sherry Yvonne Fortenberry	Sullivans Island	-----	Miami Springs, Fla.
*Barry Edward Grofic	Versailles, Pa.	John Melville Severs	Charlotte, N. C.
James William Hancock, Jr.	Greenwood	Hugh Paley Sharpe	Landrum
Charles Phillip Hanna	Greenville	*Kristen Shealy	Columbia
Charles Wesley Harrell, Jr.	Columbia	Richard Stanley Simpson	Pendleton
**Anne Louise Harshman	Clemson	Stephen Dennis Sinclair	Huntingtown, Md.
Peter Ambridge Hendricks	Chapin	*John Wilson Sloan, Jr.	Charlotte, N. C.
Robert Eugene Hoover	Ridgeville	Thornwell Forrest Sowell III	Chesterfield
Charles Thain Huff	Clemson	Mary McCarter Strom	Piedmont
**Marilyn Duttera Isenhour	Norwood, N. C.	Teresa Lynn Thomason	Pickens
Randolph Dunbar Jones Jackson	Camden	*Robert Wood Thompson, Jr.	Dundaik, Md.
*William Jerome Kelley	Hartsville	Deborah Jane Toney	Seneca
Johnny Aaron Kelly	Williamston	*Vickie Sue Unger	Greenville
Thomas Byron Kendrick	Stone Mountain, Ga.	Kathleen Van Gieson	Greenville
*John Bradford Knudsen		**Jonathan Walker	Easley
-----	Overland Park, Kans.	*Cecelia Elaine Whitten	Clemson
*Thomas Manning Lensing	Alexandria, Va.	*Samuel Free Williams, Jr.	Allendale
*Jerry Glenn Long	Greenville	Warren Dale Willoughby	Chesapeake, Va.
Joseph Wayne Lowe	New Ellenton	Kathy Elizabeth Wright	Seneca
†James Lloyd Lucas III	Chester	David Campbell Wylie III	Chester



## COLLEGE OF NURSING

*Geraldine Labecki, Dean*

## ASSOCIATE IN ARTS

## Nursing

*Linda Diane Ashley -----	Donalds	Debra Guinn Edwards -----	Seneca
Meta Alexander Beard -----	Camden	Steven Earl Freeman -----	Pickens
Margaret Rose Bowers -----	Lancaster	Linda Janet Ingram -----	Marion, N. C.
Christine Ann Bowling -----	Gosford, New South Wales	Anne Louise Kelso -----	Gastonia, N. C.
*Alice Cook Campbell -----	Memphis, Tenn.	*Patricia Dianne Lynn -----	Westminster
Jill Marie Coxey -----	Spartanburg	Sara Lynne McCurley -----	Anderson
*Rhonda Russ Crolley -----	Barnwell	*Linda Grace Perry -----	Clinton
Sandra Roberts Dickson -----	Westminster	Nancy Alden Stone -----	Miami, Fla.
Jane Richardson Duncan -----	Seneca	Wanda Faye Wood -----	Greenville

## BACHELOR OF SCIENCE

## Nursing

*Patricia Ann Bolding -----	Pickens	Nancy Carolyn Lawrence -----	Greenville
Verna Marynell Britton -----	Hemingway	Wilma Jean Mathis -----	Campobello
Claudia Lyn Burkhalter -----	Greenville	*Margaret Adair Patrick -----	Mt. Pleasant
*Jean Faye Garrison -----	Clemson	Ellen Taylor Poe -----	Greenville
Deloris Gardner Griffith -----	Sumter	Mary Madeo Smith -----	Clemson
Linda June Hilliard -----	Greer	*Rebecca Louise Terry -----	Varnville
Janet Elaine Kukulcorn -----	Orangeburg		

## COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES

*Henry Elliott Vogel, Dean*

## BACHELOR OF ARTS

## Arts and Sciences

Charles Joseph Sanguinito -----	Easton, Pa.	Sherry Lynn Stanford ---	St. Augustine, Fla.
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## BACHELOR OF SCIENCE

## Botany

**Stephen Gregory Gibson -----	Clemson	Robert Oliver Hutchens -----	Sumter
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## Chemistry

Joseph Alexander Botts ----	Sullivans Island	Sherryl Anne Schultz -----	Alexandria, Va.
*Thomas Herbert Fielder, Jr. -----	Columbia	*Charles Manly Shuler, Jr. -----	Santee
Walter San Juan Horton -----	Rock Hill	**Eric Heinman Snider -----	Anderson
Dewey Paul Rochester -----	Walhalla		

## Geology

William Edward Truman III --	Temple Hills, Md.
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## Mathematics

**Roxana Alam -----	Clemson	Richard Patrick Montgomery ---	Greenville
Thomas Wimberly Avant -----	Charleston	**William Gaffney Nelson --	Charlotte, N. C.
Elizabeth Deane Clark ----	Asheville, N. C.	*Barbara Rosemary Parris ----	Spartanburg
*Donald Clair Hunt -----	Greenville	*Danny Ray Roberts -----	Spartanburg
Paula Lincine Jones -----	Charleston	*Patricia Diane Rogers ----	North Charleston
**Mary Beth Kelsey -----	Pickens	†**William Frank Thorneloe	
Robert Edward Koch -----	Newberry		Forest City, N. C.
George Winfred Lee -----	Greenville	James Marshall Turner -----	Greenville

**Medical Technology**

Gladys Elizabeth Bloss ----- Clemson      Brenda Joyce Davis ----- Westminster  
 \*Patricia Cowan ----- Aiken

**Microbiology**

Sammy Joe Bates ----- Pickens      Steven Richard Kerekanich ----- Columbia  
 Michael Leonard Brown ----- Mauldin      Susan Pannell Phillips ----- Easley  
 Phillip Harold Charming ----- Taylors      Lee Milton Powers ----- Easley  
 \*Robert Bradley Eaddy ----- Lake City      Ronald Damon Runyon ----- Charleston  
 Wanda Sue Grainger ----- Loris      Susan Elizabeth Rush ----- Greenwood  
 Nancy Ellen Hamilton ----- Clifton, N. J.      \*\*\*Ralph Walter Seelke -- Charleston Heights  
 William Jack Jones ----- Columbia      \*Carol Wannamaker Shuler ----- Clemson

**Physics**

†\*\*\*Kay Wyatt Brown ----- Anderson      \*George Phillips O'Brien ----- Clemson  
 \*Stephen Ray Ledford ----- Fountain Inn      Harold Wayne Page ----- Galivants Ferry  
 \*Earl Bynum Munday ----- Anderson      Donald Kevin Reynolds ----- Clemson

**Pre-Medicine**

\*James Archibald Atkins ----- Dillon      \*\*\*Carey Wilson McKain ----- Taylors  
 Thomas Edward Bunning ----- Greenville      \*James Hinton McMillan ----- Atlanta, Ga.  
 \*Raeford Lee Calloway ----- Easley      \*\*Franklin Edward McPhail, Jr. -- Blackville  
 Helen Yolanda Clark ----- Moncks Corner      \*Dennis K. McRoyan ----- Sarasota, Fla.  
 James Rutledge Coleman, Jr. ----- Pamplico      \*Vann Beth Myers ----- Bowman  
 Vincent James Cositore ----- Bronx, N. Y.      \*John Hill Paylor ----- Greenville  
 \*Samuel Francis Crews III ----- Hampton      \*James Thomas Powell ----- Bethesda, Md.  
 \*Perry Walker DuRant ----- Sumter      †\*Adrian Recinos III ---- Falls Church, Va.  
 \*Jack Curtis Durham, Jr. ----- Mauldin      \*Baron Algernon Rush ----- Camden  
 William Ray Flemming, Jr. ----- Columbia      \*Gary Eugene Siciliano ----- Ocean, N. J.  
 \*\*Lawrence William Freeman ---- Greenville      Thomas James Spencer, Jr. --- Travelers Rest  
 \*Philip Cameron Gainey ----- Hartsville      James Milton Stewart, Jr. ----- Greenville  
 Richard Sewell Halpern --- Huntington, N. Y.      Johnson Huff Ward ----- Ninety Six  
 \*\*David Mark Hicklin ----- Spartanburg      \*Raymond Earl White, Jr. ---- Fountain Inn  
 \*John Patrick Howard ----- Greenville      \*William Lindsay Wylie, Jr. --- Winnsboro  
 \*Barto Paul Kellelt ----- Enoree

**Zoology**

James Blake Bigelow ----- Summerville      Deborah Anne Lindberg ----- Charleston  
 James Harold Bramlett ----- Travelers Rest      Alan Darrell Maxwell ----- Greenwood  
 William Lockman Cathey ----- Williamston      Henry Eddie McKnight ----- Moncks Corner  
 Jesse Alan Chappell ----- Leesville      Lloyd Wayne Pace ----- Easley  
 \*Chadi Ree Daum ----- Miami, Fla.      \*David Paul Potocik ----- Stratford, Conn.  
 Mary Elizabeth DeLoache ----- Camden      Dennis Paul Pruitt ----- Clinton, Md.  
 George Donald Ehnat --- Hilton Head Island      Gloria Jean Sanders ----- Denmark  
 John Wallace Guilds ----- Sumter      Ray Scott Sanders ----- Union  
 \*Dan Lyon Horton ----- Clemson      Nathaniel Bruce Senn, Jr. ----- Laurens  
 Zonnie Jones III ----- Simpsonville      Burl Lee Sorenson ----- Tuttle, N. D.  
 \*Patricia Anne Kelly ----- Greenville      John Thomas Sox, Jr. ----- Columbia  
 \*Evalyn Selby Kilgo ----- Darlington      \*\*\*Nelwyn Louise Stone ----- Anderson  
 Darrell Ross Lake ----- Columbia      \*\*\*Jerry Samuel Watson, Jr. ----- Columbia  
 \*Stephen Ford Lightsey ----- Georgetown

\*With honor  
 \*\*With high honor  
 \*\*\*With highest honor  
 †With departmental honors

**MASTERS' DEGREES CONFERRED MAY 11, 1973***Arnold Edward Schwartz, Dean, Graduate School***COLLEGE OF AGRICULTURAL SCIENCES****MASTER OF AGRICULTURE**

Manuel Padgett Black, Jr. .... Orangeburg	Lucy Peterson Kilby ..... Greenville
Toney Clinton Boozer ..... Inman	Benjamin Whitfield Turnage .... Charleston
David Newberry Hall ..... Mt. Ulla, N. C.	Foster Bradley Wardlaw, Jr. ... St. Matthews

**MASTER OF SCIENCE****Agronomy**

Brian Allison Bailey .... Holly Springs, Miss.	Gerald Neal Hohla ..... Amherst, Ohio
--	---------------------------------------

**Entomology**

John Patrick Dunbar ..... Rock Hill	Paul Mackey Horton ..... Marietta
Randall Parrish Griffin ..... Six Mile	

**Horticulture**

Eldon Elbert Allen, Jr. .... Aynor	Richard Dean Wheeler ..... Clemson
Henry Curtis Edens III ..... Dalzell	

**Poultry Science**

Kathleen Ann Wall ..... Melbourne, Fla.
---

**Wildlife Biology**

David Ruple Hutto ..... Orangeburg
------------------------------------

**COLLEGE OF ARCHITECTURE****MASTER OF ARCHITECTURE**

Verne Cassaday ..... Greenwood	Brooks Robinson Prince III ..... Greenville
William Francis Donaldson, Jr. ..... Annapolis, Md.	Paul Ervin Reavis, Jr. ... Winston-Salem, N. C.
Paul Hughes, Jr. .... Cayce	Stephen Andrew Russell .. Indianapolis, Ind.
George Booker Jennings III ... Roanoke, Va.	Steven Allan Sandberg ... Jamestown, N. Y.
Robert Gene McCleskey ..... Greenville	Tad Allan Stanley ..... Sumter

**MASTER OF CITY AND REGIONAL PLANNING**

Melvyn Raney Brown ..... Columbia	Richard Leslie Merrick .... Northfield, N. J.
William Paul Gilbert ..... Ellicott City, Md.	

**MASTER OF FINE ARTS**

Jeanet Steckler Dreskin ..... Greenville
--

**COLLEGE OF EDUCATION****MASTER OF AGRICULTURAL EDUCATION**

(Agricultural Education is jointly administered by the College of  
Agricultural Sciences and the College of Education.)

Carlton Genair Hutchinson ..... Conway	Martin Howard Hutto ..... Swansea
--	-----------------------------------

**MASTER OF EDUCATION**

Mary Lou Shuff Andrews -----	Elgin, Ill.	Genevieve Elizabeth Pyles Jamison	
Carole Wilson Armfield -----	Clemson	-----	Fountain Inn
Agatha Bailey Babb -----	Starr	Rose Morgan Jochimsen -----	Travelers Rest
Jerry Dillard Baughman -----	Simpsonville	Ruby Bessie Kwan -----	Greenville
Thad Maurice Bevis -----	Union	Anne Glenn Lake -----	Anderson
Barbara Bethea Boling -----	Greenville	Miriam Ashley Lark -----	Anderson
Doris Mitchell Bradberry -----	Williamston	Nancy Jane LeMaster -----	Gaffney
Donna Adkins Brantley -----	Greenville	Fletcher Lenwood Martin, Jr. ....	Greenville
Patricia Lynn Brissey -----	Ware Shoals	Inez Abercrombie Massingill -----	Central
Cleodis Brown -----	Greenville	Roslyn Johnson Mauldin -----	Clemson
Glenn David Buddin -----	New Zion	Eugene McElhannon, Jr. ....	Greenville
Rebecca Louise Burton -----	Donalds	Robby Edward Miller -----	Greenville
Martha Heckerman Carter		Robert Homer Mitchell -----	Greenville
-----	Charleston Heights	Carol Padgett Owens -----	Newberry
Norman McSwain Cason -----	Abbeville	Richard Lee Parson -----	Westminster
Harold Chandler III -----	Sumter	Rachel Ann Patrick -----	St. George
Alan Charney -----	Brooklyn, N. Y.	Carolyn Ferguson Patterson ----	Greenwood
Elizabeth Long Chiles -----	Greenville	Geraldine Poole Price -----	Anderson
Anna Rebecca Clay -----	Greenville	Nell Seawright Reeves -----	Pendleton
Merrily Morris Clippard -----	Greenville	Genevieve Leonora Reidy -----	Clemson
Steve Wayne Coley -----	Landrum	Mary Washington Richardson ..	Decatur, Ala.
James Madison Conley -----	Belton	Derrill Keith Rogers -----	Pelzer
Margaree Seawright Crosby -----	Greenville	Irene Barron Scarborough -----	Greenville
Don Cowan Crum -----	Bartow, Fla.	Timothy Wayne Scott -----	Simpsonville
Jesse Daniel Edgar -----	Seneca	Dora Ellen Shelton -----	Clemson
John Ellis Farr -----	Union	Mary Jo Burton Slice -----	Anderson
Roberta Hinkle Gansman ..	Thomasville, N. C.	Mary Susan Stein -----	Anderson
Elizabeth Hazzard Garner -----	Abbeville	Edna Katherine Stribling -----	Laurens
Martha Murph George -----	Seneca	Lawrence P. Thompson -----	Anderson
Carolyn Virginia Godfrey -----	Ware Shoals	Ransom Carroll Timmerman, Jr. ..	Ninety Six
Emma Mae Goodwin -----	Abbeville	Debbie Inman Townsend -----	Anderson
Shirley McCraw Gray -----	Spartanburg	Rebecca Player Turrentine -----	Greenville
Anjoy Franklin Griffith -----	Greenville	Elizabeth Baynard Ulmer -----	Abbeville
Barbara Allen Haney -----	Greenville	Lawrence Lemond Vanderford -----	Union
Robert Barnes Harrington -----	Greenwood	Geraldine Dugger Walsh -----	Tigerville
Louise Catherine Harris -----	Greenville	Riley Ficklin Watson -----	Greenwood
Sara Welsh Hendricks -----	Easley	May Joonase Welborn -----	Taylors
Margaret Diane Alverson Henson ..	Greenville	Marlene Martin Wheeler -----	Clemson
William Thomas Alvin Henson, Jr. ....	Greenville	Joan Whitehurst -----	Greenville
Elizabeth Ann Holliday -----	Belton	Margaret Wright Williams -----	Honea Path
Myrtle Padgett Hollis -----	Greenville	Kristina Krausche Zipin -----	Central
Henry Hall Hunt -----	Easley		

**MASTER OF INDUSTRIAL EDUCATION**

David Workman Hancock ----- Honea Path

**COLLEGE OF ENGINEERING**

**MASTER OF ENGINEERING**

Joe Kenneth Jones, Jr. ....	Clemson	James Eben Vey -----	Evanston, Ill.
Saifee Kurbanhusain Motiwalla	Bombay, India		
(Degree awarded posthumously)			

**MASTER OF SCIENCE**

**Bioengineering**

David Millard Bartles -----	Rock Hill	Henry Leroy Richbourg, Jr. ....	Dillon
Glenn Fletcher Cueman -----	Honea Path	Ladd Wilson Smith -----	Clearwater, Fla.
David Garvin Porter -----	Spartanburg		



## 442 Student Register

### Chemical Engineering

Norman Lee Brown ----- Hampton, Va.      Douglas Waters VanOsdell ----- Summerton  
Paul Wilson Mims, Jr. ----- Columbia

### Civil Engineering

Charles Leslie Bopp, Jr. ----- Roxboro, N. C.      Phillip James Rowell ----- Columbia

### Electrical Engineering

Ronald James Kopczyk ----- LaSalle, Ill.

### Engineering Mechanics

William James McCabe ----- Stuart, Fla.

### Environmental Systems Engineering

Janice Wilson Daniel ----- Durham, N. C.      Anthony John Knepp ----- Baltimore, Md.  
Michael Glenn Darr ----- Wadsworth, Ohio      William Thomas Knowles ----- Charleston  
Charles Robert Froneberger -- Gastonia, N. C.      Stanley William McChesney ---- Spartanburg

### Materials Engineering

Robert Douglas Ainsworth ---- Dunedin, Fla.

### Mechanical Engineering

Kenneth Paul Conner ----- Gadsden, Ala.      Lonnie Dowd Phifer III ----- Fort Mill  
William Edward Frias ----- Charlotte, N. C.      Bhoopendra Nath Tripathi -- Lucknow, India

### Systems Engineering

Carl Wayne Malstrom ----- Clemson

## COLLEGE OF FOREST AND RECREATION RESOURCES

### MASTER OF FORESTRY

Joseph Snowden Tyson ----- Charleston

### MASTER OF SCIENCE

#### Forestry

James Gordon Williams, Jr. ---- Ridge Spring

## COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

### MASTER OF ARTS

#### Economics

Joyce Bushong Eastman ---- Woodstock, Va.

### MASTER OF SCIENCE

#### Management

Robert Daniel Bowen ----- Camden      Thomas Arthur Messick ----- North Augusta  
Donald Victor Brown ----- Florence      William Robert Wise III ----- Abbeville  
William Lewis Chartier ----- Greenville

**Textile Science**

Chi-Hsiang Henry Chang ---- Yumlin, Taiwan      Harry Phillip Maynard, Jr. ---- Belmont, N. C.

**COLLEGE OF LIBERAL ARTS**

**MASTER OF ARTS**

**English**

Dorothy Smith Golden ----- Eastman, Ga.      Ferris Hendley Hardin ----- Decatur, Ga.

**History**

Linda Jane Dearybury ----- Cowpens

**COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES**

**MASTER OF SCIENCE**

**Chemistry**

Stephen Dewitt Bright ----- Greer

**Mathematics**

James Alan Bate ----- North Rose, N. Y.	Frederick Charles Newruck, Jr.
Stephen Craig Cooper ----- Carrollton, Ga.	----- Norristown, Pa.
Pamela Lynn Frostick ----- Rock Hill	Ronald Wayne Rushing ----- Elba, Ala.
Anne Walters Hitt ----- Taylors	Claude George Songy III
Carolyn Janet Kirby ----- Morganton, N. C.	----- Donaldsonville, La.
Antonio Manuel Lopez, Jr. ----- Miami, Fla.	

**Microbiology**

Paul Ling-Mien Ko ---- Kowloon, Hong Kong

**DOCTORS' DEGREES CONFERRED MAY 11, 1973**

*Arnold Edward Schwartz, Dean, Graduate School*

**COLLEGE OF AGRICULTURAL SCIENCES**

**DOCTOR OF PHILOSOPHY**

**Entomology**

Herbert McCammon Henry ----- Avondale Estates, Ga.

B.A., Hendrix College; M.S., Georgia Southern College

Dissertation: Behavior and Control of Coastal South Carolina Tabanidae (Diptera)

Louise Greene Henry ----- Avondale Estates, Ga.

B.S., University of Georgia; M.S., Georgia Southern College

Dissertation: Biting Midges (*Culicoides* spp.) of Coastal South Carolina

**Plant Physiology**

George Emmitt Carter, Jr. ----- Fayetteville, N. C.

B.S., M.A., Wake Forest University

Dissertation: Chemical and Microbial Degradation of the Substituted Dinitroaniline Herbicide, Trifluralin

**COLLEGE OF ENGINEERING**

**DOCTOR OF PHILOSOPHY**

**Engineering**

Aaron Strother Collins ----- Walhalla

B.S., M.S., Clemson University

Dissertation: State Estimation and Control for the Anaerobic Digestion Process (Field of Specialization: Electrical Engineering)

Jordan Lewis Dorrity ----- Ridgeland

B.S., Clemson University; M.S., Air Force Institute of Technology

Dissertation: Real-Time Digital Tensile Test System with Minicomputer Control (Field of Specialization: Electrical Engineering)

James William Jones, Jr. ----- Travelers Rest

B.S., Clemson University

Dissertation: The Application of Advanced Microelectronics Technology to Water Quality Monitoring (Field of Specialization: Electrical Engineering)

Jiunn Shyong Lin ----- Tainan Hsien, Taiwan

B.S., Cheng Kung University; M.S., National Taiwan University

Dissertation: On Torsional Analysis of a Composite Material Containing a Cavity (Field of Specialization: Engineering Mechanics)

**COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES**

**DOCTOR OF PHILOSOPHY**

**Mathematics**

Nick Mark Stavrakas ----- Charlotte, N. C.

B.S., University of North Carolina; M.S., Clemson University

Dissertation: Two Extensions of Tietze's Theorem on Convex Sets

**Physics**

George Robert Fletcher, Jr. ----- Fort Knox, Ky.

B.A., North Georgia College; M.S., Clemson University

Dissertation: Low Temperature Annealing and Irradiation of Titanium

Joesph Clifford Foster, Jr. ----- Rockford, Ill.

B.S., Memphis State University

Dissertation: Applications of the  $G_4$ , IV Isometry Group to Einstein's Equations

## CLEMSON-FURMAN UNIVERSITIES

### MASTERS' DEGREES CONFERRED MAY 6, 1973

William Russell Adkins	Fort Mill, S. C.
John Norris Aldrich	Laurens, S. C.
Robert Newell Alexander	Spartanburg, S. C.
Flavil Barber, Jr.	Simpsonville, S. C.
Richard Michael Barras	Taylors, S. C.
Paul Otis Batson, III	Marion, S. C.
Billy Covington DuRant	Hartwell, Ga.
Julius Edwards Earle, Jr.	Anderson, S. C.
Grover Sager Elliott	Greenville, S. C.
Derrill Ray Fowler	Clinton, S. C.
Sanford Woodrow Griffin, Jr.	Fort Mill, S. C.
Gary Lee Groff	Taylors, S. C.
Jitendra Nath Gupta	Benaras, India
Ronald Rufus Hall	Anderson, S. C.
James William Hannah	Greer, S. C.
Doyle Roy Harper	Anderson, S. C.
Hugh Michael Hill	Greenwood, S. C.
Michael Larry Hurt	Honea Path, S. C.
Michael Carl Jordan	Simpsonville, S. C.
Paul Arnold Kisling	Simpsonville, S. C.
James Edward Komer	Pittsburg, Pa.
Michael Sidney Lipscomb	Roebuck, S. C.
John G. Makhijani	Bombay, India
Earl Daniel McCutcheon	Spartanburg, S. C.
Anthony Gaines Riley, Jr.	Greenville, S. C.
Thomas Herbert Roberts	Greenville, S. C.
Michael Larry Sanford	Clinton, S. C.
Ray Albert Smalley	Greenville, S. C.
John Wilbur Stoudenmire, Jr.	Sumter, S. C.
George Thomas Thomas, Jr.	Brevard, N. C.
Kenneth Freeman Wickwire	Greenville, S. C.



ASSOCIATE AND BACHELORS' DEGREES CONFERRED  
AUGUST 11, 1973

COLLEGE OF AGRICULTURAL SCIENCES

*Luther Perdee Anderson, Dean*

BACHELOR OF SCIENCE

Agricultural Economics

Turner Correll Hall, Jr. ----- Mt. Ulla, N. C.      Lawrence Smith Norton, Jr. ----- Clio  
Charles Joab Hudson ----- Conway

Agronomy

Russell Henry Shealy ----- Saluda

Dairy Science

Albert Perry Black, Jr. ----- Barnwell      John Ralph Fleming ----- Freehold, N. J.

Horticulture

William Copp Newall ----- Clemson

Poultry Science

Richard Malcolm Turner, Jr. ---- Orangeburg

COLLEGE OF ARCHITECTURE

*Harlan Ewart McClure, Dean*

BACHELOR OF ARTS

Pre-Architecture

Gary Edward Ainslie ----- Cohasset, Mass.      James Leroy Metze ----- Columbia  
James Frank Blose, Jr. ----- Annapolis, Md.      George Washington Seabrook ---- Charleston  
Jerry Dorvan Gilley ----- Wise, Va.      Lawrence Tarentino ----- Bound Brook, N. J.  
John Joseph Heyrich -- Upper Montclair, N. J.      Anthony Carl Triolo ----- Staten Island, N.Y.

COLLEGE OF EDUCATION

*Harold Fochone Landrith, Dean*

BACHELOR OF ARTS

Early Childhood Education

Gladys Jean Shealy ----- Leesville      \*Ellen Howard Stakeman ----- Bennettsville  
\*Martha Jane Snoddy ----- Greenville

Elementary Education

\*Susan Agnew ----- Piedmont      Bivens Smith Rinehart ----- Clemson  
Barbara Sue Finley ----- Belton      \*Joey Wilmoth Roeder -- Jefferson City, Tenn.  
Harriett Ann Floyd ----- Seneca      \*\*\*Cecelia Greene Rogers ----- Piedmont  
Rebecca Jo Turner Harris ----- Simpsonville      \*\*Ann Brewer Sharpe ----- Siler City, N. C.  
Paula Stephens Mitchell ----- Anderson      Selma Diane Smith ----- Central  
Peggy Jean Nicholson ----- Charleston      \*Iveanne Lee Taylor Waters -- North Augusta

**Secondary Education**

*Sherry Davis Bagwell ----- Greenville	Larry Wolfe Laney ----- Monroe, N. C.
Sandra Jane Brunson ----- Alcolu	*Barbara Jean McCrickard ----- Greenwood
*Deborah Anne Cothran ----- Easley	Brenda Melvina Pace ----- Greenville
*Herbert Clarence Eason III ----- Charleston	Betty Jean Terry ----- Anderson
Brenda Sue Grainger ----- Loris	*Teresa Gambrell Watson ----- Anderson
*Mary Rebecca Jessen ----- Summerville	Mary Kay Westmoreland ----- Lancaster
Linda Lever Kelley ----- Bethesda, Md.	

**BACHELOR OF SCIENCE**

**Agricultural Education**

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

William King Bomar ----- Duncan	Stephen Craig Thompson ----- Conway
David Willard Bouknight, Jr. ----- Irmo	Larry Eugene Watts ----- Florence

**Industrial Education**

**Silvie David Crawford ----- Greenville	Michael Hoyt Mathews -- Waynesville, N. C.
David Craig Dorn ----- Charleston	John Ernest Moon ----- Piedmont
Stephen Franklin Gravely ----- Sunset	*Donald Eugene Oglesby -- Oak Ridge, Tenn.
Peter Timothy Haley ----- Pinewood	Joseph Warren Pearson ----- Pendleton
Michael Dennis Hellams ----- Laurens	John Aubrey Price ----- Martin
William John Lind ----- Abbeville	Daniel Hale Toole ----- Warrenville

**Science Teaching**

Wayne Douglas Baker ----- Oakland, N. J.
--

**COLLEGE OF ENGINEERING**

*Lyle Chester Wilcox, Dean*

**BACHELOR OF SCIENCE**

**Ceramic Engineering**

Jerry David Dover ----- Enoree	Mabry Everette Martin ----- Wayland, Ky.
*Carl Russell Epting ----- Leesville	Charles Glenn Morgan ----- Greenville

**Chemical Engineering**

Leif Martin Adams ----- Hartsville	Nelson Larue Hardwick ---- Galivants Ferry
Buddy Eugene Davis ----- Anderson	

**Civil Engineering**

Edward Henry Heuer III ----- Charleston	*Marion Chapman Osteen ----- Anderson
Wilson Jerome Kay ----- La France	*John Bush Pate, Jr. ----- Sumter
Gary James Ledbetter ----- Summerville	Gary Dana Thompson ----- Columbia
Earl Clarence Morrison ----- Bennettsville	William Brown Wright ----- Isle of Palms

**Electrical Engineering**

*Michael Clifton Cannon ----- Liberty	John Paul Mincey ----- Winnsboro
William Jay Carson ----- Sumter	*Derrell Edward Woodfin ----- Gramling
William Floyd Chancellor ----- Charleston	

**Engineering Analysis**

James Henry Aichele, Jr. ----- Charleston	**Michael Simpson Anderson ----- Piedmont
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**Engineering Technology**

*Ronnie James Duncan ----- Seneca	Barry Duane Palm ----- Greenville
Thomas Richard Hare ----- Leesville	Orris Anthony Smith ----- Piedmont
Lewis Milton McAlhany, Jr. ----- Bamberg	

**Mechanical Engineering**

**Samuel David Alexander, Jr. .... Lancaster	Edward Dewey Lindsay ... Alexander, N. C.
John Patrick Ashton, Jr. .... Millville, N. J.	Michael Edward Miller
Richard Sease Cathcart III ..... Columbia	..... Laurel Springs, N. C.
Edward Thomas Cunningham ..... Taylors	Perry Joe Mize ..... Central
Terry Lynn Hampton ..... Laurens	David Paul Patrick ..... Garden City Beach
Robert LaCoste Kirven III ..... St. Charles	John Clement Tomsyck ..... Greenville

**COLLEGE OF FOREST AND RECREATION RESOURCES***William Henry Davis McGregor, Dean***BACHELOR OF SCIENCE****Forestry**

Robert Donald Carey .... Farmingdale, N. Y.	Robert Lee McMahan ..... Myrtle Beach
Robert Lamar Coble ..... Florence	Carl Forest Murphy ..... Central
Edward Boykin Hicks ..... Spartanburg	Gene Dallaire Prevatte ..... Hemingway
Charles Paul Major ..... Wilmington, Del.	

**Recreation and Park Administration**

Randy Leo Bell ..... Greenville	James Abner Heckle ..... Rock Hill
Jane Burdette ..... Ware Shoals	Michael LeGrand Hendrick ..... Conway
Terry Alan Calhoun ..... Hyattsville, Md.	*Claudette Farrow Lewis ..... Clemson
Philip Creswell Curtis ..... Johnston	Candis Anne Ridgley ..... Greenville
Lamar Nelson Deaton ..... North Charleston	Michael Earl Rochester ..... Seneca
Richard McClean Garrison .. Sandy Springs	Daniel Steven Smith ..... Liberty
Gerald Wade Gerken ..... Charleston	Thomas Hunter West ..... Marion
Calvin Cecil Harris, Jr. .... Walterboro	

**COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE***Wallace Dabney Trevillian, Dean***BACHELOR OF ARTS****Arts and Sciences**

James Robert Clarkson ..... Kingstree	Barry Glenn Spruell ..... Greenville
Michael Eugene Sams ..... Anderson	Marilyn Stuart Whitener ..... Newberry
Tommy Perkins Smith ..... Greenville	John Dewey Winburn ..... Columbia

**BACHELOR OF SCIENCE****Accounting**

David Martin Landers ..... Nutley, N. J.	*Jerry Burgess Miller ..... Greenville
Charles Stephen Lee ..... Conway	**Gloria Jean Warner ..... Greenwood
Michael Fred McGlothlin ..... Charleston	

**Administrative Management**

Albert Donal Allbritton, Jr. .... Sumter	Charles Baldwin Hilburn ..... Mt. Pleasant
Richard Daniel Blanton ..... Augusta, Ga.	Irving William Hunt III ..... Columbia
Roberto George Bradford	Nelson Thomas Kessler ..... Greenville
..... Rio de Janeiro, Brazil	William Franklin Lowe ..... Greenville
David Leaque Connelly ..... Greenville	Franklin Darnell McElveen ..... Sumter
Ernest Wesley Cooler III ..... Pickens	Michael Russell Randall ..... Rock Hill
Thomas Dale Ferguson III ..... Abbeville	*Alanna Dee Venezia .... Cambridge, Mass.
David Karl Fishburne ..... Doraville, Ga.	Thomas James Weeks ..... Ware Shoals
James Steve Gresham ..... Greenville	Edward Donald Woodrow ..... Olanta

**Financial Management**

Patrick Warner Dawkins ----- Greenville  
 Jack Williamson Gibson ----- Sumter  
 Craig Suydam McManus ----- Charleston

Eugene Howard Schlaman -- Hampton, Iowa  
 Barry DeLane Waters ----- Anderson

**Industrial Management**

Ronnie Larry Brown ----- Piedmont  
 Grady Edward Dominick ----- Prosperity  
 Timothy Eugene Gause ----- Spartanburg  
 George Constantine Georgiades -- Greenville  
 James Michael Greenwood -- Greenville, Tenn.

Steven Robeson King ----- Chesterfield  
 Victor William Mullen ----- Anderson  
 David Emory Ott ----- North Charleston  
 Thomas Freeman Watkins ----- Seneca  
 David Leon Wynn ----- Cheraw

**COLLEGE OF LIBERAL ARTS**

*Headley Morris Cox, Dean*

**BACHELOR OF ARTS**

\*Debra Lisa Burton ----- Calhoun Falls  
 Sandra Sue Cameron ----- Palermo, N. J.  
 Johnny Mitchell Clary ----- Greenville  
 Richard Furman Dabbs ----- Sumter  
 Robert Derrell Drake ----- Mauldin  
 Daniel Max Foster ----- Greenville  
 Candace Ann Galloway ----- Anderson  
 Saverio Hagood ----- Philadelphia, Pa.  
 \*\*Joyce Cameron Harder ----- Sumter  
 Ben Wayne Harding ----- McBee  
 Richard Worthington Hopkins  
 ----- Fort Deposit, Md.  
 Stewart Douglas Ivey ----- Candler, N. C.  
 Charles Lee Jackson, Jr. ----- Summerville  
 Elizabeth Coit Johnson ----- Columbia  
 Mary Kathryn Kemp ----- Ninety Six

Edward Hamlin King ----- Hartsville  
 William Norris Lawrence ---- Rockville, Md.  
 Mary Elizabeth McCaskill ----- Greenville  
 Sharon Ann Mumma ----- Greenville  
 \*\*Marilyn Clark Norton ----- Seneca  
 \*George Michael Pearce ----- Cheraw  
 Chris Parnell Plyler ----- Columbia  
 Thomas Henderson Priddy ---- Dover, Mass.  
 Kirk Dickson Rutter ----- Summerville  
 Philip Blase Samulski ----- North Augusta  
 Robert Wayne Sellars ----- Greenville  
 \*James Paul Shirley ----- Pickens  
 \*Linda Ruth Sloan ----- Greenville  
 Steven Harold Thompson ----- Easley  
 William Howard Watson, Jr. ----- Anderson  
 Wendy Collis Willeford ----- Charleston

**COLLEGE OF NURSING**

*Geraldine Labecki, Dean*

**ASSOCIATE IN ARTS**

**Nursing**

Patricia Stroud Gettys --- Huntington, W. Va.

**BACHELOR OF SCIENCE**

**Nursing**

Nancy Laura Byars ---- Morgantown, W. Va.

**COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES**

*Henry Elliott Vogel, Dean*

**BACHELOR OF ARTS**

**Arts and Sciences**

\*\*Sarah Lavinia Henderson -- Baltimore, Md.

Craig Allan Mobley ----- Chester



**BACHELOR OF SCIENCE**

**Geology**

Robert Benjamin Hursey --- North Charleston

**Mathematics**

Karl Beasley Chandler ----- Sumter \*John Harrison Ragland ----- Newberry

**Microbiology**

James Edward Keller, Jr. ----- Spartanburg

**Pre-Medicine**

Jeffrey William Foster ---- Newburgh, N. Y. Michael Thomas Jones ----- Greenville  
 Aubrey Doyle Gantt, Jr. ----- Williston Talmadge Lawson ----- Bamberg  
 \*Wayne Edward Iseman ----- Sumter \*\*Jacob Dudley Rouse ----- Luray  
 Daniel Alberto Janer ----- Rio Piedras, P. R.

**Zoology**

Malcolm Logan Brooks, Jr. ----- Gordon, Ga. \*Diana Rose Glover ----- Huger  
 Thomas Winfred Cleveland, Jr. Howard Walter Harder II ----- Sumter  
 ----- Fort Valley, Ga. Rick Alan Harvey ----- Greenville  
 Michael Gregg DeWitt ----- Hartsville Thomas McKinley King ----- Darlington  
 Theodosius Bartow Ford III ----- Greenville \*\*Lewis Miller Wright ----- Anderson

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\*With honor  
 \*\*With high honor  
 \*\*\*With highest honor

**MASTERS' DEGREES CONFERRED AUGUST 11, 1973**

*Arnold Edward Schwartz, Dean, Graduate School*

**COLLEGE OF AGRICULTURAL SCIENCES**

**MASTER OF AGRICULTURE**

James Clement Davis \_\_\_\_\_ Centenary      Leon John Luszcz, Jr. \_\_\_\_\_ Franklin, Mass.  
John Evans Keller \_\_\_\_\_ Elloree

**MASTER OF SCIENCE**

**Agronomy**

Gene Eldred Hardee \_\_\_\_\_ Loris

**Entomology**

Glen Irwin Garris \_\_\_\_\_ Sumter      Joseph Harry Patti \_\_\_\_\_ Hinesville, Ga.  
Henry Singleton Moore IV \_\_\_\_\_ Georgetown

**COLLEGE OF ARCHITECTURE**

**MASTER OF CITY AND REGIONAL PLANNING**

Michael Downey Best \_\_\_\_\_ Hartsville      Leonardo Serrano \_\_\_\_\_ Quito, Ecuador  
Lewis Mobley Ficken \_\_\_\_\_ North Augusta

**MASTER OF FINE ARTS**

Thomas George Turner, Jr. \_\_\_\_\_ Morris, Ill.

**COLLEGE OF EDUCATION**

**MASTER OF AGRICULTURAL EDUCATION**

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

William Frank Sandifer \_\_\_\_\_ York      Hubert Boyd Waldrop \_\_\_\_\_ Inman  
Woodroe Harold Stokes \_\_\_\_\_ Lake City      William Weston Weldon \_\_\_\_\_ Florence  
James Duffie Stone \_\_\_\_\_ Ridgeville

**MASTER OF EDUCATION**

Edward Colie Ables \_\_\_\_\_ Liberty  
Gary Dean Adams \_\_\_\_\_ Bessemer City, N. C.  
Kathy Lynn Adams \_\_\_\_\_ Bessemer City, N. C.  
Nancy Trexler Amundson \_\_\_\_\_ Columbia  
Nancy Wilson Bagwell \_\_\_\_\_ Piedmont  
Georgia Lou Thompson Bannister \_\_\_\_\_ Anderson  
Jane Greer Barnes \_\_\_\_\_ Walhalla  
Elaine Lanford Barnett \_\_\_\_\_ Walhalla  
Ann Harding Bettis \_\_\_\_\_ Greenville  
Lillian McGee Bevell \_\_\_\_\_ Anderson  
Priscilla Savage Blankenship \_\_\_\_\_ Simpsonville  
Donald Paul Bock \_\_\_\_\_ Easley  
Eleanor Gayle Bolt \_\_\_\_\_ Greenwood  
John Dale Bone \_\_\_\_\_ Anderson  
Henry Hoyt Bonnette, Jr. \_\_\_\_\_ Myrtle Beach  
Willie Elmer Bowers \_\_\_\_\_ Pickens  
Martha Dobbins Brackin \_\_\_\_\_ Westminster  
Charles Daniel Broome \_\_\_\_\_ Spartanburg  
Barbara Lawson Brown \_\_\_\_\_ Buffalo  
Sallie Ann Chapman Brown \_\_\_\_\_ Greenville  
Joseph Brownlee \_\_\_\_\_ Iva  
Larry Thomas Bryant \_\_\_\_\_ Anderson  
David Read Buzzell \_\_\_\_\_ Greenville  
Ulis Byrd, Jr. \_\_\_\_\_ Gray Court  
Louise Hoyt Campbell \_\_\_\_\_ Pendleton  
Judith Snelgrove Cannon \_\_\_\_\_ Liberty  
Anne Cromer Cargill \_\_\_\_\_ Greenville  
Harriett Bannister Cartledge \_\_\_\_\_ Abbeville  
Katherine Baker Chandler \_\_\_\_\_ Abbeville  
Vicky Moore Chartier \_\_\_\_\_ Greenville  
Jerry Dennis Cheek \_\_\_\_\_ Anderson  
Peggy Smith Clevenger \_\_\_\_\_ Buies Creek, N. C.  
Caroline Conwell Clyde \_\_\_\_\_ Anderson  
David Luther Coleman \_\_\_\_\_ Summerton  
Sheryl Robinson Connell \_\_\_\_\_ Union  
Polly Adair Copeland \_\_\_\_\_ Clinton  
Catherine Lee Cox \_\_\_\_\_ Napierville, Ill.  
William Max Cox \_\_\_\_\_ Greenville  
Gerald Wood Crawford \_\_\_\_\_ Donalds  
Arlar Carthel Crout \_\_\_\_\_ Easley  
Eleanor Marie Cunningham \_\_\_\_\_ Greenville  
Maxine Robinson Cunningham \_\_\_\_\_ Belton  
Barbara L. Chestnut Darracott \_\_\_\_\_ Piedmont  
Judith Harris Davies \_\_\_\_\_ Greenwood  
Fannie Belle Davis \_\_\_\_\_ Belton  
Judith Freeman Davis \_\_\_\_\_ Marion  
Margaret Duncan Dean \_\_\_\_\_ Williamston  
Sue Foster Deane \_\_\_\_\_ Easley  
Jesse William Diss \_\_\_\_\_ Anderson  
Hazel Nix Driggers \_\_\_\_\_ Abbeville

## MASTER OF EDUCATION (Continued)

Margaret Clyburn Duckett -----	Greenwood	Debra Buzhardt McAmish -----	Greenwood
Brenda Sims Ellison -----	Williamston	Joe Thomas McConnell -----	Calhoun Falls
June Miller Emery -----	Townville	Anthony McFadden -----	Easley
David Roy Farnham -----	Travelers Rest	Bessie McFadden -----	Easley
Charles Dean Fleming -----	Taylor	Anne Sadler McInvaill -----	Conway
Thomas Wilson Fort -----	Abbeville	Kay Hamilton McKee -----	Anderson
Jeanne Gore Fowler -----	Belton	R. Jean McRae -----	Augusta, Ga.
Jessie Lewis Gaillard -----	Williamston	Susanna Sargent Medlock -----	Pendleton
Warren Richard Garrett, Jr. -----	Fair Lawn, N. J.	Lynda Vinson Milasnovich -----	Pendleton
Mary Lou Golightly -----	Easley	Ann Marie Miller -----	Spartanburg
Mildred Guyton -----	Aiken	David Hood Mitchell, Jr. -----	York
Alva Romayne Hamilton -----	Easley	Virginia Colvin Mobley -----	Anderson
Sarah Joan Harris -----	Bellmead, Tex.	Billy Jack Moore -----	Anderson
Jerry Kay Hawkins -----	Inman	Ronald Elvin Moore -----	Easley
Margaret Elizabeth Hayden -----	Starr	Allan Jake Moretz -----	Boone, N. C.
Jack Nelson Hendrick, Jr. -----	Chesterfield	Myra Dale Moseley -----	Toccoa, Ga.
Linda Pound Hill -----	Abbeville	Gail Brewer Newell -----	Cayce
Nancy LaVerne Hill -----	Piedmont	Shirley Anne O'Dell -----	Travelers Rest
Homer Eugene Hinton -----	Simpsonville	Lucy Seawright Orr -----	Pendleton
Richard Calhoun Hitch -----	Greenville	Nancy Carolyn Owen -----	Piedmont
Jerry Wesley Holliday -----	Anderson	Vivian Nichols Owens -----	Mauldin
Hershell Ray Hubbard -----	Clemson	Tillie Marlowe Parker -----	Honea Path
Susan Moore Hughes -----	Clemson	William David Patrick -----	Florence
James Truman Humbert -----	Pelzer	Elizabeth Abernathy Pearce -----	Gaffney
Cynthia Beall Hyatt -----	Greenville	Donna Jordan Peek -----	Anderson
Ann Barrett Ingram -----	Easley	Susan Reisinger Pence -----	Greenville
Theresa Lawson Jacobs -----	Greenwood	Wayne Andrew Pendergrass -----	Oak Ridge, Tenn.
Ellen Palmer Johnson -----	Spartanburg	Susan Henderson Poss -----	Taylor
Fred Warren Johnson -----	Kingsport, Tenn.	Donna Loftis Pursley -----	Abbeville
Maritha Jacqueleen Johnson -----	Columbia	Thomas Michael Quinn -----	Anderson
Judith Drake Jones -----	Anderson	Mary Helen Ragland -----	Piedmont
Betty Sue Jordan -----	Greenville	Barbara Alice Wells Rearden -----	Seneca
Christine Nix Julian -----	Easley	Karen Ann Reese -----	Easley
Letha Vauceille Kay -----	Six Mile	Dwight Raymond Reynolds -----	Clinton
John H. Kelley -----	Walhalla	John Ann Rhodes -----	Pendleton
Ann McElrath King -----	Greer	Linda Louise Richardson -----	Seneca
Lynn Rogers King -----	Piedmont	Rebecca Shetley Riddle -----	Greenville
Doris Masters Landrum -----	Simpsonville	Lynne McCuen Ridgeway -----	Williamston
Rachel C. Larson -----	Greenville	Dorothy Duckett Robertson -----	Anderson
Ann Tanner Lawson -----	Anderson	Barbara Clark Rogers -----	Westminster
Patricia Simmons Lehman -----	Clinton	Barbara Thompson Rogers -----	Anderson
Charlotte Riley Leitner -----	Winnsboro	Dorothy Battle Rosemond -----	Greenville
Vicki Lee Lesley -----	Easley	John Neely Ross -----	Washington, D. C.
Douglas Eugene Limbaugh -----	Easley	Margaret R. Rucker -----	Belton
Connie Chism Lister -----	Anderson	Eloise Lyndon Rudy -----	Simpsonville
Sara Polk Lochridge -----	Pascagoula, Miss.	Carlotta Kornahrens Rutter -----	Summerville
Joyce Paschal Lofton -----	Clemson	Cornelia Elizabeth Sargent -----	Pendleton
Gloria Tate Long -----	Anderson	William Jesse Seay -----	Charlotte, N. C.
James Gnann Long -----	Newberry	Patricia Hadden Senn -----	Seneca
Marcelle Babb Long -----	Greenville	Mary Kathleen Shackelford -----	Piedmont
Gary Wendell Looper -----	Pickens	Elaine Robbins Shamlin -----	Piedmont
Jacqueline McCraw Looper -----	Anderson	Shelby Jean Simmons -----	Greenville
Gloria Wilson Lowe -----	Belton	Brenda Massey Simpson -----	Williamston
Jay Randall Luncford -----	Clemson	Fredrick McCall Simpson -----	Greenville
Maria Doris Lynn -----	Greer	Betty Kellett Sims -----	Pelzer
Millie Ann Mahaffey -----	Newberry	Joy Seawright Smith -----	Donalds
Joan Ladinig Mahn -----	Clemson	Pam Etta Lines Smith -----	Cocoa Beach, Fla.
Marion Lee Manning -----	Calhoun Falls	Dorothy Bridges Sprouse -----	Piedmont
Sue Coffey Maret -----	Anderson	Merilyn Huggins Stalvey -----	Spartanburg
Lila Wells Massengill -----	Greenwood	Carl Dayton Stegall -----	Anderson
Nelle Dillard Matthews -----	Columbia	Mary Susan Stein -----	Anderson
James G. Mattos -----	Greenville	Carol Joan Steingard -----	Greenville
James Fuller Maxon -----	Laurens	Sarah Knox Strickland -----	Anderson
Robin Leslie May -----	Wilmette, Ill.	Vivian Staples Strickland -----	Abbeville

**MASTER OF EDUCATION (Continued)**

Carolyn Anne Stuart ----- Greenwood	Harold Monroe Waters ----- Liberty
Thanell Ladd Sumpter ----- Easley	Catherine Bowen Weaver ----- Anderson
Melinda Jean Sutton ----- Laramie, Wyo.	Charleen Baker Welch ----- Anderson
Betty Baughcome Taylor ----- Greer	Brenda McCarter Whitesides ----- Laurens
Leighton Douglas Teague ---- Purlear, N. C.	Ann LaVerne Williams ----- Hodges
Doris Jacks Tingle ----- Tigerville	Pamela Davis Williams ----- Anderson
John Edward Tipton ----- Greenville	William Wesley Williams II ---- Greenville
Robert Lee Todd III ----- Greenville, Ga.	Emmaline Ashley Woods ----- Honea Path
Laura Blanche Tyler ----- Allendale	Sallie Campbell Woodson ---- Travelers Rest
Gladys Cannada Vernon ----- Greenville	Alice Potts Wright ----- Anderson
Ronald Alan Walfield ----- Walterboro	Linda Gay Wright ----- Marion
William Lloyd Walker ----- Greenville	Daniel Clark Yarborough ----- Woodruff
Cheryl Riddle Warder ----- Anniston, Ala.	Wanda Vickery Youmans ----- Greenville

**MASTER OF INDUSTRIAL EDUCATION**

Donald Thomas Boone ----- Clemson	John Francis Hartnett ----- Clemson
J. Patrick Bruening ----- Charleston	Kenneth William Lake ----- Taylors
Eugene Chastain ----- Sumter	Allen M. Main ----- Island Falls, Maine
James Lee Cook ----- Olney, Ill.	Charles Albert Mayer ----- Little Mountain
Horace Ellis Crouch ----- Columbia	Winfred Seawell McLeod ----- Vinton, Va.
David Wayne Dailey ----- Spanish Ft., Ala.	Francis Willard Strong ----- Appleton, N. Y.
Lee Grand Edens ----- Hamlet, N. C.	Marshall William Welch ----- Easley

**COLLEGE OF ENGINEERING**

**MASTER OF ENGINEERING**

Robert Jay Cooper ----- Clemson	Joseph Francis O'Brien ---- Annandale, Va.
Michael Charles Mark ----- Bronx, N. Y.	

**MASTER OF SCIENCE**

**Bioengineering**

Ronald Larry Dooley ----- Martinsville, Va.	William Curtis Richardson ---- Spartanburg
---	--

**Ceramic Engineering**

John Weston Cotton ----- Columbia
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**Chemical Engineering**

Ralph Michael Mobley ----- Heath Springs
--

**Civil Engineering**

Sidney Ashford Brantley ----- Easley	Marvin Eugene Nettles ----- Ridgeland
Don Michael Cribb ----- Walterboro	Joseph James Wiley III ----- Summerville
Thomas Raymond Dion ----- Summerville	

**Electrical Engineering**

Thomas Marvin Bell ----- Lodge	John Edward Hadstate ----- Summerville
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**Environmental Systems Engineering**

Kenneth Monroe Barrett ----- Rock Hill	Hyman Karesh ----- Burton
Marshall Wayne Corlew -- Hazel Green, Ala.	

**Materials Engineering**

Ralph James Brackett ----- Tampa, Fla.	Charles Wesley Jennings ---- Spartanburg
--	--

**Mechanical Engineering**

William Barry Chisholm ----- Clinton	Harold Senn James ----- Union
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**Water Resources Engineering**

Wayne Bryan Smith ----- Greenwood
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**COLLEGE OF FOREST AND RECREATION RESOURCES**

**MASTER OF RECREATION AND PARK ADMINISTRATION**

Leslie Williams Brusse -- College Station, Tex.	Keenan Gary Craig ----- Greenville
Edward Joshua Collins, Jr. ----- Belvedere	Carey Lee Rawlinson, Jr. ----- Manning



**COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE**

**MASTER OF ARTS**

**Economics**

George Edward Biediger ----- Greenville      Janet Jamison Glocker ----- Glenelg, Md.

**MASTER OF SCIENCE**

**Management**

Alison Luedtke Drews ----- Central      Jack Laverne Mooneyhan ----- Seneca

**COLLEGE OF LIBERAL ARTS**

**MASTER OF ARTS**

**English**

Larry William Abernathy --- North Augusta      Jean Dale Brubeck ----- Staunton, Va.  
Evelyn Katherine Brownlee --- Honea Path

**History**

Patricia Ali ----- Clemson      Elizabeth Fleming Balk ----- Blackville

**COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES**

**MASTER OF SCIENCE**

**Mathematics**

Thomas Barry Edwards ----- Ninety Six      John Augustus Neuffer ----- Clayton, N. Y.  
James Michael Malec -- South Hadley, Mass.

**Microbiology**

Joseph Kirby Farrington --- Jacksonville, Fla.

**Physics**

Mark Stephen Chapman -- Falls Church, Va.      Charles Evans Thompson -- North Charleston

**Zoology**

Leo Stephen Frawley' ----- Hingham, Mass.      Robert Braynard Peabody ---- Holden, Mass.  
Daniel Edward Meyer ----- Ramsey, N. J.

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**DOCTORS' DEGREES CONFERRED AUGUST 11, 1973**

*Arnold Edward Schwartz, Dean, Graduate School*

**COLLEGE OF AGRICULTURAL SCIENCES**

**DOCTOR OF PHILOSOPHY**

**Agronomy**

Joseph Ray Johnson ----- Waynesboro, Miss.  
B.S., M.S., Mississippi State University  
Dissertation: Inheritance of Test Weight in Semi-Dwarf Wheat Crosses

**Animal Physiology**

Patsy Salome Capps ----- Zirlonia, N. C.  
B.S., University of North Carolina  
Dissertation: Influence of Undernutrition on the Bovine Adrenal Cortex  
I. Histochemistry and Biochemistry  
II. Ultrastructure  
III. Plasma Corticosteroid Levels

**COLLEGE OF ENGINEERING**

**DOCTOR OF PHILOSOPHY**

**Engineering**

- Raymond Rees Glenn ----- Barberton, Ohio  
 B.S., Tri-State College; M. S., Clemson University  
 Dissertation: Design of a Speech Synthesizer Using Interactive Graphics (Field of Specialization: Electrical Engineering)
- John William Hyden ----- Charleston  
 B.S., Bucknell University; M.S., Oregon State University  
 Dissertation: A Computer Simulation Analysis of Surface Water Quality Management Policies under Dynamic Economic and Hydrologic Conditions (Field of Specialization: Systems Engineering)
- Irvin Atla Jefcoat ----- Newport News, Va.  
 B.S., Virginia Polytechnic Institute; M.S., Clemson University  
 Dissertation: The Hydrogenation of Ethylene Using a Platinum-Alumina Catalyst Prepared by Chemical Vapor Deposition (Field of Specialization: Chemical Engineering)
- Howard McDonald Jones ----- Greenville  
 B.S., Clemson University  
 Dissertation: The Investigation of the Properties of a Sequential Machine that is Capable of Parallel Computation of Regular Expression (Field of Specialization: Electrical Engineering)

**COLLEGE OF PHYSICAL, MATHEMATICAL AND BIOLOGICAL SCIENCES**

**DOCTOR OF PHILOSOPHY**

**Chemistry**

- Charles Virgil Hinton, Jr. ----- Atlanta, Ga.  
 B.A., West Georgia College  
 Dissertation: Concentration Effects on the Kinetics of Methyl Acrylate-1, 1-Diphenylethylene Copolymerization

**Mathematics**

- Philip George Buckhiester ----- Clemson  
 B.S., Clemson University  
 Dissertation: Symmetric Bilinear Forms and the Matrix Equation  $XAX^t = C$  Over a Finite Field of Characteristic Two
- Robert Richard Taylor, Jr. ----- Greenville  
 B.S., Bob Jones University; M.A., Pennsylvania State University  
 Dissertation: Certain Matrix Equations Over Finite Boolean and Incidence Algebras

**Physics**

- Vivian Gail Horton Foster ----- Central  
 B.S., East Tennessee State University  
 Dissertation: A Lagrangian Field Theory for Massive Arbitrary Spin Particles

**Zoology**

- Radman Mahmood Ali ----- Clemson  
 B.A., M.S., Miami University, Oxford, Ohio  
 Dissertation: The Dissolution of Urinary Stones with a Flaxseed Extract
- Donald Stephen Cherry ----- Paterson, N. J.  
 B.S., Furman University; M.S., Clemson University  
 Dissertation: Dynamics of a Piscine Community in a Reservoir Ecosystem
- Henry Richard Mushinsky ----- Pendleton  
 B.S., Tusculum College; M.S., East Tennessee State University  
 Dissertation: Ontogenetic Development of Habitat Preference in Amphibians: The Influence of Early Experience

**ASSOCIATE AND BACHELORS' DEGREES CONFERRED  
DECEMBER 20, 1973**

**COLLEGE OF AGRICULTURAL SCIENCES**

*Luther Perdee Anderson, Dean*

**BACHELOR OF SCIENCE**

**Agronomy**

*Daryl Roger Critchlow ----- Halsey, Oregon	Broadus Patterson Lamb, Jr. ----- Callison
Wayne Fulton Hill, Jr. ----- Timmons ville	Ernest Lyle Locke ----- Rock Hill
Sidney Hamilton Hughes ----- Blenheim	Steven Lamar Long ----- Clemson

**Animal Science**

Evin Joan Evans ----- Greenville	Michael Ervin Lane ----- Kingstree
James Frank Gilreath, Jr. ---- Travelers Rest	Thomas Belton Laney, Jr. ----- Cheraw
Mason Leroy Harris, Jr. -- Charleston Heights	*John David Ohlandt, Jr. ----- Charleston
William Melvin Harris, Jr. ----- Chester	**John William Snyder --- Delray Beach, Fla.
Thomas Holmes Herlong ----- Johnston	Phil Erwin Wood ----- Woodruff

**Dairy Science**

\*Joel Clinton Riley ----- Saluda

**Horticulture**

Edward Young Murphy ----- Edgemoor	Fred Morgan Robinette ----- Pacolet
Shirley Brooks Parler ----- Myrtle Beach	***Judith Elizabeth Sheppard ----- Liberty

**COLLEGE OF ARCHITECTURE**

*Harlan Ewart McClure, Dean*

**BACHELOR OF ARTS**

**Pre-Architecture**

Thomas Clayton Anders, Jr. ----- Cleveland	Robert Tad Silance ----- Florham Park, N. J.
Henry Elbert Avent, Jr. ----- Bennettsville	James Christian Slater ---- Washington, D. C.
Bradford Lee Bauss ----- Portland, Conn.	

**BACHELOR OF SCIENCE**

**Building Construction**

Calvin Randolph Barnette ----- Pendleton	Sanford Paul Turner ----- Anderson
James Harold Edgerly ---- Gatlinburg, Tenn.	

**BACHELOR OF ARCHITECTURE**

Charles Henry Clinchard ---- Guayama, P. R.

**COLLEGE OF EDUCATION**

*Harold Fochone Landrith, Dean*

**BACHELOR OF ARTS**

**Early Childhood Education**

Ann Elizabeth Barnes ----- Walterboro	Jeannie Rogers Sasser ----- Dillon
Doris Davis Brannock ----- Greenville	

**Elementary Education**

Elizabeth Ann Benjamin -----	Greenville	*Jan Melia Owens -----	Greenville
Pamela DeFanti Bowen -----	Camden	Katherine Finley Parnell -----	Ware Shoals
Claudia Gail Bowers -----	Greenville	Deborah Susan Polson -----	Marion
*Judy Vearl Bryson -----	Taylors	**Elaine Burgess Pullen -----	Kingstree
Doris Wilson Clayton -----	Laurens	Doris Jane Reynolds -----	Slater
**Bonnie Lee Cooke -----	Greenville	Thomas Mell Richardson, Jr. --	Good Hope, Ga.
Martha Katherine Crain -----	Greenville	*Marjorie Lynn Salter --	Ft. Lauderdale, Fla.
Deborah Skinner Cumbie -----	Clemson	Kelli Anne Sanborn -----	Greenville
*Barbara Anne Drake -----	Anderson	*Arleatha Smith Sartain -----	Easley
Elizabeth Gregg Hamilton -----	Easley	Jerrilu Kirk Smith -----	Easley
Mary Elizabeth Harris -----	McCormick	Donna Yvonne Spainhour -----	North Myrtle Beach
Pamela Caroline Hitt -----	Liberty	Lois Henson Stokes -----	Campobello
Diane Walters Ivey -----	Decatur, Ga.	Kay Coleman Thompson -----	Hopkins
**Judy Mason Keaton -----	Anderson	**Patricia Corrinne Vaughn ----	Great Falls
*Deborah Mulkey Long -----	Monroe, Ga.	**Nancy Kathleen Watkins -----	Greenwood
Margaret Martin Nelson -----	DeLand, Fla.		
*Anita Wilson Newton -----	Clemson		

**Secondary Education**

Ronald Paul Addis -----	Seneca	John Blakely Hughes, Jr. -----	Rock Hill
*Alice Morley Beckish -----	Wichita, Kan.	**Faye Balentine Jones -----	Simpsonville
David Franklin Boothe -----	Greenville	*James Edward Loftis, Jr. -----	Spartanburg
Katheryn Elizabeth Craven -----	Florence	*Carol Jean McCown -----	Anderson
Glenn Elliott Davis -----	Rock Hill	*Rebecca Jean McKinney -----	Greenville
Pamela Ruth Dulin -----	Columbia	**Corrie Scott Morrow -----	Greenville
Kathy Myers Foster -----	Clemson	Wade Thomas Oxendine -----	Dalzell
Carl Robert Garrison -----	Easley	*Nancy Elaine Pace -----	Pickens
Allen Russell Gerhardt -----	Baltimore, Md.	*Dorothy Jean Dennis Priddy ----	Greenville
Larry Alan Greene -----	Newberry	*Robert Patrick Snoddy -----	Greenville

**BACHELOR OF SCIENCE**

**Agricultural Education**

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

Hugh Mitchell Bland -----	Edgefield	John Owen Weathers -----	Bowman
Douglas Royce Shannon -----	Chester	Walter Joseph Wilson -----	Calhoun Falls

**Industrial Education**

Lindsey Wingard Addy, Jr. -----	Lexington	James Albert McMillan III -----	Bamberg
Tony Dean Anderson -----	Anderson	William Ernest Parker -----	Maplewood, N. J.
Robert Dee Barrier -----	Lexington	Michael Bonham Rector -----	Greer
William Lee Barrier -----	Lexington	Joe Mac Skinner -----	Gaffney
Andrew Hoyt Coleman -----	Lake City	Lawrence Glenn Sobczyk -----	Clemson
Malcolm Dennis Faulkenberry ----	Kershaw	*Thomas Lee Webb -----	Columbia
Thomas O'Neil Harrelson -----	Georgetown	Keith Elden Whatley -----	Greenville

**Science Teaching**

*Shirley Louise Barnes -----	Brunson	James Richard Gaines -----	Central
Steven Otway Burns -----	Jacksonville, Fla.	Raymond James Hester, Jr. -----	West Pelzer
George Force Chamberlain, Jr. -----	Pompton Plains, N. J.	Gregory Calvin Johnston -----	Clemson

**COLLEGE OF ENGINEERING**

*Lyle Chester Wilcox, Dean*

**BACHELOR OF SCIENCE**

**Chemical Engineering**

Roger Kenneth Abrams -----	Seattle, Wash.	*Gilbert Chase Robinson, Jr. -----	Clemson
*Nabeel Fouad Kammoun --	Tripoli, Lebanon		



**Civil Engineering**

Erik Fred Anderson .....	Spartanburg	*Clarence Johnson Fennell .....	Estill
Donald Ray Crowder .....	Kinards	Zollie Cecil Green .....	Turbeville
Earl Robertson Dearhart .....	Greenville	James Edward Noffz, Jr. ....	Cross Hill
James Joseph Dillon .....	Babylon, N. Y.	*Richard Carroll Pennock .....	Atlanta, Ga.
*Donald Lee Feather .....	Elnora, N. Y.	*George William Scott .....	Sumter

**Electrical Engineering**

*Patrick Thoman Apperson ....	Summerville	**Joachim Hans Peter Ludwig ...	Greenwood
Stanley David Coleman, Jr. ....	Conway	Frank Horace Nix .....	Easley
*Henry Boyd Coulter .....	Rising Sun, Md.	David Whitley Sheppard ....	Hollywood, Fla.
Victor Stephen Fleishel .....	DeLand, Fla.	Ronald Stephan Waters ....	Hephzibah, Ga.
Thomas Cruikshank Hill III ..	Salisbury, Md.	Arthur Archie Woo, Jr. ....	Greenville

**Engineering Analysis**

George Leon Clark .....	Spartanburg	Wilson Joel Gossett .....	Calhoun, Ga.
Charles Horace Craig .....	Pickens	*Karen Susan Kelly .....	Florence

**Engineering Technology**

James Gerald Aswell .....	Union, N. J.	Thomas Mitchell Rose ....	Jekyll Island, Ga.
James David Caldwell .....	Campobello	Walter George Smith .....	Anderson
John Michael Hames .....	Chesnee	Cromwell W. Swygert III .....	Lexington
*Emmett Blackshear Peter III ..	Leesburg, Fla.	Charles William Wilson, Jr. ....	Union

**Mechanical Engineering**

Alvin Maxcy Carter .....	Columbia	*Thomas Keith Raines .....	Landrum
Philemon Kennard Croft .....	Greenville	Robert Lee Scarborough ..	Belle Haven, Va.
Donald Henderson Fraser, Jr. ...	Walterboro	Floyd Stephen Simpson .....	Greenville
Donald Joseph Koser, Jr. ....	.....	James Boyd Sparrow .....	Hartsville
.....	Mechanicsburg, Penn.	Ernest Louis Stelling, Jr. ....	Charleston
Ronald William Myers .....	Charleston	Terry Dan Varner .....	Simpsonville
Kenneth Albert Newton .....	Duncan		

**COLLEGE OF FOREST AND RECREATION RESOURCES**

*William Henry Davis McGregor, Dean*

**BACHELOR OF SCIENCE**

**Forestry**

*Louis Emile Brossy, Jr. ....	Newberry	John Charles Ramsey .....	Monticello
*Mark Sidney Dymkoski .....	Central	Thomas Robert White .....	Winnboro
John Rawlinson Pagett .....	Hopkins		

**Recreation and Park Administration**

Lyndon Kerry Ashworth .....	Brevard, N. C.	Robert Wailles Gray .....	Easley
Alan Lee Bolick .....	Ringgold, Ga.	Francis Joseph Greene III ....	Mt. Pleasant
William Robert Bolick .....	.....	Thomas Richard Hood .....	Charleston
.....	Erlensee, West Germany	Edwin Barksdale Jackson .....	Batesburg
Wayne David Carroll .....	Greenville	Joseph Bruno Pendle ...	Niagara Falls, N. Y.
Joel McGee Copeland .....	Honea Path	*Irvin Anthony Player .....	Sumter
*George Herefield Dickinson III ..	.....	Frank Raymond Romero .....	Delair, N. J.
.....	Chapel Hill, N. C.	Marianna Byrd Street .....	Branchville
*William Davis Fralick .....	Bamberg	*Thomas McDonald Sturtevant ...	Columbia
Gerard Anthony Gaeta ....	Livingston, N. J.	Earl Hazwell Wooten, Jr. ....	Williamston

**COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE**

*Wallace Dabney Trevillian, Dean*

**BACHELOR OF ARTS**

**Arts and Sciences**

Andrew Mattison Carter .....	Greenville	William Henry Lloyd, Jr. ....	Lydia
Samuel McGarthy Frazer III .....	Chester	Ronny Lee Lowder .....	Sumter
Donald Eugene Hart ...	Winston-Salem, N. C.	*Marilyn Jeanne Waters ..	Greensboro, N. C.
Charles Merritt Holmes .....	North Charleston		

**BACHELOR OF SCIENCE**

**Accounting**

Thomas Edmund Goodson -----	Hartsville	Allen Bryant Shelley -----	St. George
*Martha Louise Hatcher -----	Clemson	Thomas Allen Summerford -----	Florence

**Administrative Management**

Thomas Ray Bryan, Jr. -----	Greenwood	Lucas Lytle Nichol, Jr. -----	Griffin, Ga.
Johnny David Chandler -----	Central	William Bryan Scruggs -----	Chesnee
Thomas James Hinchman -----	Myrtle Beach	Michael Francis Storen -----	Charleston
Michael Charles Imperiale --	Metuchen, N. J.	Mark Steadman Stoudenmire -----	Pendleton
*Robert Alan Johnson -----	Columbia	Henry Malcolm Stuckey -----	Orangeburg
Charles Daniel Jones -----	Bishopville	Eugene Francis Sweeney, Jr. --	Bennettsville
Stephen Walker Jones -----	Camden	Charlie Tony Young -----	Bradley
Curtis Michael Moss -----	Cameron		

**Financial Management**

James Ely Cornwell -----	Charlotte, N. C.	John Drayton Hopkins, Jr. -----	Simpsonville
Larry Mitchell Crawford -----	Clemson	Tony Horace Lee -----	Anderson
Tommy Randall Feagin -----	Bonneau	David Richard Murray -----	Greenville
Richard Stanley Galloway -----	Greenville	Franklin Andrew Parnell -----	Anderson

**Industrial Management**

Tony* Ansel Adams -----	Seneca	Lewis Arnold Knight -----	Lancaster
Dennis Jerome Arwood -----	Spartanburg	Harold Pettit Langford -----	Columbia
Richard Stephen Balentine -----	Greenville	John Alan Rhodes -----	Franklin Lakes, N. J.
Douglas Terry Carter -----	Harlem, Ga.	William Donnay Robinson -----	Clinton
John Burdine Cooper -----	Greenville	Joseph Anthony Salerni -----	North Charleston
David Vernon DeHart, Jr. -----	Anderson	James Alan Slabaugh -----	Lexington, Ky.
Michael Anthony Green -----	Charlotte, N. C.	Walton Graham Snow -----	Orlando, Fla.
John Robert Hollingsworth, Jr. -----	Anderson	John Sanford Sprouse, Jr. -----	Roanoke, Ala.

**Textile Chemistry**

\*AlexSandra Carmichael Hyder --- Anderson

**Textile Science**

\*Kang-Min Huang ----- Taipei, Taiwan

**Textile Technology**

Charles Lawrence Huntley ----- Greenwood

**COLLEGE OF LIBERAL ARTS**

*Headley Morris Cox, Dean*

**BACHELOR OF ARTS**

*Joyce Hartley Adkins -----	Clemson	Robert Meyer Hollings, Jr. -----	Charleston
Robert David Archer -----	Summerville	*Merrie Marbeth Huff -----	Columbia
Charles Raymond Black -----	Westminster	Matthew Richard Jagusak ---	Cranford, N. J.
Noah Benjamin Bolt -----	Anderson	Vivian Elaine Johnson -----	Anderson
**Catherine Elaine Bonner -----	Charleston	Douglass Melville Keiper --	Shrewsbury, N. J.
Diane Oswald Bosler -----	Allendale	James Maxwell King -----	Hartsville
Charles Halbert Browne -----	Hickam A.F.B., Hawaii	Marita Elizabeth Kuhnen --	Kenilworth, N. J.
Thomas Jeffrey Burch -----	Clemson	John Robert Mauney -----	Charleston
*Amy Irene Bynum -----	Mountain Rest	**Brenda Joyce Medlin -----	Summerville
Georgia Ann Callahan -----	Millville, N. J.	Floyd Simpson Mills, Jr. -----	Newberry
Vernon Keith Callicutt -----	Chester	John Michael Padgett -----	Camden
Allison William Cooner -----	Johnston	James Phillip Pearson -----	Greenville
James Arthur Cox -----	Lexington, Ky.	Robert Dean Pursley -----	Rock Hill
Rhonda Kay Crowe -----	Liberty	Bruce Wayne Rice -----	Spring Lake Heights, N. J.
Thomas Mitchell Davidson -----	Chesterfield	Charles Gray Taylor -----	Greenville
William Bert Finney II -----	Liberty	*Peggy Jane Traynham -----	Honea Path
Sheila Wynne Fletcher -----	Williston	*Lisa Anne Wilcox -----	Elkton, Md.
Jay Wesley Goodman, Jr. -----	Charleston	*Mary Margaret Wilkes -----	Columbia

**COLLEGE OF NURSING**

*Geraldine Labecki, Dean*

**ASSOCIATE IN ARTS**

**Nursing**

Kathy Jo Burton ----- Calhoun Falls      Marilyn Lee Sharpe ----- Due West

**BACHELOR OF SCIENCE**

**Nursing**

Maxine Carrol Roberts Ragin ----- Gaffney

**COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES**

*Henry Elliott Vogel, Dean*

**BACHELOR OF ARTS**

**Arts and Sciences**

Daniel Allen Key ----- Spartanburg      Harrison Duster Snow -- New Canaan, Conn.  
 Freddy Ray Richardson ---- Galivants Ferry      \*\*Douglas Albert Wolfe ----- Inman

**BACHELOR OF SCIENCE**

**Botany**

\*\*Sara Louise Leslie ----- Clemson

**Mathematics**

\*William Keith Gibson ----- Saluda      Ronald Edman Rice, Jr. ----- Anderson  
 Richard Roy Kirk ----- Greenville

**Microbiology**

Charles Edward Beaman ----- Greenville      Herbert Gray Pregnall ----- Denmark  
 Joe Hartman Cooley ----- Prestonsburg, Ky.      Paul Andrew Seesman ----- Rockville, Md.  
 \*\*Barbara Ellen Hill ----- Clemson      Nitin Harshadray Thaker -- Ahmedabad, India

**Pre-Medicine**

Ronald Anson Berry ----- Sumter      \*Richard Lane McDaniel ----- Leesville  
 Dallas Franklin Brown ----- Belton      Hubert Norman Smith, Jr. ----- Anderson  
 Monroe Stephen Busch ----- Rowesville      \*Rodney Ramon Tucker ----- Charleston  
 \*Thomas Conrad Gilliam ----- Aiken      \*Steven Oramel Young ----- Seneca  
 \*\*Larry Louis Maggiore ---- Hollywood, Fla.

**Zoology**

Luke Davis Baxley ----- Hartsville      \*William Larry Matthews ----- Hanahan  
 Marilyn Diana Blair ----- Greenville      Charles Lewis McCord, Jr. ----- Manning  
 Edward Henry Booker ----- Walhalla      Ben Tillman Pruitt, Jr. ----- Williamston  
 Danny Keith Bradley ----- Lugoff      Stephen Louis Strieter ---- College Park, Md.  
 Richard Scott Denton, Jr. ----- Rock Hill      Edgar Eugene Trussell ----- Walterboro  
 Willard Eugene Hayes ----- Greenville      Lorraine Walker Young ----- Camden

\*With honor

\*\*With high honor

\*\*\*With highest honor

**MASTERS' DEGREES CONFERRED DECEMBER 20, 1973**

*Arnold Edward Schwartz, Dean, Graduate School*

**COLLEGE OF AGRICULTURAL SCIENCES**

**MASTER OF AGRICULTURE**

Eben Dudley Godbold -----	Florence	John Gordon Strickland -----	Bailey, N. C.
Curtis Leslie Hobbs, Jr. -----	Lynchburg	Gary Michael Watkins -----	Lamar

**MASTER OF NUTRITIONAL SCIENCE**

Darina Kuklish Neel ----- Beaufort

**MASTER OF SCIENCE**

**Wildlife Biology**

Edmund Carlton Aldridge III -- North Augusta

**COLLEGE OF ARCHITECTURE**

**MASTER OF ARCHITECTURE**

John Michael Currie -----	Arlington, Va.	Frank Wilson Spencer III ----	Savannah, Ga.
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**COLLEGE OF EDUCATION**

**MASTER OF AGRICULTURAL EDUCATION**

(Agricultural Education is jointly administered by the College of Agricultural Sciences and the College of Education.)

George Paul Jones, Jr. -----	Roebuck	Barron Robert Simms -----	Clemson
Donald Christopher Lovette --	Fair Bluff, N. C.	Kenneth Gowan Southerlin -----	Greer
Calvin Thompson Robertson ----	Blacksburg		

**MASTER OF EDUCATION**

Martha Ann Adams -----	Alamo, Ga.	Asilee Capell Looper -----	Greenville
Thomas Lee Allen -----	Seneca	Judy Shaw Lusk -----	Honea Path
Carroll Franklin Anthony -----	Pickens	Margaret Ann Lyerly -----	Florence
Rose Godwin Arant -----	Gainesville, Ga.	Henry Howard Madden -----	Calhoun Falls
Mary Wilson Arrowood -----	Greenville	June Dodd Martin -----	Anderson
Lucile Fisher Black -----	Due West	Margaret Shaw McClain -----	Honea Path
Gwendolyn Gaillard Bolt -----	Williamston	Sammy Lee McDowell -----	Laurens
Kathleen Kay Campbell -----	Honea Path	Ernest Eugene Mills -----	Greenville
Martha Ellen Cleveland -----	Marietta	Thomas Luther Murphy -----	Savannah, Ga.
Betty Jo Cox -----	Townville	Aubrey Walker Parker, Jr. -----	Dillon
Susan White Cox -----	Pamplico	Patsy Ashley Parker -----	Honea Path
Barbara Walters Crunkleton -----	Clinton	Nancy Tilson Pate -----	Round O
Mary Elizabeth DeWitt -----	Greenville	Margaret Fountain Paylor -----	Greenville
Karen Coogler Dobson -----	Greenville	Wade Cooper Jimmie Pearson -----	Greer
Johnnie Muldrow McLeod Edwards -----	Anderson	Tenne Ann Petty -----	Memphis, Tenn.
Gracie Maria Floyd -----	Belton	Mary Jo Ramage -----	Greenville
Gay Timmerman Free -----	Greenwood	Marie Palmer Ruhland -----	Townville
Darrell Henry Garber -----	Scottsburg, Va.	Vicki Culbreth Sain -----	Due West
Frances Lawson Godfrey -----	Greenville	Bruce Eugene Smith -----	Walhalla
Robert Charles Godfrey -----	Orangeburg	Mary Lucile Stranch -----	Greenwood
Tiney Irene Hamer -----	Little Rock	William Bernard Swinger -----	Anderson
Marquerite Jones Hendrix -----	Taylors	Margaret Etheridge Turner -----	Greenville
Deborah Buckner Herin -----	Greenwood	Shirley Vivian Vandiver --	North Charleston
Marcia Creel Jensen -----	Florence	Ann Wainwright Warren -----	Easley
Joanne Graham Jumper -----	Pacolet Mills	Mildred Ellen Watson -----	Greenville
Gloria Brodie King -----	Clinton	Jane Boland Wham -----	Clinton
Charles Ernest Layton -----	Newberry	Carol Jean Wynn -----	Easley



## 462 Student Register

### MASTER OF INDUSTRIAL EDUCATION

Donald Gilbert Austin ----- Mercersburg, Pa.      Lewis Albert Jordan ----- Myrtle Beach  
Joseph Stephen Hunter ----- Clemson      Barney Franklin Pepper II ----- Walhalla

## COLLEGE OF ENGINEERING

### MASTER OF ENGINEERING

Heath Persons Dobson ----- Greer      Pamela Amanda Koester ---- Andover, Mass.  
James Donovan Dukes ----- Orangeburg      Henry Floyd Weathers, Jr. ---- Fountain Inn

### MASTER OF SCIENCE

#### Bioengineering

Keith William Greer ----- Boone, N. C.      George Terry McAmish ----- Greenwood

#### Ceramic Engineering

Lynn Brian Starling ----- Lakeland, Fla.

#### Chemical Engineering

Barry Louis Ornitz ----- Seneca      Ahmet Mazhar Yazar  
----- Karsiyaka, Izmir, Turkey

#### Civil Engineering

Harvey Raymond Mathias --- West Columbia

#### Electrical Engineering

Alan Edward Cowart ----- Charleston      Chen-Liang Hsieh ----- Chica-I, Taiwan  
Rainer Heller ----- Clemson      Gary Dean Youell ----- Seaford, Del.

#### Environmental Systems Engineering

Charles Raymond Carter ----- Seneca      George Raymond Kreigsman ---- Eustis, Fla.  
Delno Rex Gleason ----- Anderson      Marion Richardson Rembert, Jr. ---- Sumter

#### Mechanical Engineering

Shankar Narayan ---- Bamrauli, Allahabad, India

#### Systems Engineering

Calvin Tycho Howle ----- Lancaster

#### Water Resources Engineering

Frank James Swit ----- Massapequa, N. Y.

## COLLEGE OF FOREST AND RECREATION RESOURCES

### MASTER OF RECREATION AND PARK ADMINISTRATION

Anne Gibson Corcoran ----- Wallace, N. C.      Nicholas Fletcher III ----- Charlotte, N. C.  
Oscar Richard Cothran III ----- Piedmont

## COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE

### MASTER OF SCIENCE

#### Management

Gordon LaVelle Brown, Jr. -- Charlotte, N. C.      David Leroy Scull ----- Jersey City, N. J.

**COLLEGE OF LIBERAL ARTS**

**MASTER OF ARTS**

**English**

Carolyn Louise Harrison ----- Largo, Fla.      James Barry Veitenheimer --- Annapolis, Md.  
Carolyn Tuten Ross ----- Seneca

**COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES**

**MASTER OF SCIENCE**

**Biochemistry**

Jim Thomas Long, Jr. ----- Clemson

**Chemistry**

Oya Yazar --- Mecidiyekoy, Istanbul, Turkey

**Mathematics**

Elaine Karen Campbell -- Donaldsonville, La.      Cynthia Ann Sikes ----- Brunswick, Ga.  
Steven Epps, Jr. ----- Chester      Nita Mary Hanlon Wilkinson  
Eleanor O'Meara Hare ----- Clemson      ----- West Palm Beach, Fla.  
Joseph Dean Price ----- Adairsville, Ga.

## DOCTORS' DEGREES CONFERRED DECEMBER 20, 1973

*Arnold Edward Schwartz, Dean, Graduate School*

## COLLEGE OF AGRICULTURAL SCIENCES

## DOCTOR OF PHILOSOPHY

## Animal Physiology

Leonard Einar Lundquist ----- Derry, Penn.

B.S., M.S., University of South Carolina

Dissertation: Studies on Bovine Luteal Cells in Monolayer Culture: I. Technique II. The Effect of PGF<sub>2a</sub> on the Progesterone Secretion Rates III. The Effect of PGF<sub>2a</sub> on the Lipid Histochemistry IV. Ultrastructural Observations of PGF<sub>2a</sub> Treated Cells

## Agricultural Economics

Robert Martin Pope, Jr. ----- Charleston

B.S., The College of Charleston

Dissertation: Effects of Price Level and Price Change upon the Domestic Use of Water over Time

## Entomology

Von H. McCaskill ----- Clemson

B.S., Western Carolina College; M.S., Clemson University

Dissertation: The Stoneflies (Order Plecoptera) of South Carolina

John Robert Strayer ----- Gainesville, Fla.

B.S.A., MAg, University of Florida

Dissertation: Economic Threshold Studies and Sequential Sampling for Management of the Velvetbean Caterpillar, *Anticarsia Gemmatilis* Hubner, on Soybeans

James Wyatt Todd ----- Tifton, Ga.

B.S., M.S., Auburn University

Dissertation: Effects of Damage by the Southern Green Stink Bug, *Nezara Viridula* (L.) on Yield and Quality of Soybeans

## Nutrition

David Lewis Wicker ----- Pomaria

B.S., Clemson University

Dissertation: Early Protein Deprivation and Subsequent Reproductive Performance in Male Turkey Breeders

## Plant Physiology

Frank Matthew Dework, Jr. ----- Clifton, N. J.

B.A., Rutgers University; M.S., Clemson University

Dissertation: Growth Studies of Methane Bacteria in Continuous Culture

## COLLEGE OF ENGINEERING

## DOCTOR OF PHILOSOPHY

## Engineering

Joseph Baber Busby ----- Aiken

B.S., The Citadel; M.S., Georgia Institute of Technology

Dissertation: Dynamic Modeling and Control Strategies for the Activated Sludge Process (Field of Specialization: Environmental Systems Engineering)

Robert Paul Carnahan ----- St. Petersburg, Fla.

B.C.E., University of Florida; M.S., University of North Carolina

Dissertation: Mathematical Modeling of Heterogeneous Sorption in Continuous Contactors for Wastewater Cecontamination (Field of Specialization: Environmental Systems Engineering)

Allen Chia-chen Chao ----- Taipei, Taiwan

B.S., M.S., National Taiwan University

Dissertation: Destabilization of Activated Sludge Suspensions with Ferric Chloride: Clarification and Thickening (Field of Specialization: Environmental Systems Engineering)

- Cecil Oates Huey, Jr. ----- Anderson  
 B.S., M.S., Clemson University  
 Dissertation: Kinematic Synthesis and Design Considerations for Cam-Link Mechanisms (Field of Specialization: Mechanical Engineering)
- Richard Alan Poduska ----- Milford, Ohio  
 B.S., M.S., Cornell University  
 Dissertation: A Dynamic Model of Nitrification for the Activated Sludge Process (Field of Specialization: Environmental Systems Engineering)
- Kenneth David Tracy ----- Erie, Pa.  
 B.S., M.S., Pennsylvania State University  
 Dissertation: Mathematical Modeling of Unsteady-State Thickening of Compressible Slurries (Field of Specialization: Environmental Systems Engineering)
- Charles Theodore Vollers III ----- Jacksonville, Fla.  
 B.S., University of Florida; M.S., Clemson University  
 Dissertation: An Analysis of the Phenomena of Drying of Fibrous Materials (Field of Specialization: Mechanical Engineering)

**COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE**

**DOCTOR OF PHILOSOPHY**

**Engineering Management**

- Fulton Vandiver Clinkscales, Jr. ----- Greenville  
 B.S., Clemson Agricultural College; M.S., Clemson University  
 Dissertation: An Econometric Model of the South Carolina Tax Sector
- Hermogenes Moreno-Calvo ----- San Jose, Guatemala  
 B.S., Tulane University; M.S., Clemson University  
 Dissertation: Econometric Study of Demand and Supply Determinants in the U. S. Carpeting Industry

**Textile and Polymer Science**

- Mohamed Safwat Elmahdy Abdo ----- Alexandria, Egypt  
 B.S., M.S., University of Alexandria; M.S., University of South Carolina  
 Dissertation: A Thermodynamic Study of the Adsorption of Disperse Dyes on Activated Carbon

**COLLEGE OF PHYSICAL, MATHEMATICAL, AND BIOLOGICAL SCIENCES**

**DOCTOR OF PHILOSOPHY**

**Chemistry**

- Danny Joe Leathers ----- Spencer, Okla.  
 B.S., Central State College; M.S., New Mexico Highlands University  
 Dissertation: Use of Reagents of the Glyoxal bis (2-Hydroxyanil) Class in the Spectrophotometric Determination of Indium, Scandium, Thallium and Uranium

**Mathematics**

- Gary Lee Guthrie ----- Greenville  
 B.S., M.A., Eastern Illinois University  
 Dissertation: On Record and Inter-Record Times for a Sequence of Random Variables Defined on a Markov Chain
- Alexia Broughton Latimer ----- Greenville  
 B.S., University of South Carolina; M.A., University of North Carolina; M.S., Clemson University  
 Dissertation: Nuclear FK-Sequence and Sum Spaces
- Donald Robert Russell ----- Fountain Inn  
 B.S., M.S., Clemson University  
 Dissertation: Some Goodness-of-Fit Tests
- Danny William Turner ----- Clover  
 B.S., Clemson University  
 Dissertation: A Semi-Markov Model for a Particle in Motion on the Line



## DEGREES AWARDED IN 1972-73 BY MAJOR COURSES

### ASSOCIATE DEGREES AWARDED IN 1972-73

COLLEGE OF NURSING .....	20
Nursing .....	20
TOTAL ASSOCIATE DEGREES AWARDED IN 1972-73 .....	20

### BACHELORS' DEGREES AWARDED IN 1972-73

COLLEGE OF AGRICULTURAL SCIENCES .....	74
Agricultural Economics .....	18
Agronomy .....	2
Animal Science .....	15
Biology .....	4
Dairy Science .....	6
Food Science .....	3
Horticulture .....	25
Poultry Science .....	1
COLLEGE OF ARCHITECTURE .....	54
Architecture .....	8
Building Construction .....	18
Pre-architecture .....	28
COLLEGE OF EDUCATION .....	279
Agricultural Education .....	25
Early Childhood Education .....	20
Elementary Education .....	75
Industrial Education .....	53
Science Teaching .....	17
Secondary Education .....	89
COLLEGE OF ENGINEERING .....	240
Agricultural Engineering .....	4
Ceramic Engineering .....	16
Chemical Engineering .....	26
Civil Engineering .....	44
Electrical Engineering .....	63
Engineering Analysis .....	10
Engineering Technology .....	34
Mechanical Engineering .....	43
COLLEGE OF FOREST AND RECREATIONAL RESOURCES ..	84
Forestry .....	16
Recreation and Park Administration .....	68
COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE .....	192
Accounting .....	13
Administrative Management .....	60
Arts and Sciences .....	28
Financial Management .....	17
Industrial Management .....	67
Textile Chemistry .....	2

Textile Science .....	4	
Textiles .....	1	
COLLEGE OF LIBERAL ARTS .....		157
Arts and Sciences .....	157	
COLLEGE OF NURSING .....		14
Nursing .....	14	
COLLEGE OF PHYSICAL, MATHEMATICAL AND BIOLOGICAL SCIENCES .....		160
Arts and Sciences .....	6	
Botany .....	2	
Chemistry .....	9	
Geology .....	2	
Mathematics .....	21	
Medical Technology .....	4	
Microbiology .....	19	
Physics .....	7	
Pre-medicine .....	46	
Zoology .....	44	
TOTAL BACHELORS' DEGREES AWARDED IN 1972-73 .....		1,254

### MASTERS' DEGREES AWARDED IN 1972-73

COLLEGE OF AGRICULTURAL SCIENCES .....		37
Agriculture .....	16	
Agronomy .....	3	
Animal Science .....	2	
Entomology .....	6	
Horticulture .....	4	
Nutrition .....	1	
Plant Pathology .....	1	
Poultry Science .....	2	
Wildlife Biology .....	2	
COLLEGE OF ARCHITECTURE .....		19
Architecture .....	11	
City and Regional Planning .....	6	
Fine Arts .....	2	
COLLEGE OF EDUCATION .....		344
Agricultural Education .....	9	
Education .....	320	
Industrial Education .....	15	
COLLEGE OF ENGINEERING .....		66
Agricultural Engineering .....	2	
Bioengineering .....	10	
Ceramic Engineering .....	2	
Chemical Engineering .....	4	
Civil Engineering .....	8	
Electrical Engineering .....	4	
Engineering .....	6	
Engineering Mechanics .....	1	
Environmental Systems Engineering .....	12	

## 468 Student Register

Materials Engineering .....	4	
Mechanical Engineering .....	8	
Systems Engineering .....	1	
Water Resources Engineering .....	4	
COLLEGE OF FOREST AND RECREATION RESOURCES .....		7
Forestry .....	3	
Recreation and Park Administration .....	4	
COLLEGE OF INDUSTRIAL MANAGEMENT AND TEXTILE SCIENCE .....		21
Economics .....	3	
Management .....	14	
Textile Chemistry .....	1	
Textile Science .....	3	
COLLEGE OF LIBERAL ARTS .....		9
English .....	6	
History .....	3	
COLLEGE OF PHYSICAL, MATHEMATICAL AND BIOLOGICAL SCIENCES .....		30
Chemistry .....	3	
Mathematics .....	15	
Microbiology .....	4	
Physics .....	5	
Zoology .....	3	
TOTAL MASTERS' DEGREES AWARDED IN 1972-73 .....		533

## DOCTORS' DEGREES AWARDED IN 1972-73

COLLEGE OF AGRICULTURAL SCIENCES .....		11
Agricultural Economics .....	1	
Agronomy .....	1	
Animal Physiology .....	3	
Entomology .....	3	
Nutrition .....	1	
Plant Physiology .....	2	
COLLEGE OF ENGINEERING .....		14
Chemical Engineering .....	3	
Electrical Engineering .....	7	
Engineering Mechanics .....	1	
Environmental Systems Engineering .....	1	
Mechanical Engineering .....	1	
Systems Engineering .....	1	
COLLEGE OF PHYSICAL, MATHEMATICAL AND BIOLOGICAL SCIENCES .....		15
Chemistry .....	3	
Mathematics .....	5	
Physics .....	4	
Zoology .....	3	
TOTAL DOCTORS' DEGREES AWARDED IN 1972-73 .....		40
TOTAL NUMBER DEGREES AWARDED IN 1972-73 .....		<u>1,847</u>

## TOTAL DEGREES AWARDED BY MAJOR COURSES, 1896-1973

## Major Course

## ASSOCIATE

Nursing .....	130
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## BACHELORS'

Accounting .....	27
Administrative Management .....	80
Agricultural Chemistry .....	102
Agricultural Economics .....	411
Agricultural Education .....	539
Agricultural Engineering .....	488
Agriculture .....	244
Agriculture and Animal Industry .....	80
Agriculture and Chemistry .....	69
Agronomy .....	804
Animal Science .....	852
Applied Mathematics .....	34
Architectural Engineering .....	118
Architecture .....	696
Arts and Sciences .....	2,269
Bachelor of Science .....	3
Biology .....	300
Botany .....	16
Building Construction .....	115
Ceramic Engineering .....	271
Chemical Engineering .....	526
Chemistry .....	433
Chemistry-Engineering .....	43
Chemistry and Geology .....	11
Civil Engineering .....	1,619
Dairy Science .....	416
Early Childhood Education .....	26
Education .....	242
Electrical Engineering .....	1,984
Elementary Education .....	249
Engineering Analysis .....	14
Engineering Industrial Education .....	70
Engineering Technology .....	44
Entomology .....	166
Financial Management .....	19
Food Science .....	26
Forestry .....	267
General Science .....	359
Geology .....	33
Horticulture .....	534
Industrial Education .....	558
Industrial Engineering .....	138
Industrial Management .....	1,394
Industrial Physics .....	56
Mathematics .....	174
Mechanical and Electrical Engineering .....	489
Mechanical Engineering .....	1,693
Medical Technology .....	33



## 470 Student Register

### Major Course

Metallurgical Engineering	20
Microbiology	24
Nursing	17
Physics	116
Poultry Science	55
Pre-architecture	101
Pre-medicine	678
Recreation and Park Administration	349
Science Teaching	90
Secondary Education	346
Soils	9
Textile Chemistry	338
Textile Engineering	1,060
Textile Industrial Education	85
Textile Management	306
Textile Manufacturing	1,045
Textile Science	51
Textiles	35
Veterinary Science	16
Vocational Agricultural Education	729
Weaving and Design	42
Zoology	85

### 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
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

## Major Course

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 .....	111
Agricultural Engineering .....	43
Agriculture .....	23
Agronomy .....	35
Animal Science .....	35
Architecture .....	19
Bacteriology .....	6
Biochemistry .....	1
Bioengineering .....	19
Botany .....	4
Business Administration .....	38
Ceramic Engineering .....	70
Chemical Engineering .....	62
Chemistry .....	107
City and Regional Planning .....	11
Civil Engineering .....	70
Dairy Science .....	22
Economics .....	12
Education .....	901
Electrical Engineering .....	63
Engineering .....	13

## 472 Student Register

### Major Course

Engineering Mechanics	13
English	41
Entomology	72
Environmental Systems Engineering	53
Fine Arts	2
Forestry	15
History	11
Horticulture	74
Industrial Education	82
Industrial Management	36
Management	50
Materials Engineering	7
Mathematics	124
Mechanical Engineering	76
Microbiology	15
Nuclear Science	3
Nutrition	6
Physics	74
Plant Pathology	18
Plant Physiology	2
Poultry Science	19
Recreation and Park Administration	4
Systems Engineering	2
Textile Chemistry	54
Textile Industrial Education	1
Textile Science	20
Textiles	1
Water Resources Engineering	35
Wildlife Biology	4
Zoology	69

### DOCTORS'

Agricultural Economics	15
Agricultural Engineering	3
Agronomy	15
Animal Physiology	8
Bioengineering	5
Chemical Engineering	19
Chemical Physics	2
Chemistry	63
Civil Engineering	3
Electrical Engineering	15
Engineering Management	9
Engineering Mechanics	6
Entomology	28
Environmental Systems Engineering	7
Materials Engineering	2
Mathematics	26
Mechanical Engineering	8
Nutrition	5
Physics	41
Plant Pathology	8
Plant Physiology	3

Major Course

Systems Engineering .....	1
Water Resources Engineering .....	1
Zoology .....	9

TOTAL DEGREES AWARDED 1896-1973 ..... 28,018

ENROLLMENT BY COURSES AND ACADEMIC CLASSIFICATION

Fall Semester, 1973-74

Major Course	Freshmen	Sophomores	Juniors	Seniors	Postgraduates	Masters'	Ph.Ds'	Total
College of Agricultural Sciences (Nondegree) .....	0	0	0	0	0	1	1	2
Agricultural Economics .....	8	14	9	7	0	11	10	59
Agricultural Engineering .....	13	3	5	4	0	4	5	34
Agricultural Mechanization and Business .....	5	4	0	0	0	4	0	13
Agriculture .....	2	1	0	0	0	0	0	3
Agronomy .....	9	13	5	16	0	6	2	51
Animal Industries .....	1	0	0	0	0	0	0	1
Animal Physiology .....	0	0	0	0	0	0	13	13
Animal Science .....	16	20	24	21	0	11	0	92
Dairy Science .....	3	1	9	2	0	4	0	19
Economic Biology .....	1	0	0	0	0	0	0	1
Economic Zoology .....	1	1	2	0	0	0	0	4
Entomology .....	2	3	5	2	0	17	13	42
Food Science .....	9	10	5	4	0	0	0	28
Horticulture .....	22	19	13	11	1	12	0	78
Nutrition .....	0	0	0	0	0	9	4	13
Plant Pathology .....	0	0	0	0	0	4	1	5
Plant Physiology .....	0	0	0	0	0	0	11	11
Plant Sciences .....	1	1	0	0	0	0	0	2
Poultry Science .....	1	1	2	2	0	1	0	7
Pre-veterinary .....	80	34	15	4	0	0	0	133
Wildlife Biology .....	0	0	0	0	0	16	0	16
<b>Total</b> .....	<b>174</b>	<b>125</b>	<b>94</b>	<b>73</b>	<b>1</b>	<b>100</b>	<b>60</b>	<b>627</b>
College of Architecture (Nondegree) .....	0	0	0	0	1	8	0	9
Architecture .....	0	0	0	0	0	32	0	32
Building Construction .....	24	37	44	26	1	0	0	132
City and Regional Planning .....	0	0	0	0	0	26	0	26
Pre-architecture (B.A.) .....	54	48	51	44	5	0	0	202
Pre-architecture (B.S.) .....	85	31	10	1	0	0	0	127
Visual Studies .....	0	0	0	0	0	5	0	5
<b>Total</b> .....	<b>163</b>	<b>116</b>	<b>105</b>	<b>71</b>	<b>7</b>	<b>71</b>	<b>0</b>	<b>533</b>
College of Education (Nondegree) .....	0	0	0	0	0	209	0	209
Administration and Supervision .....	0	0	0	0	0	46	0	46
Agricultural Education .....	11	13	12	10	0	15	0	61
Early Childhood Education .....	62	54	47	35	0	0	0	198
Elementary Education .....	146	114	97	94	0	102	0	553
Industrial Education .....	24	33	30	40	0	23	0	150
Personnel Services .....	0	0	0	0	0	106	0	106
Reading .....	0	0	0	0	0	78	0	78
Science Teaching .....	5	13	14	21	0	0	0	53
Secondary Education .....	83	93	104	95	4	74	0	453
<b>Total</b> .....	<b>331</b>	<b>320</b>	<b>304</b>	<b>295</b>	<b>4</b>	<b>653</b>	<b>0</b>	<b>1,907</b>



# 474 Student Register

Major Course	Freshmen	Sophomores	Juniors	Seniors	Postgraduates	Masters'	Ph.Ds'	Total
<b>College of Engineering</b>								
(Nondegree) .....	0	0	0	0	0	6	0	6
Bioengineering .....	0	0	0	0	0	16	4	20
Ceramic Engineering .....	12	16	12	11	0	10	0	61
Chemical Engineering .....	42	31	33	30	0	19	10	165
Civil Engineering .....	89	46	43	47	0	19	5	249
Electrical Engineering .....	114	70	62	54	0	18	6	324
Engineering .....	17	4	1	0	1	0	0	23
Engineering Analysis .....	8	10	5	12	0	0	0	35
Engineering Mechanics .....	0	0	0	0	0	2	2	4
Engineering Technology .....	5	19	16	21	0	0	0	61
Environmental Systems Engineering .....	0	0	0	0	0	29	12	41
Materials Engineering .....	0	0	0	0	0	3	1	4
Mechanical Engineering .....	59	41	35	46	0	18	5	204
Systems Engineering .....	0	0	0	0	0	5	5	10
Water Resources Engineering .....	0	0	0	0	0	10	0	10
<b>Total</b> .....	<b>346</b>	<b>237</b>	<b>207</b>	<b>221</b>	<b>1</b>	<b>155</b>	<b>50</b>	<b>1,217</b>
<b>College of Forest and Recreation</b>								
Resources (Nondegree) .....	0	0	0	0	0	1	0	1
Forest Management .....	105	48	41	33	0	9	0	236
Recreation and Park Administration .....	135	111	102	83	0	26	0	457
<b>Total</b> .....	<b>240</b>	<b>159</b>	<b>143</b>	<b>116</b>	<b>0</b>	<b>36</b>	<b>0</b>	<b>694</b>
<b>College of Industrial Management and Textile Science (Nondegree)</b>								
Accounting .....	51	40	34	27	0	0	0	152
Administrative Management .....	210	197	137	89	0	0	0	633
Economics .....	9	11	11	23	0	7	0	61
Engineering Management .....	0	0	0	0	0	0	22	22
Financial Management .....	84	61	49	34	0	0	0	228
Industrial Management .....	28	22	26	69	0	0	0	145
Management .....	0	0	0	0	0	14	0	14
Management Science .....	0	0	0	0	0	0	3	3
Textile Chemistry .....	13	3	3	7	0	12	0	38
Textile and Polymer Science .....	0	0	0	0	0	0	8	8
Textile Science .....	4	4	3	5	0	10	0	26
Textile Technology .....	12	4	6	2	0	0	0	24
<b>Total</b> .....	<b>411</b>	<b>342</b>	<b>269</b>	<b>256</b>	<b>0</b>	<b>45</b>	<b>33</b>	<b>1,356</b>
<b>College of Liberal Arts</b>								
English .....	67	37	56	27	2	51	0	240
French .....	5	8	2	1	0	0	0	16
German .....	1	1	0	3	0	0	0	5
History .....	50	24	25	17	0	9	0	125
Liberal Arts .....	44	8	2	0	2	0	0	56
Political Science .....	99	55	54	36	0	0	0	244
Psychology .....	107	81	72	63	1	0	0	324
Sociology .....	47	31	17	23	1	0	0	119
Spanish .....	6	9	7	3	0	0	0	25
<b>Total</b> .....	<b>426</b>	<b>254</b>	<b>235</b>	<b>173</b>	<b>6</b>	<b>60</b>	<b>0</b>	<b>1,154</b>
<b>College of Nursing</b>								
Nursing (A.A.) .....	45	38	10	0	1	0	0	94
Nursing (B.S.) .....	152	76	58	28	1	0	0	315
<b>Total</b> .....	<b>197</b>	<b>114</b>	<b>68</b>	<b>28</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>409</b>

Major Course	Freshmen	Sophomores	Juniors	Seniors	Postgraduates	Masters'	Ph.Ds'	Total
College of Physical, Mathematical and Biological Sciences (Nondegree)	0	0	0	0	1	10	0	11
Biochemistry	0	0	0	0	0	12	0	12
Biology	10	4	0	0	0	0	0	14
Botany	10	6	2	5	0	11	0	34
Chemistry (B.A.)	2	2	4	5	0	0	0	13
Chemistry (B.S.)	19	14	13	6	1	14	27	94
Geology (B.A.)	1	1	4	1	0	0	0	7
Geology (B.S.)	7	4	6	3	0	0	0	20
Mathematics (B.A.)	12	9	6	11	0	0	0	38
Mathematics (B.S.)	52	27	28	27	0	51	28	213
Medical Technology	52	29	24	5	0	0	0	110
Microbiology	56	43	42	27	0	20	0	188
Physics (B.A.)	0	0	0	1	0	0	0	1
Physics (B.S.)	14	6	10	8	0	10	20	68
Pre-dentistry	14	17	6	18	1	0	0	56
Pre-medicine	21	59	14	28	3	0	0	125
Pre-medicine (Core)	168	0	0	0	0	0	0	168
Pre-pharmacy	37	24	1	0	0	0	0	62
Zoology	85	60	72	55	0	28	8	308
Total	560	305	232	200	6	156	83	1,542
Graduate—Master's Level								1,276
Graduate—Ph.D. Level								226
Nondegree Students								15
Postgraduates								34
Total								1,551
Campus Total								9,461
Clemson-Furman M.B.A. Institutes								136
Institutes								515
Total								651
Grand Total								10,112

## ENROLLMENT BY COUNTIES AND STATES

## Fall Semester, 1973-74

County	State or Country			
Abbeville	67 Alabama	36	Louisiana	15
Aiken	210 Alaska	1	Maine	2
Allendale	13 Argentina	1	Maryland	159
Anderson	737 Arizona	1	Massachusetts	37
Bamberg	28 Arkansas	5	Michigan	8
Barnwell	36 California	8	Minnesota	1
Beaufort	48 Canal Zone	4	Mississippi	3
Berkeley	60 Chile	3	Missouri	5
Calhoun	31 China	23	Montana	1
Charleston	350 Colombia	3	Nebraska	1
Cherokee	67 Colorado	3	Netherlands	1
Chester	50 Connecticut	49	Netherlands Antilles	1
Chesterfield	67 Cuba	1	New Hampshire	3
Clarendon	51 Delaware	26	New Jersey	270
Colleton	47 Denmark	1	New Mexico	3
Darlington	122 District of Columbia	9	New York	154
Dillon	54 Ecuador	1	Nicaragua	1
Dorchester	107 Egypt	2	Nigeria	4
Edgefield	52 El Salvador	1	North Carolina	214
Fairfield	39 England	2	North Dakota	3
Florence	171 Ethiopia	3	Ohio	51
Georgetown	33 Finland	1	Oklahoma	5
Greenville	1,220 Florida	171	Pakistan	3
Greenwood	240 France	1	Panama	5
Hampton	46 Georgia	242	Pennsylvania	139
Horry	88 Germany	2	Peru	3
Jasper	11 Greece	1	Puerto Rico	4
Kershaw	110 Guatemala	2	Rhode Island	5
Lancaster	70 Guyana	7	Sierra Leone	1
Laurens	149 Hawaii	2	South Carolina	7,469
Lee	42 Honduras	1	South Vietnam	3
Lexington	198 Hong Kong	2	Tennessee	38
McCormick	18 Idaho	1	Texas	10
Marion	45 Illinois	18	Thailand	6
Marlboro	34 India	23	Turkey	5
Newberry	70 Indiana	13	Vermont	2
Oconee	358 Iowa	3	Virginia	106
Orangeburg	196 Iran	3	Washington	1
Pickens	843 Kansas	1	West Virginia	9
Richland	397 Kentucky	17	Wisconsin	6
Saluda	55 Korea	3	Yugoslavia	1
Spartanburg	351 Lebanon	5		
Sumter	200 Libya	1	GRAND TOTAL	9,461
Union	28			
Williamsburg	42			
York	218			
S. C. TOTAL	7,469			

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