Each engineering program has additional objectives specific to the discipline. All prepare students for a wide range of career opportunities and provide sound preparation for graduate study. Each curriculum provides opportunities for students to pursue individual areas of interest.

**A admission Requirements**

The University admission requirements are given under the section entitled A dmission. Engineering applicants are strongly advised to include the following in their high school program:

- **Mathematics**—Four units, including geometry, trigonometry, and introductory calculus.
- **Laboratory Science**—At least three units, including both chemistry and physics.
- **Computing**—At least one unit, including introduction to a programming language. Applicants should have good keyboarding skills.

**General Engineering Program**

All new engineering students (including transfer students who have not completed all courses in the freshman engineering curriculum) are admitted into a General Engineering. The General Engineering Program provides students with an opportunity to explore various engineering fields while getting a sound academic preparation for engineering study. To prepare students for entry into a specific engineering degree program, the second semester of the General Engineering curriculum includes a Major Requirement of 6–7 credits. A detailed information about General Engineering can be found at www.ces.clemson.edu/ge.

**Freshman Curriculum**

First Semester

- 2 - CES 102 Engineering Disciplines and Skills
- 3 - CH 101 General Chemistry
- 3 - ENGL 103 Accelerated Composition
- 4 - MATH 106 Calculus of One Variable I
- 3 - Arts and Humanities Requirement
- 3 - Social Science Requirement

16

Second Semester

- 4 - MATH 108 Calculus of One Variable II
- 3 - PHYS 222 Physics with Calculus I
- 3 - Arts and Humanities Requirement
- 3 - Social Science Requirement
- 6-7 - Major Requirement

16-17

**Admission into Engineering Degree Programs**

To transfer into an engineering degree program, a student must have a 2.0 minimum cumulative grade-point ratio on courses taken at Clemson and must have completed the freshman engineering curriculum (including the Major Requirement for the intended major) with a C or better in each course except the Arts and Humanities/Social Science Requirements.

Students should initiate a change-of-major request prior to the registration period during the semester when they expect to complete the freshman curriculum. Students who fail to meet the requirements for admission into a degree program may remain in General Engineering until those requirements are met; however, General Engineering majors are not permitted to take 300- or 400-level engineering courses. Engineering departments may allow General Engineering majors to enroll in selected 200-level engineering courses (policy varies by department). Students transferring into an engineering degree program will follow the curriculum in effect at the time of transfer.

**Engineers as a professional Bachelor of Science engineering program**

Engineers have an obligation to practice their profession in a socially responsible manner. The education of engineers must prepare them for this responsibility and make them aware of the constraints imposed by societal and cultural factors. Thus, the humanities and social sciences are an important component of the engineering curriculum. Further, the program of study must include educational experiences addressing the intersection of science and technology with society and cross-cultural awareness.

Engineering curricula include a minimum of 15 credits of humanities/social science courses selected so as to satisfy the University’s General Education Arts and Humanities and Social Science Requirements, as well as specific program objectives. Individual engineering curricula may have more specific requirements or may require more than 15 hours of humanities/social science courses. Students should consult their academic advisors for further information.

**Registration Requirements**

A cumulative grade-point ratio of 2.0 or higher is required for registration in engineering courses numbered 300 or higher. Priority for registration in engineering courses is given to those majors for whom the course is a degree requirement. Exceptions to this requirement may be granted by the department offering the course.

**Graduation Requirements**

In addition to other institutional requirements, candidates for a baccalaureate degree in Engineering are required to have a 2.0 or higher cumulative grade-point ratio in all engineering courses taken at Clemson. A ll courses with “Engineering” in the course designator (e.g., ENGR 130, M E 545, etc.) are used in this calculation.

The baccalaureate programs in Engineering are designed to be completed in four years (eight regular semesters). Taking a reduced load or participating in cooperative education will extend this time. On average, Clemson engineering students take about four and one-half years to complete the requirements for graduation.
### BIOSYSTEMS ENGINEERING
#### Bachelor of Science

The principal objective of the Biosystems Engineering program is to educate and prepare students for a wide range of engineering endeavors involving biological entities. Two main areas are supported: engineering for management of natural resources and the environment and engineering for production of value-added products from bioprocessing technologies.

Biosystems engineers work at the interface between engineering and life sciences and must be knowledgeable in both disciplines. In addition to the common objectives of all engineering programs listed on page 79, Biosystems Engineering students should achieve familiarity with both biosystems concentrations, experience an interdisciplinary education, and develop a career goal of professional recognition and licensure. Students develop specialization in one of two concentrations:

- The Applied Biotechnology Concentration equips students to apply engineering and biological sciences to problem solving for biological systems and production of value-added bioproducts in a wide range of industries.

- The Natural Resources and Environment Concentration equips students to apply engineering, agricultural, and environmental sciences to assess and control the impact of human activities on the biosphere.

Students are urged to complete a minor and participate in the Cooperative Education, Biosystems Engineering Intern, and/or Study Abroad Programs. Those with interests in medical careers should consider graduate study and/or medical school.

Additional information is available from the departmental offices and can be found on the Web at [www.clemson.edu/agbioeng/bio/home.htm](http://www.clemson.edu/agbioeng/bio/home.htm).

### APPLIED BIOTECHNOLOGY CONCENTRATION
#### Freshman Year

<table>
<thead>
<tr>
<th>First Semester</th>
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<tr>
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**Sophomore Year**

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**Junior Year**

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**Senior Year**

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### NATURAL RESOURCES AND ENVIRONMENT CONCENTRATION
#### Freshman Year

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<th>First Semester</th>
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**Sophomore Year**

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**Junior Year**

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<th>Second Semester</th>
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</tbody>
</table>

Notes:

1. All Biosystems Engineering students must have a cumulative engineering grade-point of 2.0 to enroll in any 300- or 400-level E E courses.
2. Students accepted to a B S/M S program must take 600-level instead of 400-level courses for Life Science and Engineering Requirements.
3. To complete Pre-medicine requirements, students must take BIO L 104 or 111, CH 224, 226, and PHYS 124, 125 as additional courses.

### Engineering Curricula

<table>
<thead>
<tr>
<th>Freshman Year</th>
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<tbody>
<tr>
<td><strong>Total</strong></td>
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</table>

**Notes:**

3. To complete Pre-medicine requirements, students must take BIO L 104 or 111, CH 224, 226, and PHYS 124, 125 as additional courses.
CERAMIC AND MATERIALS ENGINEERING

Bachelor of Science

The School of Materials Science and Engineering offers undergraduate degrees in Ceramic and Materials Engineering, Polymer and Textile Chemistry, and Textile Management.

Ceramic and materials engineers design, develop, and participate in the manufacture of both standard and new materials intended for use in a wide variety of industries with diverse applications. These range from the semiconductor to the aerospace and finally to the traditional ceramics industry. The broad scope of industrial responsibilities handled by ceramic and materials engineers requires knowledge in mathematics, science, engineering, and the social sciences, skills in problem solving, engineering analysis, design, and written and oral communication.

Second Semester
3 - B E 314 Biosystems Engr. Mechanical Design or
3 - M E 306 Fundamentals of Machine Design
3 - B E 322 Small Watershed Hydrology and Sedimentology
3 - B E 412 Heat and Mass Transport in BE
4 - B E 415 Instrumentation and Control for Biosystems Engineers
3 - Structural Design Requirement2

Senior Year
First Semester
3 - B E 414 Biosystems Engr. Unit Operations
3 - B E 464 Non-Point Source Management in Engineered Ecosystems
2 - B E 474 Engineering Project Management/Portfolio
6 - Arts and Humanities Requirement1 or
6 - Social Science Requirement1
3 - Engineering Requirement2
3 - Engineering Requirement2

Second Semester
2 - B E 421 Engineering Systems for Soil-Water Management
2 - B E 475 Biosystems Capstone Design
3 - Arts and Humanities Requirement1 or
3 - Social Science Requirement1
3 - Communication Requirement2 or
3 - Minor Requirement
3 - Engineering Requirement2
13

128 Total Semester Hours

Specifically, the Accreditation Board for Engineering and Technology Engineering Criteria 2000 requires that baccalaureate degree graduates in Ceramic and Materials Engineering be able to:

- demonstrate an integrated understanding of the scientific and engineering principles underlying structure, properties, processing, and performance relationships
- apply this understanding to the solution of ceramic and materials engineering problems
- apply appropriate experimental, statistical, and computational methods to advantage in the solution of ceramic and materials problems

Freshman Year
First Semester
2 - CES 102 Engineering Disciplines and Skills
4 - CH 101 General Chemistry
3 - ENGL 103 Accelerated Composition
4 - MTH SC 106 Calculus of One Variable I
3 - Arts and Humanities Requirement1 or
3 - Social Science Requirement1

Second Semester
4 - CH 102 General Chemistry
2 - ENGR 130 Engineering Fundamentals
4 - MTH SC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
3 - Arts and Humanities Requirement1 or
3 - Social Science Requirement1

Sophomore Year
First Semester
3 - C M E 210 Intro. to Materials Science
4 - MTH SC 205 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
6 - Arts and Humanities Requirement1 or
6 - Social Science Requirement1

Notes:
1. All Biosystems Engineering students must have a cumulative grade-point of 2.0 to enroll in any 300- or 400-level B E courses.
2. Students accepted to a BS/MS program must take 600-level courses for Engineering Requirements.
3. In addition to the common educational objectives of all engineering programs listed on page 79, baccalaureate degree graduates in Ceramic and Materials Engineering will be able to:

Second Semester
1 - C M E 241 M etrics Lab.
2 - E G 209 Intro. to Engr./Comp. Graphics
3 - E M 201 Engineering Mechanics: Statics
4 - MTH SC 208 Intro. to Ord. Diff. Equations
3 - TEXT 324 Technical Writing

Junior Year
First Semester
3 - C M E 319 M etals Processing I
3 - C M E 326 T hermodynamics of M etals
3 - C M E 327 Transport Phenomena
3 - COMM 250 Public Speaking
3 - ENGL 314 Technical Writing

Second Semester
3 - C M E 328 Phase Diagrams for M etals Processing and A pplications
3 - C M E 361 Process of M etals and C omposites
3 - C M E 422 M echanical Behavior of M etals
3 - E E 384 Engineering Economic A nalysis
3 - PT C 303 Textile Chemistry

Senior Year
First Semester
2 - C M E 342 Structure/Property Lab.
3 - C M E 402 Solid State M etals
3 - C M E 413 N oncristalline M etals
3 - C M E 432 M anufacturing Processes and Syst.
1 - C M E 441 M anufacturing Lab.
3 - PT C 415 Intro. to Polymer Science and Engr.

Second Semester
3 - C M E 407 Senior Capstone Design
3 - C M E 416 Electronic Properties of M etals
3 - C M E 424 O ptical M etals and A pplications
3 - C M E 433 Combustion S ystems and Environmental E missions
1 - C M E 445 Practice of M etals Engineering
3 - Departmental Requirement2

125 Total Semester Hours

Notes:
1. See Policy on Social Sciences and Humanities for Engineering Curricula. Six of these credit hours must also satisfy General Education Cross-Cultural Awareness and Science and Technology in Society Requirements.
2. See advisor. Select from department-approved list.
3. See advisor.
CHEMICAL ENGINEERING

Bachelor of Science

Chemical engineering is based on chemistry, physics, mathematics, and biology. The curriculum at Clemson includes a blend of classroom and laboratory instruction and emphasizes broadly applicable fundamental principles and current technology to prepare graduates for immediate, productive employment as well as life-long learning and professional growth. Communication skills and group projects are emphasized because chemical engineers frequently work in multidisciplinary teams. Graduates are prepared to engage successfully in chemical engineering practice or postgraduate education; apply their knowledge and use modern chemical engineering tools to design chemical processes and identify, formulate, and solve chemical engineering problems; educate themselves as knowledge and tools advance; and function effectively on teams, communicate effectively, and serve society through professional contributions. Chemical engineers are involved in the research, manufacture, sales, and use of commodity and specialty chemicals, petroleum products, synthetic fibers and textiles, pharmaceuticals, pulp and paper, electronic components, food and consumer goods, and many other products. They work at the forefront of environmental pollution prevention and remediation and apply engineering science and technology to solve a variety of medical and health-related problems.

In addition to the Bachelor of Science degree, the Department of Chemical and Biomolecular Engineering offers advanced study leading to the Master of Science and Doctor of Philosophy degrees. Additional information can be found on the Web at www.ces.clemson.edu/chemeng.

Freshman Year

First Semester
- 2 - CES 102 Engineering Disciplines and Skills
- 4 - CH 101 General Chemistry
- 3 - ENGL 103 Accelerated Composition
- 4 - MTHSC 106 Calculus of One Variable I
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 16

Second Semester
- 4 - CH 102 General Chemistry
- 3 - CH E 130 Chemical Engineering Tools
- 4 - MTHSC 108 Calculus of One Variable II
- 3 - PHYS 122 Physics with Calculus I
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 17

Sophomore Year

First Semester
- 3 - CH 223 Organic Chemistry
- 4 - CH E 211 Intro. to Chemical Engineering
- 4 - MTHSC 206 Calculus of Several Variables
- 3 - PHYS 221 Physics with Calculus II
- 3 - A and H Humanities Requirement
- 17

Second Semester
- 3 - CH 224 Organic Chemistry
- 1 - CH 229 Organic Chemistry Lab.
- 3 - CH E 220 Chemical Engr. Thermodynamics I
- 4 - MTHSC 208 Intro. to Ord. Diff. Equations
- 15

Junior Year

First Semester
- 3 - BIO CH 301 Molecular Biochemistry
- 1 - CH 339 Physical Chemistry Lab.
- 3 - CH E 307 Unit Operations Lab. I
- 3 - CH E 319 Engineering Materials
- 2 - CHE 307 Basic Electrical Engineering
- 1 - CHE 309 Electrical Engineering Lab. I
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 16

Second Semester
- 3 - CH 332 Physical Chemistry
- 1 - CH 340 Physical Chemistry Lab.
- 3 - CH E 321 Chemical Engr. Thermodynamics II
- 4 - CH E 330 Mass Transfer and Separation Proc.
- 3 - Emphasis A Area
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 17

Senior Year

First Semester
- 3 - CH E 407 Unit Operations Lab. II
- 1 - CH E 443 Chemical Engr. Senior Seminar I
- 3 - CH E 450 Chemical Reaction Engineering
- 3 - Emphasis A Area
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 16

Second Semester
- 3 - CH E 353 Process Dynamics and Control
- 3 - CH E 433 Process Design II
- 1 - CH E 444 Chemical Engr. Senior Seminar II
- 3 - MICRO 413 Industrial Microbiology
- 3 - Emphasis A Area
- 13

127 Total Semester Hours

CIVIL ENGINEERING

Bachelor of Science

Civil Engineering involves the planning, design, construction management, operation, and maintenance of facilities and systems in the built environment including bridges, buildings, airports, water supply systems, ports, dams, and highways.

The Civil Engineering program leads to the Bachelor of Science degree in Civil Engineering and includes the common educational objectives listed on page 79 for the College of Engineering and Science. The first two years provide students with building blocks necessary to be successful civil engineers. This includes proficiency in calculus, engineering mechanics, physics, and chemistry. During the junior year, students receive a broad introduction to the fundamental areas of civil engineering (structures, hydraulics, geotechnical, transportation, environmental, construction materials, and project management). Design experiences are integrated throughout the curriculum, culminating in the senior year with a major capstone design project. In addition, during the senior year, students can select from available emphasis areas which serve to strengthen their undergraduate background.

The Civil Engineering program prepares students to work immediately upon graduation in most areas of civil engineering or to pursue graduate degrees. Students are also exposed to issues related to professional practice, including professional registration, life-long learning, and communication and team skills. Because a concerned society demands a realistic consideration of the impacts of engineering projects, civil engineering students are also educated in the broad areas of the humanities and social sciences.

The Department of Civil Engineering allows students to count up to six hours of graduate credit (600- and 800-level courses) toward both the bachelor’s and master’s degrees. Students participating in this program must have completed the junior year, must have earned a minimum 3.4 grade-point ratio, and must be admitted to the Graduate School prior to registering for graduate courses. Details of the suggested curriculum and program information are available from the department.

The complete objectives of the program can be found on the Web at www.ce.clemson.edu.

Freshman Year

First Semester
- 2 - CES 102 Engineering Disciplines and Skills
- 4 - CH 101 General Chemistry
- 3 - ENGL 103 Accelerated Composition
- 4 - MTHSC 106 Calculus of One Variable I
- 3 - Social Science Requirement
- 16

Second Semester
- 4 - CH 102 General Chemistry
- 3 - CH E 130 Chemical Engineering Tools
- 4 - MTHSC 108 Calculus of One Variable II
- 3 - PHYS 122 Physics with Calculus I
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 17

Sophomore Year

First Semester
- 3 - CH 223 Organic Chemistry
- 4 - CH E 211 Intro. to Chemical Engineering
- 4 - MTHSC 206 Calculus of Several Variables
- 3 - PHYS 221 Physics with Calculus II
- 3 - A and H Humanities Requirement
- 17

Second Semester
- 3 - CH 224 Organic Chemistry
- 1 - CH 229 Organic Chemistry Lab.
- 3 - CH E 220 Chemical Engr. Thermodynamics I
- 4 - MTHSC 208 Intro. to Ord. Diff. Equations
- 15

Junior Year

First Semester
- 3 - BIO CH 301 Molecular Biochemistry
- 1 - CH 339 Physical Chemistry Lab.
- 3 - CH E 307 Unit Operations Lab. I
- 3 - CH E 319 Engineering Materials
- 2 - CHE 307 Basic Electrical Engineering
- 1 - CHE 309 Electrical Engineering Lab. I
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 16

Second Semester
- 3 - CH 332 Physical Chemistry
- 1 - CH 340 Physical Chemistry Lab.
- 3 - CH E 321 Chemical Engr. Thermodynamics II
- 4 - CH E 330 Mass Transfer and Separation Proc.
- 3 - Emphasis A Area
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 17

Senior Year

First Semester
- 3 - CH E 407 Unit Operations Lab. II
- 1 - CH E 443 Chemical Engr. Senior Seminar I
- 3 - CH E 450 Chemical Reaction Engineering
- 3 - Emphasis A Area
- 3 - A and H Humanities Requirement
- 3 - Social Science Requirement
- 16

Second Semester
- 3 - CH E 353 Process Dynamics and Control
- 3 - CH E 433 Process Design II
- 1 - CH E 444 Chemical Engr. Senior Seminar II
- 3 - MICRO 413 Industrial Microbiology
- 3 - Emphasis A Area
- 13

127 Total Semester Hours

1See Policy on Social Sciences and Humanities for Engineering Curricula. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.

2See advisor for details. Nine credit hours devoted to completing an emphasis area or approved minor are required. Note: No student may exceed a maximum of two attempts, including a W, to complete successfully any CH E course.
Second Semester
2 - ENGR 130 Engineering Fundamentals
3 - GEOL 101 Physical Geology
1 - GEOL 103 Physical Geology Lab.
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
1 - PHYS 124 Physics Lab.
3 - Arts and Humanities Requirement
3 - C E 459 Capstone Design Project

First Semester
3 - Arts and Humanities Requirement
3 - C E 459 Capstone Design Project

Sophomore Year
First Semester
4 - C E 203 Statics and Dynamics
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
1 - MTHSC 223 Physics Lab.
3 - Arts and Humanities Requirement
3 - Social Science Requirement

Second Semester
4 - C E 206 Structural Mechanics
3 - C E 255 Geomatics
2 - C E 352 Economic Evaluation of Projects
2 - E G 209 Intro. to Engr./Computer Graphics
4 - MTHSC 208 Intro. to Ord. Diff. Equations

Junior Year
First Semester
3 - C E 301 Structural Analysis
3 - C E 331 Construction Engineering and Mgt.
4 - C E 341 Introduction to Fluid Mechanics
4 - C E 351 Civil Engineering Materials
3 - EX ST 301 Introductory Statistics

Second Semester
3 - C E 311 Transportation Engr. Plan. and Design
4 - C E 321 Geotechnical Engineering
3 - C E 342 Applied Hydraulics and Hydrology
1 - C E 353 Civil Engineering Materials
3 - EE & S 401 Environmental Engineering
3 - Technical Design Requirement

Senior Year
First Semester
3 - ENGL 314 Technical Writing
9 - Technical Requirement
3 - Technical Requirement Restricted

Second Semester
3 - C E 459 Capstone Design Project
3 - Arts and Humanities Requirement
3 - Social Science Requirement
3 - Arts and Humanities (Literature) Requirement
3 - Technical Requirement
3 - Elective

127 Total Semester Hours

Notes:
1 - Arts and Humanities Requirement
1 - Social Science Requirement

Sophomore Year
First Semester
3 - E C E 201 Logic and Computing Devices
3 - E C E 202 Electric Circuits I
1 - E C E 211 Electrical Engineering Lab. I
3 - E C E 222 Systems Programming Concepts for Computer Engineering
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II

Second Semester
1 - E C E 212 Electrical Engineering Lab. II
3 - E C E 223 Computer Systems Engineering
3 - E C E 262 Electric Circuits II
4 - E C E 272 Computer Organization
4 - MTHSC 208 Intro. to Ordinary Diff. Equations

Junior Year
First Semester
1 - E C E 311 Electrical Engineering Lab. III
3 - E C E 320 Electronics I
3 - E C E 329 Computer Systems Structures
3 - E C E 330 Signals, Systems, and Transforms
4 - E C E 371 Microcomputer Interfacing
3 - MTHSC 311 Linear Algebra

Second Semester
3 - E C E 317 Random Signal Analysis
3 - E C E 327 Digital Computer Design
3 - E C E 352 Programming Systems
3 - ENGL 314 Technical Writing
3 - MTHSC 419 Discrete Math. Structures I

Senior Year
First Semester
3 - Arts and Humanities Requirement
3 - Social Science Requirement
9 - Computer Engineering Technical Requirement
3 - Oral Communication Requirement

Second Semester
3 - E C E 453 Software Practicum
6 - Arts and Humanities Requirement
6 - Social Science Requirement
6 - Comp. Engr. Depth Technical Requirement

127 Total Semester Hours

Notes:
1 - See Policy on Humanities and Social Sciences for Engineering Curricula. Six of these credit hours must also satisfy General Education Cross-Cultural Awareness and Science and Technology in Society Requirements.
2 - Select from department-approved list.
3 - See General Education Requirements.

1 - A student is allowed to enroll in E C E courses (excluding E C E 307, 308, 309, 310) only when all prerequisites have been passed with a grade of C or better.
2 - A ll Computer Engineering students must have a cumulative engineering grade-point average of 2.0 to enroll in any 300- or 400-level E C E courses.
3 - No student may exceed a maximum of two attempts, excluding a W, to complete successfully any E C E course.

College of Engineering and Science

www.ece.clemson.edu/
ELECTRICAL ENGINEERING
Bachelor of Science

Electrical engineers are in high demand for a wide range of influential positions. Professional duties range from analytical problem solving to the design of components and systems. The scope of employment requires a unique breadth and depth of knowledge and technical skills, which are reflected in the Electrical Engineering program. This program also offers an excellent preparation for graduate education. Detailed information can be found on the Web at www.ece.clemson.edu/ece/index.shtml.

Building on a foundation of mathematical and physical sciences, students progress into the application of these in the engineering science areas of circuits, electronics, communications, controls, power, and electromagnetics. In these subjects, students also begin to apply the concepts and techniques learned to the design of circuits and systems. Senior technical design courses offer the opportunity to further develop expertise in a selected area.

In addition to these technical skills, students learn to communicate effectively, both orally and with the written word. Because engineers work for the benefit of society, the curriculum includes a strong component of humanities and social science courses. Also, many project design assignments enable the development of interpersonal, teamwork, and management skills which are necessary for success in a professional engineering career.

Freshman Year
First Semester
1 - CES 102 Engineering Disciplines and Skills
2 - CH 101 General Chemistry
3 - ENGL 103 Acelerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Arts and Humanities Requirement
3 - Social Science Requirement
16

Second Semester
4 - CH 102 General Chemistry
3 - CP SC 111 Elem. Computer Prog. in C/C++
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
3 - Arts and Humanities Requirement
3 - Social Science Requirement
17

Sophomore Year
First Semester
3 - ECE 201 Logic and Computing Devices
3 - ECE 202 Electric Circuits I
1 - ECE 211 Electrical Engineering Lab. I
4 - MTHSC 106 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
3 - Technical Requirement (E C E) or
3 - Arts and Humanities Requirement
3 - Social Science Requirement
17

Second Semester
1 - ECE 212 Electrical Engineering Lab. II
3 - ECE 262 Electric Circuits II
4 - ECE 272 Computer Organization
3 - EME 201 Engineering Mechanics: Statics
4 - MTHSC 208 Intro. to Ordinary Diff. Equations
15

Junior Year
First Semester
1 - ECE 311 Electrical Engineering Lab. III
3 - ECE 320 Electronics I
3 - ECE 330 Signals, Systems, and Transforms
4 - ECE 371 Microcomputer Interfacing
3 - ECE 380 Electromagnetics
3 - Technical Requirement (Adv. Mathematics) or
3 - Technical Requirement (A dv. Mathematics)
17

Second Semester
1 - ECE 312 Electrical Engineering Lab. IV
3 - ECE 317 Random Signal Analysis
3 - ECE 321 Electronics II
3 - ECE 360 Electric Power Engineering
3 - ECE 381 Fields, Waves, and Circuits
3 - ENGL 314 Technical Writing
16

Senior Year
First Semester
3 - ECE 409 Continuous and Discrete Syst. Des.
3 - ECE 427 Communications Systems
2 - ECE 495 Integrated Systems Design I
3 - Oral Communication Requirement
3 - Technical Requirement (E C E) or
3 - Technical Requirement Depth (E C E)
14

Second Semester
2 - ECE 496 Integrated System Design II
6 - Arts and Humanities Requirement or
6 - Social Science Requirement
3 - Arts and Humanities Requirement or
3 - Social Science Requirement or
3 - Technical Requirement (E C E) or
3 - Technical Requirement Depth (E C E)
14

126 Total Semester Hours

ECE 307, 308, 309) only when all prerequisites have been passed with a grade of C or better.

INDUSTRIAL ENGINEERING
Bachelor of Science

Industrial engineers design, install, and improve the complex systems that provide goods and services vital to our society and economy. These systems place unique demands for breadth of preparation on industrial engineers. Baccalaureate degree graduates demonstrate the ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and energy. Graduates will demonstrate the ability to apply the principles and techniques of industrial engineering analysis and design supported by a foundation in mathematical, physical and social sciences, and economic, operational, and engineering analyses. Graduates will possess a breadth of knowledge that allows them to practice industrial engineering with an appropriate awareness of information issues in systems improvement. In addition, graduates are able to work and communicate effectively with colleagues at every level in the organization.

The traditional arena for the practice of industrial engineering are the manufacturing facilities of industry; however, many practicing industrial engineers are employed in non-manufacturing institutions such as hospitals, banks, and government agencies. In addition to numerous employment opportunities in professional practice, industrial engineering graduates may further their formal education. The Department of Industrial Engineering offers programs leading to the Master of Science and Doctor of Philosophy degrees.

The Department of Industrial Engineering allows students to count up to 12 hours of graduate credit (approved 600- and 800-level courses) toward both the bachelor’s and master’s degrees. Students participating in this program must have a minimum grade-point ratio of 3.4 and be admitted to the Graduate School prior to registering for graduate courses. Details of the suggested curriculum and program information are available from the Industrial Engineering Department.

Detailed curriculum and department information is available on the Web at www.ces.clemson.edu/ie.

Freshman Year
First Semester
2 - CES 102 Engineering Disciplines and Skills
4 - CH 101 General Chemistry
3 - ENGL 103 Acelerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Arts and Humanities Requirement or
3 - Social Science Requirement
16

Second Semester
4 - CH 102 General Chemistry
3 - CP SC 111 Elem. Computer Prog. in C/C++
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
3 - Arts and Humanities Requirement or
3 - Social Science Requirement
17

Sophomore Year
First Semester
3 - ECE 201 Logic and Computing Devices
3 - ECE 202 Electric Circuits I
1 - ECE 211 Electrical Engineering Lab. I
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
3 - Technical Requirement (E C E) or
3 - Arts and Humanities Requirement or
3 - Social Science Requirement
17

Second Semester
4 - CH 102 General Chemistry
2 - ENGR 130 Engineering Fundamentals
4 - MTHSC 106 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
1 - PHYS 124 Physics Lab. II
3 - Arts and Humanities Requirement or
3 - Social Science Requirement
17
Sophomore Year
First Semester
1 - E G 209 Intro. to Engr./Computer Graphics
2 - I E 201 System Design I
3 - I E 220 Design of Information Systems in IE or
   3 - CP SC 161 Intro. to Visual Basic Program.
4 - M TH SC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
16
Second Semester
3 - C M E 210 Introduction to Materials Science
3 - E M 201 Engineering Mechanics: Statics
4 - I E 210 Design and Analysis of Work Systems
3 - I E 280 Methods of Operational Research
3 - I E 384 Engineering Economic Analysis
16
Junior Year
First Semester
2 - E C E 307 Basic Electrical Engineering
1 - E C E 309 Electrical Engineering Lab. I
3 - H IST 122 History, Technology, and Society
3 - I E 360 Ind. A ppl. of Probability and Statistics
4 - I E 440 Decision Support Systems in I E
3 - I E 465 Facilities Planning and Design
16
Second Semester
3 - COMM 150 Intro. to Human Comm. or
3 - COMM 250 Public Speaking
3 - I E 361 Industrial Quality Control
1 - I E 368 Professional Practice in I E
3 - I E 381 Methods of Operational Research II
3 - I E 386 Production Planning and Control
3 - Engineering Science Requirement
4 - Technical Requirement
16
Senior Year
First Semester
3 - ENGL 314 Technical Writing
3 - I E 467 Systems Design II
3 - MGT 301 Principles of Management
3 - PO SC 102 Intro. to International Relations
3 - A rts and Humanities Requirement
3 - Social Science Requirement
3 - Technical Requirement
16
Second Semester
3 - I E 467 Systems Design II
3 - MGT 301 Principles of Management
3 - PO SC 102 Intro. to International Relations
3 - A rts and Humanities Requirement
3 - Social Science Requirement
3 - Technical Requirement
15
128 Total Semester Hours

MECHANICAL ENGINEERING
Bachelor of Science

Breadth, individuality, and flexibility are inherent characteristics of the mechanical engineering profession. Mechanical engineers, in a broad sense, make major contributions to the creation of products and systems that benefit mankind. They work in a variety of areas including bioengineering, energy systems, environmental and life-support systems, propulsion and transportation systems, food production, materials processing, automated manufacturing, and construction. A wide spectrum of career opportunities is open to them. The practice of mechanical engineering includes one or more of the following activities: manufacturing, testing, research, development, design, technical management, technical sales and marketing, construction, and teaching.

Preparation for a 40-45 year professional career requires development of the whole person through a balanced program encompassing the humanities, social sciences, communication and computer skills, physical and engineering sciences, design, and laboratory experience. Students start with the physical sciences and communication skills and progress through the engineering sciences, ultimately applying the principles learned in such areas as energy conversion and transfer, mechanical design, and systems analysis. Throughout the curriculum, the fundamental nature of engineering as a problem-solving discipline is emphasized.

Most graduates take positions in industry, government, or business. Many, however, continue their formal education in a graduate program. The Department of Mechanical Engineering offers study leading to the Master of Engineering, Master of Science, and Doctor of Philosophy degrees.

Mechanical Engineering students who have a cumulative grade-point ratio or cumulative engineering grade-point ratio (EGPR) below 2.0 are on probation and will have restricted enrollment in classes. Students whose cumulative GP R is below 2.0 are subject to the regulations stipulated under Continuing Enrollment Policy. Students on probation for EG PR below 2.0 will fail to recover in the first regular semester (fall or spring) will not be allowed to register for mechanical engineering classes. After one year, such students may petition the M echanical Engineering Department for continued enrollment. A n advising policy for students on probation is available from the M echanical Engineering Department.

A dditional information can be found on the Web at www.ces.clemson.edu/me.

Freshman Year
First Semester
2 - C E S 102 Engineering Disciplines and Skills
4 - CH 101 General Chemistry
3 - ENGL 103 Accelerated Composition
4 - M TH SC 106 Calculus of One Variable I
3 - A rts and Humanities Requirement
3 - Social Science Requirement
16
Second Semester
3 - ENGR 141 Programming and Problem Solving in Mechanical Engineering
4 - M TH SC 108 Calculus of One Variable II
1 - PHYS 122 Physics with Calculus I
1 - PHYS 124 Physics Lab. I
3 - A rts and Humanities Requirement
3 - Social Science Requirement
16
Sophomore Year
First Semester
5 - M E 201 Statics and Dynamics for Mech. Engr.
2 - M E 222 M echanical Engineering Lab. I
4 - M TH SC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
3 - Science Requirement
17-19
Second Semester
2 - E C E 307 Basic Electrical Engineering
1 - E C E 309 Electrical Engineering Lab. I
3 - M E 202 Foundations of M echanical Systems
3 - M E 203 Found. of Thermal and Fluid Syst.
4 - M TH SC 208 Intro. to Ord. Diff. Equations
3 - N umerical A nalysis Requirement
16
Junior Year
First Semester
3 - M E 302 M echanics of Materials
3 - M E 303 Thermodynamics
3 - M E 305 M odel. and Analysis of Dynamic Syst.
3 - M E 308 Fluid M echanics
2 - M E 333 M echanical Engineering Lab. II
3 - A rts and Humanities Requirement
3 - Social Science Requirement
17
Second Semester
3 - M E 304 Heat Transfer
3 - M E 306 Fundamentals of M achine Design
3 - M E 312 M anufacturing Proc. and The ir A ppl.
3 - A dvanced Writing Requirement
3 - Statistics Requirement
15
Senior Year
First Semester
3 - M E 401 M echanical Engineering Design
3 - M E 403 Control and Integration of M ultidomain Dynamic Systems
2 - M E 444 M echanical Engineering Lab. III
6 - Technical Requirement
14
Second Semester
1 - M E 400 Senior Seminar
3 - M E 402 Internship in Engineering Design
6 - A rts and Humanities Requirement
3 - Social Science Requirement
3 - Technical Requirement
13
124-126 Total Semester Hours

85
College of Engineering and Science
SCIENCE PROGRAMS

The College offers curricula leading to the Bachelor of Science in Chemistry, Computer Information Systems, Computer Science, Geology, Mathematical Sciences, and Physics. The Bachelor of Arts is offered with a major in Chemistry, Computer Science, Geology, Mathematical Sciences, and Physics.

The science departments at the College work closely with the other academic departments in the University, including such disciplines as economics and management as well as engineering. This allows students in the sciences great flexibility and responsibility in designing their own programs.

Bachelor of Science Curricula

The Bachelor of Science degree prepares graduates for professional employment or graduate study in the chosen science discipline. BS curricula are thus more highly structured than BA curricula, but nonetheless offer opportunity for students to pursue a minor or secondary area of interest.

Bachelor of Arts Curricula

The curricula leading to the Bachelor of Arts degree are designed to meet the needs of students who desire a broad general education. They require a minor (or a second major) as well as the major concentration. A major requires a minimum of 24 credits from above the sophomore level, including or in addition to courses specified by the major department. In some major disciplines, certain prescribed courses at the sophomore level are counted toward the 24 credit requirement.

Students have a large degree of flexibility and responsibility in selecting the minor area from those listed on page 96. The courses for these minors are to be selected in consultation with the appropriate department.

CHEMISTRY

Bachelor of Science

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 students whose education is built around the principles of this discipline.

The curriculum, through the career requirement options and the large number of electives, provides students the opportunity to select a coherent program of study beyond the basic courses. Career requirement options are provided for students anticipating graduate study in chemistry or related fields, employment following the BS degree in laboratory, production, technical sales, or management positions; professional studies (e.g., medicine); chemical physics; geochemistry; and employment in fields requiring extensive preparation in courses other than sciences (e.g., patent law and technical writing). Significant features of the curriculum are the student’s extensive participation in experimental work and the opportunity to take part in a research investigation during the junior and senior years.

Freshman Year

First Semester
4 - CH 101 General Chemistry
1 - CH 141 Chemistry Orientation
3 - ENGL 103 A Celerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Arts and Humanities Requirement1 or Social Science Requirement1

Second Semester
4 - CH 102 General Chemistry
2 - CH 152 Chemistry Communication I
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
3 - Arts and Humanities Requirement1 or Social Science Requirement1

Sophomore Year

First Semester
3 - CH 223 Organic Chemistry
1 - CH 227 Organic Chemistry Lab.
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
1 - PHYS 223 Physics Lab. II
4 - Foreign Language Requirement2

Second Semester
3 - CH 205 Introduction to Inorganic Chemistry
3 - CH 224 Organic Chemistry
1 - CH 228 Organic Chemistry Lab.
4 - MTHSC 208 Intro. to Ordinary Diff. Equations
3 - PHYS 222 Physics with Calculus III
1 - PHYS 224 Physics Lab. III

Junior Year

First Semester
3 - BIOCH 301 Molecular Biochemistry
3 - CH 313 Quantitative Analysis
2 - CH 315 Quantitative Analysis Lab.
3 - CH 331 Physical Chemistry
1 - CH 339 Physical Chemistry Lab.
3 - ENGL 314 Technical Writing

Second Semester
3 - CH 322 Physical Chemistry
1 - CH 340 Physical Chemistry Lab.
3 - CH 411 Instrumental Analysis
2 - CH 412 Instrumental Analysis Lab.
3 - Arts and Humanities (Literature) Requirement1
3 - Elective

Senior Year

First Semester
3 - CH 402 Inorganic Chemistry
2 - CH 403 Advanced Synthetic Techniques
3 - CH 443 Research Problems
3 - Arts and Humanities Requirement1 or Social Science Requirement1
3 - Chemistry Requirement1

Second Semester
3 - CH 444 Research Problems
3 - CH 450 Chemistry Capstone
1 - CH 452 Chemistry Communication II
3 - Arts and Humanities Requirement1 or Social Science Requirement1
3 - Chemistry Requirement1
3 - Elective

122 Total Semester Hours

Bachelor of Arts

Freshman Year

First Semester
4 - CH 101 General Chemistry
1 - CH 141 Chemistry Orientation
3 - ENGL 103 A Celerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Arts and Humanities Requirement1 or Social Science Requirement1

Second Semester
4 - CH 102 General Chemistry
2 - CH 152 Chemistry Communication I
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
3 - Arts and Humanities Requirement1 or Social Science Requirement1

Sophomore Year

First Semester
3 - CH 223 Organic Chemistry
1 - CH 227 Organic Chemistry Lab.
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
1 - PHYS 223 Physics Lab. II
4 - Foreign Language Requirement2

Second Semester
3 - CH 205 Introduction to Inorganic Chemistry
3 - CH 224 Organic Chemistry
1 - CH 228 Organic Chemistry Lab.
4 - MTHSC 208 Intro. to Ordinary Diff. Equations
3 - PHYS 222 Physics with Calculus III
1 - PHYS 224 Physics Lab. III

Junior Year

First Semester
3 - BIOCH 301 Molecular Biochemistry
3 - CH 313 Quantitative Analysis
2 - CH 315 Quantitative Analysis Lab.
3 - CH 331 Physical Chemistry
1 - CH 339 Physical Chemistry Lab.
3 - ENGL 314 Technical Writing

Second Semester
3 - CH 322 Physical Chemistry
1 - CH 340 Physical Chemistry Lab.
3 - CH 411 Instrumental Analysis
2 - CH 412 Instrumental Analysis Lab.
3 - Arts and Humanities (Literature) Requirement1
3 - Elective

118 Total Semester Hours
Junior Year
First Semester
3 - CH 313 Quantitative Analysis
1 - CH 317 Quantitative Analysis Lab.
1 - Arts and Humanities Requirement1 or
3 - Social Science Requirement1
3 - Arts and Humanities (Literature) Requirement1 or
3 - Foreign Language Requirement1
3 - Minor
16
Second Semester
3 - CH 331 Physical Chemistry
3 - EN GL 314 Technical Writing
3 - Arts and Humanities Requirement1 or
3 - Social Science Requirement1
3 - Foreign Language Requirement1
3 - Minor
15
Senior Year
First Semester
3 - CH 332 Physical Chemistry
3 - Arts and Humanities Requirement1 or
3 - Social Science Requirement1
3 - Chemistry Requirement3
3 - Minor
3 - Elective
15
Second Semester
3 - CH 450 Chemistry Capstone
1 - CH 452 Chemistry Communication II
3 - Chemistry Requirement3
6 - Minor
3 - Elective
16
122 Total Semester Hours
1See General Education Requirements. Six of these credit hours must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.
2Four semesters (through 202) of the same modern foreign language are required.
3See advisor.

COMPUTER INFORMATION SYSTEMS
Bachelor of Science
The Computer Information Systems degree program is oriented toward computer applications in management-related problems. The program emphasizes functional areas of management including accounting, production, marketing, and finance and the applications of computers in these areas. The curriculum is designed to prepare students for careers in areas such as systems design and analysis, applications programming, database administration, and information retrieval as well as for continued study toward an advanced degree.

Students who change majors into Computer Information Systems must have a cumulative grade-point ratio of 2.0 or higher.

A additional information can be found on the Web at www.cs.clemson.edu.

Freshman Year
First Semester
4 - CP SC 101 Computer Science I
3 - EN GL 103 A ccelerated Composition
4 - MTH SC 106 Calculus of One Variable I
3 - Social Science Requirement1,2
14
Second Semester
4 - CP SC 102 Computer Science II
4 - MTH SC 108 Calculus of One Variable II
3 - MTH SC 113 Intro. to Discrete Mathematics
3 - Arts and Humanities (Non-Lit.) Requirement1,2
3 - Social Science Requirement1,2
17
Sophomore Year
First Semester
4 - CP SC 212 Algorithms and Data Structures
3 - Arts and Humanities (Literature) Requirement1
3 - Social Science Requirement1,2
3 - Oral Communication Requirement1
17
Second Semester
3 - CP SC 215 Tools and Tech. for Software Dev.
4 - CP SC 231 Intro. to Computer Organization
1 - CP SC 291 Seminar in Professional Issues I
3 - MTH SC 210 Applied Matrix Algebra or
3 - MTH SC 311 Linear Algebra
4 - Natural Science Requirement1
15
Junior Year
First Semester
3 - A C C T 201 Financial Accounting Concepts
3 - CP SC 322 Introduction to Operating Systems
3 - CP SC 372 Intro. to Software Development
3 - ECON 211 Principles of Microeconomics
3 - MTH SC 301 Statistical Methods
15
Second Semester
3 - A C C T 202 Managerial Accounting Concepts
3 - CP SC 360 Networks and Network Program.
3 - CP SC 371 Systems Analysis or
3 - MGT 452 Systems Analysis and Design
3 - MGT 301 Principles of Management
3 - Elective
15
Senior Year
First Semester
3 - CP SC 462 Database Management Systems
1 - CP SC 491 Seminar in Professional Issues II5
3 - Advanced Writing Requirement1
3 - Business Requirement4
3 - Computer Science Requirement7
3 - Information Systems Requirement8
16
Second Semester
3 - MGT 312 Decision Models for Management
3 - MKT 301 Principles of Marketing
3 - Business Requirement4
3 - Computer Science Requirement7
1 - Elective
13
122 Total Semester Hours
1See General Education Requirements.
2Six of these credit hours must also satisfy General Education Cross-Cultural Awareness and Science and Technology in Society Requirements.
3Select from courses in A A H, A A S, A N T H, ART, CHIN, COMM, DANCE, E A S, ECON, ENGL, FR, GEOG, GER, HIST, HUM, ITAL, JAPN, MUSIC, P A, PHIL, PO SC, PSYCH, REL, RUSS, SOC, SPA N, THEA, W S.
4CP SC H 395 may be substituted.
5MGT 390, 400, or FIN 306
6Select from CP SC courses numbered 300 or higher.
7MGT 452, 454, 455, 456, or 400-level CP SC course
8See advisor.
9For graduation, a candidate for the BS degree in Computer Information Systems must have earned a grade of C or better in each CP SC course applied to the degree.
10A grade of C or better must be earned in all prerequisite courses (including CP SC and MTH SC courses) before enrolling in the next CP SC course.

COMPUTER SCIENCE
Bachelor of Science
The Computer Science degree program is oriented toward design, implementation, and application of software systems to solve information processing problems. Emphasis areas outside computer science allow the program to be tailored to the needs and interests of individual students. The program is more technically oriented than the Computer Information Systems curriculum. It prepares students for employment in the computer software field or for continued study toward an advanced degree in computer science. This program is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET).

Students who change majors into Computer Science must have a cumulative grade-point ratio of 2.0 or better.

A additional information can be found on the Web at www.cs.clemson.edu.

Freshman Year
First Semester
4 - CP SC 101 Computer Science I
3 - ENGL 103 A ccelerated Composition
4 - MTH SC 106 Calculus of One Variable I
3 - Social Science Requirement1
14
### Sophomore Year

#### First Semester
- CP SC 212 Algorithms and Data Structures
- PHYS 122 Physics with Calculus I
- PHYS 119 Introduction to Discrete Methods
- A & Heter and Humanities (non-lit.) Requirement
- Social Science Requirement
- Elective

#### Second Semester
- CP SC 311 Seminar in Professional Issues I
- MTHSC 301 Statistical Methods I
- Elective
- Elective
- Social Science Requirement
- Fine Arts Requirement
- Elective

### Junior Year

#### First Semester
- CP SC 330 Computer Systems Organization
- CP SC 360 Networks and Networking Program
- CP SC 372 Introduction to Software Development
- MTHSC 311 Linear Algebra
- Elective

#### Second Semester
- CP SC 322 Introduction to Operating Systems
- CP SC 350 Foundations of Computer Science
- CP SC 362 Distributed and Cluster Computing
- Emphasis Area
- Natural Science Requirement

### Senior Year

#### First Semester
- CP SC 428 Design and Implementation of Programming Languages
- CP SC 429 Advanced Writing Requirement
- Computer Science Requirement
- Elective

#### Second Semester
- CP SC 491 Seminar in Professional Issues II
- CP SC 492 Seminar in Professional Issues I
- Computer Science Requirement
- Fine Arts Requirement
- Elective

### Computer Science Bachelor of Arts

The Bachelor of Arts in Computer Science is ideal for students interested in acquiring a broad-based liberal arts education that includes a strong and solid understanding of computer science. The curriculum is oriented toward design, implementation, and application of computer software systems to solve information processing problems. The program prepares students for employment in the computer software field or for continued study toward an advanced degree in computer science.

Students who change majors into Computer Science must have a cumulative grade-point ratio of 2.0 or higher.

Additional information can be found on the Web at www.cs.clemson.edu.

### Freshman Year

#### First Semester
- CP SC 101 Computer Science I
- ENGL 103 A & Heterated Composition
- MTHSC 106 Calculus of One Variable I
- Foreign Language Requirement

#### Second Semester
- CP SC 102 Computer Science II
- MTHSC 108 Calculus of One Variable II
- MTHSC 119 Introduction to Discrete Methods
- Foreign Language Requirement

### Sophomore Year

#### First Semester
- CP SC 212 Algorithms and Data Structures
- A & Heter and Humanities (literature) Requirement
- Foreign Language Requirement
- Natural Science Requirement
- Oral Communication Requirement

#### Second Semester
- CP SC 215 Tools and Tech. for Software Dev.
- CP SC 231 Intro. to Computer Organization
- CP SC 291 Seminar in Professional Issues I
- Foreign Language Requirement
- Natural Science Requirement

### College of Engineering and Science
**GEOLOGY**

**Bachelor of Science**

Geology involves the physics and chemistry of materials which comprise the earth, but equally important, it considers the development of life on earth. Fundamentally, the chemical, physical, and biological responses to environments on and in the earth must be thoroughly understood so that the historical development of the earth can be deduced, predictions of the future inferred, and natural resources intelligently developed. Industry depends on minerals and rocks; metals have their origin in them as do our chief power sources, coal, petroleum, and radioactive minerals.

Employment opportunities for geologists include such far-reaching fields as mineral-producing industries, railroads, municipalities, engineering firms, and water authorities. It is important, therefore, that a geology education rest on a broad yet rigorous base.

Students pursuing a Bachelor of Science degree in Geology have three concentrations from which to choose. The “traditional” curriculum provides the fundamentals of geology and excellent support in the other basic sciences. Graduates are prepared for employment or for graduate study in any field of geology. The Environmental Science Concentration prepa red students for careers in the environmental consulting industry or graduate school in environmental fields. Students in this concentration take 15 credits of Environmental Science Requirement, including at least nine credits from one of three subdisciplines: geology, soil science, biology/ecology, or chemistry/physics. The Hydrogeology Concentration may be taken by students interested in applying engineering principles to geologic problems. Engineering geologists are increasingly called upon to perform geologic site evaluations for construction projects and to minimize the threat of geologic hazards. The curriculum involves courses in engineering and soil mechanics plus 15 credits of Engineering Geology Requirement selected from courses in civil, environmental, and biosystems engineering or advanced mathematics.

**Freshman Year**

**First Semester**
- CH 101 General Chemistry
- ENGL 103 Accelerated Composition
- GEOL 101 Physical Geology
- GEOL 103 Physical Geology Lab.
- MTHSC 106 Calculus of One Variable I

**Second Semester**
- CH 102 General Chemistry
- GEOL 102 Earth History
- MTHSC 108 Calculus of One Variable II
- Arts and Humanities (Non-Lit.) Requirement

**Sophomore Year**

**First Semester**
- BIOL 103 General Biology I
- GEOL 206 Mineralogy and Intro. Petrology
- GEOL 211 Geoanalysis I
- GEOL 291 Introduction to Research I
- Social Science Requirement

**Second Semester**
- CSENV 202 Soils
- GEOL 212 Geoanalysis II
- GEOG 216 Petrography
- GEOL 292 Introduction to Research II
- PHYS 222 Physics with Calculus I

**Junior Year**

**First Semester**
- EN SP 200 Intro. to Environmental Science
- GEOL 302 Structural Geology
- GEOL 316 Igneous and Metamorphic Petro.
- GEOL 391 Research Methods I
- Arts and Humanities (Literature) Requirement

**Second Semester**
- GEOL 300 Environmental Geology
- GEOL 313 Sedimentology and Stratigraphy
- GEOL 392 Research Methods II
- Geology Requirement
- Social Science Requirement
- Elective

**Summer**
- Summer Geology Field Course

**Senior Year**

**First Semester**
- GEOL 405 Geomorphology
- GEOL 408 Geohydrology
- GEOL 491 Research Synthesis I
- Elective

**Second Semester**
- GEOL 409 Subsurface Methods
- GEOL 492 Research Synthesis II
- Geology Requirement
- Elective

**Summer**
- Field Experience

**ENVIRONMENTAL SCIENCE CONCENTRATION**

**Freshman Year**

**First Semester**
- CH 101 General Chemistry
- ENGL 103 Accelerated Composition
- GEOL 101 Physical Geology
- GEOL 103 Physical Geology Lab.
- MTHSC 106 Calculus of One Variable I

**Second Semester**
- CH 102 General Chemistry
- GEOL 102 Earth History
- MTHSC 108 Calculus of One Variable II
- Arts and Humanities (Non-Lit.) Requirement

**Sophomore Year**

**First Semester**
- BIOL 103 General Biology I
- GEOL 206 Mineralogy and Intro. Petrology
- GEOL 211 Geoanalysis I
- GEOL 291 Introduction to Research I
- Social Science Requirement

**Second Semester**
- BIOL 104 General Biology II
- GEOL 212 Geoanalysis II
- GEOL 292 Introduction to Research II
- GEOL 300 Environmental Geology
- PHYS 222 Physics with Calculus I

**Junior Year**

**First Semester**
- EN SP 200 Intro. to Environmental Science
- GEOL 292 Introduction to Research II
- Arts and Humanities (Literature) Requirement

**Second Semester**
- GEOL 300 Environmental Geology
- GEOL 313 Sedimentology and Stratigraphy
- GEOL 392 Research Methods II
- Geology Requirement
- Social Science Requirement

**Summer**
- Field Experience

**Senior Year**

**First Semester**
- EN SP 400 Studies in Environmental Sciences
- GEOL 408 Geohydrology
- GEOL 491 Research Synthesis I
- Environmental Science Requirement
Second Semester
3 - CH 223 Organic Chemistry or
3 - CH 413 Chemistry of Aqueous Systems
4 - GEOL 492 Research Synthesis II
6 - Environmental Science Requirement
13

122 Total Semester Hours

See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.

1STHSC 206 and 208 or 301 or EX ST 301 may be substituted.

Select from department-approved list. At least three credit hours must be from geology courses.

Field course in geology, ecology, or related area. Must be at least three credits. Students desiring to become registered professional geologists should take a six credit summer geology field course.

HYDROGEOLOGY CONCENTRATION

Freshman Year
First Semester
4 - CH 101 General Chemistry
3 - ENGL 103 Acelerated Composition
3 - GEOL 101 Physical Geology
1 - GEOL 103 Physical Geology Lab.
4 - MTHSC 106 Calculus of One Variable I
15

Second Semester
4 - GEOL 206 Mineralogy and Intro. Petrology
4 - GEOL 211 Geoaanalysis I
1 - GEOL 291 Introduction to Research I
3 - Arts and Humanities (Non-Lit.) Requirement
3 - Technical Requirement
15

Sophomore Year
First Semester
4 - BIOL 103 General Biology
4 - GEOL 206 Mineralogy and Intro. Petrology
1 - GEOL 291 Introduction to Research I
3 - Arts and Humanities (Non-Lit.) Requirement
3 - Foreign Language Requirement
16

Second Semester
4 - GEOL 212 Geoaanalysis II
1 - GEOL 292 Introduction to Research II
3 - GEOL 300 Environmental Geology
3 - PHYS 122 Physics with Calculus I
1 - PHYS 124 Physics Lab. I
3 - Social Science Requirement
15

Junior Year
First Semester
4 - GEOL 302 Structural Geology
1 - GEOL 391 Research Methods I
4 - GEOL 408 Geohydrology
3 - PHYS 221 Physics with Calculus II
3 - Geology Requirement
14

Second Semester
4 - GEOL 313 Sedimentology and Stratigraphy
3 - GEOL 318 Introduction to Geochemistry
1 - GEOL 392 Research Methods II
3 - Social Science Requirement
3 - Technical Requirement
14

Summer
6 - GEOL 475 Summer Geology Field Camp

Senior Year
First Semester
3 - GEOL 421 GIS Applications in Geology
4 - GEOL 491 Research Synthesis I
3 - Geology Requirement
3 - Technical Requirement
13

Second Semester
3 - EE&S 401 Environmental Engineering
4 - GEOL 409 Subsurface Methods
4 - GEOL 492 Research Synthesis II
3 - Technical Requirement
14

121 Total Semester Hours

See General Education Requirements. Three of these credit hours must also satisfy the Cross-Cultural Awareness Requirement.

1STHSC 206 and 208 or 301 or EX ST 301 may be substituted.

Select from department-approved list.

Bachelor of Arts

Freshman Year
First Semester
4 - CH 101 General Chemistry
3 - ENGL 103 Acelerated Composition
3 - GEOL 101 Physical Geology
1 - GEOL 103 Physical Geology Lab.
4 - MTHSC 106 Calculus of One Variable I
15

Second Semester
4 - GEOL 206 Mineralogy and Intro. Petrology
4 - GEOL 211 Geoaanalysis I
1 - GEOL 291 Introduction to Research I
3 - Arts and Humanities (Non-Lit.) Requirement
3 - Foreign Language Requirement
16

Sophomore Year
First Semester
4 - CH 101 General Chemistry
3 - ENGL 103 Acelerated Composition
3 - GEOL 101 Physical Geology
1 - GEOL 103 Physical Geology Lab.
4 - MTHSC 106 Calculus of One Variable I
15

Second Semester
4 - GEOL 206 Mineralogy and Intro. Petrology
4 - GEOL 211 Geoaanalysis I
1 - GEOL 291 Introduction to Research I
3 - Arts and Humanities (Non-Lit.) Requirement
3 - Foreign Language Requirement
16

Junior Year
First Semester
4 - CH 101 General Chemistry
3 - ENGL 103 Acelerated Composition
3 - GEOL 101 Physical Geology
1 - GEOL 103 Physical Geology Lab.
4 - MTHSC 106 Calculus of One Variable I
15

Second Semester
4 - GEOL 206 Mineralogy and Intro. Petrology
4 - GEOL 211 Geoaanalysis I
1 - GEOL 291 Introduction to Research I
3 - Arts and Humanities (Non-Lit.) Requirement
3 - Foreign Language Requirement
16

Senior Year
First Semester
4 - GEOL 491 Research Synthesis I
3 - Arts and Humanities (Literature) Requirement
3 - Mathematical Requirement
3 - Elective
16

Second Semester
4 - GEOL 492 Research Synthesis II
3 - Mathematical Requirement
3 - Technical Requirement
3 - Elective
13

Second Semester
4 - GEOL 492 Research Synthesis II
3 - Mathematical Requirement
3 - Technical Requirement
6 - Elective
16

122 Total Semester Hours

MTHSC 106 and 108 are recommended; however, MTHSC 101 and 102 or MTHSC 106 and 203 may be substituted.

See General Education Requirements.

Spanish is recommended. Two years (through 202) in the same foreign language are required.

Select from department-approved list.
MATH EMATICAL SCIENCES

Bachelor of Science

The Mathematical Sciences curriculum is designed to be versatile. Students gain a broad knowledge of mathematical concepts and methods that are applicable in sciences, engineering, business, industry, and other professions desiring a strong mathematical background. In addition to the basic courses which provide necessary mathematical skills, the curriculum allows students to select an emphasis area or concentration, providing an introduction to a specific area where mathematics is applied. These are Applied and Computational Mathematics, Biology, Computer Science, Operations Research/Management Science, and Statistics.

In addition to the overall goal of preparing students to cope with a variety of mathematical problems, the curriculum seeks to provide an adequate background for students who plan to pursue graduate study or positions in business, industry, or government. Students electing the Biology Concentration will have the necessary preparation for entering medical school. More information about the degree program can be found on the Web at www.math.clemson.edu.

A II mathematical sciences majors are required to complete a capstone experience which provides an opportunity to pursue research, independent study, or an approved internship under the direction of a faculty member or the opportunity to study mathematical models in some area of the mathematical sciences. The capstone experience requires a written report (thesis, computer code, project description, intern experience, etc.) and an oral or poster presentation by each student.

Combined Bachelor's/Master's Plan

Under this plan, students may reduce the time necessary to earn both degrees by applying graduate credits to both undergraduate and graduate program requirements. Students are encouraged to obtain the specific requirements for the dual degree from the Department of Mathematical Sciences (on the Web at www.math.clemson.edu) as early as possible in their undergraduate program.

Enrollment guidelines and procedures can be found under Aademic Regulations in this catalog.

Freshman Year

First Semester
3 - ECON 211 Principles of Microeconomics
3 - ENGL 103 A celerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Foreign Language Requirement
1 - Elective
14

Second Semester
4 - MTHSC 108 Calculus of One Variable II
4 - MTHSC 129 Prob. Solving in Discrete Math.
3 - PHYS 122 Physics with Calculus I
3 - Computer Science Requirement
3 - Social Science Requirement
9

Sophomore Year

First Semester
4 - MTHSC 206 Calculus of Several Variables
1 - MTHSC 250 Intro. to Mathematical Sciences
3 - MTHSC 360 Intermediate Math. Computing
3 - Arts and Humanities (Literature) Requirement
4 - Natural Science Requirement
15

Second Semester
4 - MTHSC 208 Intro. to Ord. Diff. Equations
3 - MTHSC 302 Statistics for Science and Engr.
3 - MTHSC 311 Linear Algebra
3 - Arts and Humanities (Non-Lit.) Requirement
4 - Natural Science Requirement
17

Junior Year

First Semester
3 - MTHSC 400 Theory of Probability
3 - MTHSC 440 Linear Programming
3 - ENGL 314 Technical Writing
3 - Science Requirement
3 - Elective
15

Second Semester
3 - COM M 250 Public Speaking
3 - MTHSC 412 Introduction to Modern Algebra
3 - Emphasis A real
3 - Math Science Requirement
3 - Science Requirement
15

Senior Year

First Semester
3 - MTHSC 453 Advanced Calculus I
3 - Capstone
3 - Emphasis A real
3 - Science and Tech. in Society Requirement
3 - Elective
15

Second Semester
3 - MTHSC 454 Advanced Calculus II
1 - MTHSC 492 Professional Development
3 - Capstone
6 - Emphasis A real
2 - Elective
15

122 Total Semester Hours

Notes:
1. Three credit hours (through 201) in any modern foreign language or American Sign Language are required.
2. Elective
4. A ny 400-level MTHSC course approved by advisor.
5. Capstone Experience may be satisfied by (1) completion of six credits of MTHSC 482 or H 482; (2) completion of six credits of MTHSC 491 or an approved substitution; or (3) completion of three credits of MTHSC 450 and three credits of an additional course approved by the advisor.
6. Elective
7. A grade of C or better must be earned in all prerequisite courses before enrolling in the next MTHSC course.

E M P H A S I S A R E A S

Applied and Computational Mathematics
3 - MTHSC 434 Advanced Engineering Math.
3 - MTHSC 460 Intro. to Numerical Analysis I
6 - Applications A real
12

Computer Science
3 - CPSC 215 Tools and Tech. for Software Dev.
9 - Computer Science 300-level Requirement
12

Operations Research/Management Science
4 - IE 482 Systems Modeling or
3 - IE 384 Engineering Economic Analysis
3 - MGT 402 Operations Planning and Control
3 - MTHSC 407 Regression and Time Series Analysis
3 - MTHSC 441 Intro. to Stochastic Models
12-13

Statistics
3 - MTHSC 403 Intro. to Statistical Theory
3 - MTHSC 405 Statistical Theory and Methods
3 - MTHSC 406 Sampling Theory and Methods
3 - MTHSC 407 Regression and Time Series Analysis
12

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BI OLOGY C O N C E N T R AT I O N

Freshman Year

First Semester
5 - BIOL 110 Principles of Biology
3 - ENGL 103 A celerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - Foreign Language Requirement
15

Second Semester
5 - BIOL 111 Principles of Biology
4 - MTHSC 108 Calculus of One Variable II
3 - Computer Science Requirement
15
Sophomore Year

First Semester
1. CH 223 Organic Chemistry
2. CH 222 Organic Chemistry Lab.
3. ENGL 314 Technical Writing
4. MTHSC 360 Intermediate Math. Computing
5. MTHSC 440 Linear Programming
6. A or B and Humanities (Literature) Requirement

Second Semester
1. CH 224 Organic Chemistry
2. CH 228 Organic Chemistry Lab.
3. COMP 250 Public Speaking
5. A or B and Humanities (Non-Lit.) Requirement
6. MTHSC 308, 400, or 454

Junior Year

First Semester
1. CH 302 General Chemistry
2. CH 301 General Chemistry Lab.
3. ENGL 103 Accelerated Composition
4. MTHSC 311 Linear Algebra
5. MTHSC 302 Statistics for Science and Engr.

Second Semester
1. CH 303 Organic Chemistry
2. CH 302 General Chemistry Lab.
3. COMP 250 Public Speaking
5. A or B and Humanities (Literature) Requirement

Senior Year

First Semester
1. CH 304 Organic Chemistry
2. CH 303 General Chemistry Lab.
3. ENGL 103 Accelerated Composition
4. MTHSC 311 Linear Algebra
5. MTHSC 302 Statistics for Science and Engr.
6. EDSEC 446 for Secondary Education

Second Semester
1. CH 305 Organic Chemistry
2. CH 304 General Chemistry Lab.
3. ENGL 103 Accelerated Composition
4. MTHSC 311 Linear Algebra
5. A or B and Humanities (Literature) Requirement

Bachelor of Arts

Mathematical Sciences

Freshman Year

First Semester
1. ENGL 201 Technical Writing
2. MTHSC 103 A accelerated Composition
3. MTHSC 501 Calculus of One Variable I
4. MTHSC 502 Calculus of One Variable II
5. A or B and Humanities (Literature) Requirement
6. MTHSC 503 Calculus of One Variable III

Second Semester
1. MTHSC 504 Calculus of One Variable IV
2. MTHSC 505 Calculus of One Variable V
3. MTHSC 506 Calculus of One Variable VI
4. MTHSC 507 Calculus of One Variable VII
5. A or B and Humanities (Literature) Requirement
6. MTHSC 508 Calculus of One Variable VIII

Sophomore Year

First Semester
1. MTHSC 509 Calculus of Several Variables
2. MTHSC 510 Inter. Math. Computing or
3. MTHSC 511 Introduction to Modern Algebra
4. MTHSC 512 Professional Development
5. Biological Sciences Requirement
6. Capstone Experience

Second Semester
1. MTHSC 513 Calculus of Several Variables
2. MTHSC 514 Inter. Math. Computing or
3. MTHSC 515 Introduction to Modern Algebra
4. MTHSC 516 Professional Development
5. Biological Sciences Requirement
6. Capstone Experience

Junior Year

First Semester
1. ENGL 314 Technical Writing
2. MTHSC 412 Introduction to Modern Algebra
3. MTHSC 450 Advanced Calculus I
4. MTHSC 451 Advanced Calculus II
5. A or B and Humanities (Literature) Requirement

Second Semester
1. MTHSC 452 Advanced Calculus III
2. MTHSC 453 Advanced Calculus IV
3. MTHSC 454 Advanced Calculus V
4. A or B and Humanities (Literature) Requirement

Notes:
1. A grade of 2.0 or better must be earned in all prerequisite courses before enrolling in the next MTHSC course.
2. A grade of 2.0 or better must be earned in all prerequisite courses before enrolling in the next MTHSC course.
3. See General Education Requirements.
4. Three of these credit hours must also satisfy the General Education Cross-Cultural Awareness Requirement.
5. Students must have completed six credits of MTHSC 491 or an approved substitution; (2) completion of six credits of MTHSC 492 or H492; (3) completion of six credits of MTHSC 493 or an approved substitution; (4) six credits of EDSEC 446 for students seeking a double major in Secondary Education-Mathematics.

122 Total Semester Hours

Second Semester
1. MTHSC 455 Advanced Calculus VI
2. MTHSC 456 Advanced Calculus VII
3. MTHSC 457 Advanced Calculus VIII
4. A or B and Humanities (Literature) Requirement

Notes:
1. See advisor.
2. A grade of 2.0 or better must be earned in all prerequisite courses before enrolling in the next MTHSC course.
### Bachelor of Science

**PHYSICS**

Physics, the most fundamental of the natural sciences, forms the basis of study upon which the other branches of science are founded. Physics is concerned with the fundamental behavior of matter and energy. Classical physics encompasses the fields of mechanics, heat and thermodynamics, electricity and magnetism, acoustics and optics. Modern physics is concerned with the study of atoms and molecules, atomic nuclei, elementary particles and the properties of liquids, crystalline solids, and other materials, as well as the areas of relativity, cosmology, and the large-scale structure of the universe.

The undergraduate Physics curricula are designed to provide students with a strong background in the classical areas of physics as well as an introduction into the more important aspects of modern physics. The BS in Physics curriculum is directed toward preparing students for graduate study ultimately leading to the PhD degree toward research and development work in industrial or governmental laboratories. It also provides a good background for graduate study or industrial work in many areas or engineering physics and applied science.

### Freshman Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td>3 - ASTR 105 Physics of the Universe, 4 - CH 101 General Chemistry, 3 - ENGL 103 Accelerated Composition, 4 - MTHSC 106 Calculus of One Variable I, 1 - PHYS 101 Current Topics in Modern Physics</td>
</tr>
<tr>
<td>Second Semester</td>
<td>4 - CH 102 General Chemistry, 4 - MTHSC 108 Calculus of One Variable II, 3 - PHYS 122 Physics with Calculus I, 1 - PHYS 124 Physics Lab. I, 3 - Arts and Humanities (Non-Lit.) Requirement</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td>4 - MTHSC 206 Calculus of Several Variables, 3 - PHYS 221 Physics with Calculus II, 1 - PHYS 223 Physics Lab. II, 4 - Foreign Language Requirement, 3 - Oral Communication Requirement</td>
</tr>
<tr>
<td>Second Semester</td>
<td>4 - MTHSC 208 Intro. to Ord. Diff. Equations, 3 - PHYS 222 Physics with Calculus III, 1 - PHYS 224 Physics Lab. III, 4 - Foreign Language Requirement, 3 - Social Science Requirement</td>
</tr>
</tbody>
</table>

### Junior Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td>3 - PHYS 311 Intro. to Meth. of Theoretical Phys., 3 - PHYS 321 M echanics I, 3 - PHYS 325 Experimental Physics I, 3 - Advanced Writing Requirement, 3 - Emphasis Area</td>
</tr>
<tr>
<td>Second Semester</td>
<td>1 - PHYS 300 Introduction to Research, 3 - PHYS 312 Methods of Theoretical Physics II, 3 - PHYS 322 Mechanics II, 3 - PHYS 326 Experimental Physics II, 1 - PHYS 356 Modern Physics Overview, 3 - PHYS 441 Electromagnetics I, 3 - Emphasis Area</td>
</tr>
<tr>
<td>Senior Year</td>
<td>3 - PHYS 401 Senior Thesis, 3 - PHYS 442 Electromagnetics II, 3 - PHYS 455 Quantum Physics I, 3 - Emphasis Area, 3 - Science Requirement</td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td>3 - PHYS 401 Senior Thesis, 3 - PHYS 442 Electromagnetics II, 3 - PHYS 455 Quantum Physics I, 3 - Emphasis Area, 3 - Science Requirement</td>
</tr>
<tr>
<td>Second Semester</td>
<td>3 - HIST 172 or 173 Western Civilization, 3 - PHYS 456 Quantum Physics II, 3 - PHYS 465 Thermodynamics and Statistical Mechanics, 3 - Arts and Humanities (Literature) Requirement, 3 - Emphasis Area</td>
</tr>
</tbody>
</table>

### BIOPHYSICS CONCENTRATION

The Biophysics Concentration offers an excellent preparation for medical school or graduate work in biological sciences. It includes the flexibility of selecting courses in chemistry, biological sciences, physics, and mathematics. This concentration also provides the necessary background for employment in industry, manufacturing, and instrumentation for clinical or molecular biology applications.

See Bachelor of Science curriculum for freshman year requirements.
**PHYSICS**

**Bachelor of Arts**

The BA in Physics program is ideal for students interested in acquiring a broad-based liberal education that includes a strong and solid understanding of either science or a broad exposure to engineering with a strong physics foundation.

**Freshman Year**

**First Semester**
3 - ASTR 105 Physics of the Universe
4 - CH 101 General Chemistry
3 - ENGL 103 A accelerated Composition
4 - MTHSC 106 Calculus of One Variable I
1 - PHYS 101 Current Topics in Modern Physics

**Second Semester**
4 - CH 102 General Chemistry
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
1 - PHYS 124 Physics Lab. I
3 - A and Humanities (Non-Lit.) Requirement

**Sophomore Year**

**First Semester**
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
1 - PHYS 223 Physics Lab. II
4 - Foreign Language Requirement
3 - Oral Communication Requirement

**Second Semester**
4 - MTHSC 208 Intro. to Ord. Diff. Equations
3 - PHYS 222 Physics with Calculus III
1 - PHYS 224 Physics Lab. III
4 - Foreign Language Requirement
3 - Social Science Requirement

**Junior Year**

**First Semester**
3 - PHYS 311 Intro. to Meth. of Theoretical Phys.
3 - PHYS 321 Mechanics I
3 - PHYS 322 Mechanics II
3 - PHYS 312 Methods of Theoretical Physics II
4 - Minor Requirement

**Second Semester**
1 - PHYS 300 Introduction to Research
3 - PHYS 312 Methods of Theoretical Physics II
3 - PHYS 322 Mechanics II
1 - PHYS 356 Modern Physics Overview
3 - PHYS 441 Electromagnetics I
3 - Foreign Language Requirement
3 - Minor Requirement

**Senior Year**

**First Semester**
3 - PHYS 455 Quantum Physics I
3 - A advanced Writing Requirement
6 - Minor Requirement
3 - Physics Requirement

**Second Semester**
3 - HIST 172 or 173 Western Civilization
3 - A and Humanities (Literature) Requirement
6 - Minor Requirement
3 - Physics Requirement
3 - Elective

**POLYMER AND TEXTILE CHEMISTRY AND TEXTILE MANAGEMENT**

The School of Materials Science and Engineering offers undergraduate degrees in Ceramic and Materials Engineering, Polymer and Textile Chemistry, and Textile Management.

Textile students study the production, structure, and properties of natural and man-made fibers, the processes for converting these fibers into textile structures, the science of coloring agents and finishes to improve the desirability and serviceability of the product, and the methods for evaluating the performance of textile materials.

Graduates in Polymer and Textile Chemistry and Textile Management hold jobs in corporate and personnel management, manufacturing management, design, research, development, technical service, quality control, and sales. They create new products and processes and solve problems. They create styles, patterns, textures, and colors for apparel, home, industry, and special applications. Their jobs utilize computers, automation, and product quality and are concerned with plant design, environmental control, and consumer safety.

The BS degree in Polymer and Textile Chemistry is based on chemistry, physics, and mathematics. With this firm base, graduates are able to apply their scientific knowledge to the solution of problems in textile and polymer materials involving both chemical and physical principles. 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. The two primary emphases in Polymer and Textile Chemistry allow students to prepare for graduate study in Textiles, Fiber, and Polymer Science as well as other disciplines.

**POLYMER AND TEXTILE CHEMISTRY**

**Bachelor of Science**

**Freshman Year**

**First Semester**
4 - CH 101 General Chemistry
3 - ENGL 103 Accelerated Composition
4 - MTHSC 106 Calculus of One Variable I
3 - TEXT 175 Intro. to Textile Manufacturing
1 - Elective

**Second Semester**
4 - CH 102 General Chemistry
4 - MTHSC 108 Calculus of One Variable II
3 - PHYS 122 Physics with Calculus I
1 - PHYS 124 Physics Lab. I
3 - A and Humanities Requirement or
3 - Social Science Requirement

**Sophomore Year**

**First Semester**
3 - CH 223 Organic Chemistry
1 - CH 227 Organic Chemistry Lab.
4 - MTHSC 206 Calculus of Several Variables
3 - PHYS 221 Physics with Calculus II
1 - PHYS 223 Physics Lab. II
4 - TEXT 201 Yarn Structures and Formation

**Second Semester**
3 - CH 224 Organic Chemistry
1 - CH 228 Organic Chemistry Lab.
4 - MTHSC 208 Intro. to Ord. Diff. Equations
4 - TEXT 202 Fabric Struct., Design, and Analysis
3 - TEXT 324 Textile Statistics
1 - Elective

**Junior Year**

**First Semester**
3 - CH 331 Physical Chemistry
3 - ENGL 314 Technical Writing
3 - PTC 415 Intro. to Polymer Science and Engr.
1 - PTC 417 Polymer and Fiber Lab.
6 - A and Humanities Requirement or
6 - Social Science Requirement

**Second Semester**
3 - CH 332 Physical Chemistry
3 - COM M 250 Public Speaking
3 - ECN 200 Economic Concepts
3 - PTC 416 Chemical Preparation of Textiles
3 - Departmental Requirement

**Senior Year**

**First Semester**
3 - PTC 457 Dyeing and Finishing I
1 - PTC 459 Dyeing and Finishing I Lab.
3 - TEXT 422 Properties of Textile Structures
5 - Approved Requirement
3 - Departmental Requirement

**Second Semester**
3 - PTC 457 Dyeing and Finishing II
1 - PTC 459 Dyeing and Finishing II Lab.
3 - TEXT 422 Properties of Textile Structures
5 - Approved Requirement
3 - Departmental Requirement

**Third Semester**
3 - PTC 417 Polymer and Fiber Lab.
1 - Elective

**Fourth Semester**
3 - PTC 417 Polymer and Fiber Lab.
1 - Elective

**College of Engineering and Science**

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Second Semester
2 - M S & E M aterials Science and Eng. Portfolio
3 - P TC 458 Dyeing and Finishing II
1 - P TC 460 Dyeing and Finishing II Lab.
3 - TEXT 421 Fiber Science
3 - TEXT 429 Textile Research
12
120 Total Semester Hours

1See General Education Requirements. Six of these credits must also satisfy the Cross-Cultural Awareness and Science and Technology in Society Requirements.
2See advisor.

TEXTILE MANAGEMENT
Bachelor of Science

Freshman Year
First Semester
4 - CH 101 General Chemistry or
3 - ENGL 103 Accelerated Composition
3 - M T H S C 102 Intro. to Mathematical Analysis
3 - TEXT 175 Intro. to Textile Manufacturing
3 - Arts and Humanities Requirement 1 or
   3 - Social Science Requirement 1
16
Second Semester
4 - CH 102 General Chemistry or
3 - C P S C 120 Intro. to Information Technology
3 - ECON 200 Economic Concepts
3 - M T H S C 207 Multivariable Calculus
4 - TEXT 176 Natural and Man-Made Fibers
17

Sophomore Year
First Semester
3 - A C C T 201 Financial Accounting Concepts
3 - C O M M 250 Public Speaking
3 - PSYCH 201 Introduction to Psychology
4 - TEXT 201 Yarn Structures and Formation
3 - Arts and Humanities Requirement 1 or
   3 - Social Science Requirement 1
16
Second Semester
3 - A C C T 202 Managerial Accounting Concepts
3 - M G T 301 Principles of Management
4 - TEXT 202 Fabric Structure, Design, and Analysis
3 - TEXT 324 Textile Statistics
3 - Arts and Humanities Requirement 1 or
   3 - Social Science Requirement 1
16

Junior Year
First Semester
3 - F I N 306 Corporate Finance
3 - L A W 322 Legal Environment of Business
3 - M K T 301 Principles of Marketing
4 - Concentration 2
3 - Emphasis Area 1
16

Second Semester
3 - ENGL 314 Technical Writing
3 - M G T 307 Personnel Management
7 - Concentration 2
3 - Emphasis Area 1
16

Senior Year
First Semester
3 - TEXT 470 Text. Cost. and Inventory Control
6 - Concentration 2
3 - Emphasis Area 1
12
Second Semester
3 - M G T 415 Business Strategy
2 - M S & E 450 Materials Sci. and Engr. Portfolio
3 - TEXT 429 Textile Research
3 - Concentration 2
3 - Emphasis Area 1
16
123 Total Semester Hours

1See General Education Requirements. Three of these credits must also satisfy the Cross-Cultural Awareness Requirement. For students not selecting the CH 105/106 sequence, three of these credits must also satisfy the Science and Technology in Society Requirement. (Note: Three additional credit hours in social sciences or arts and humanities are required beyond the basic General Education Requirements.)
2Chemical—PTC 303/305, 304/306, 405, 406, 416, 457/459
Manufacturing—TEXT 308, 314, 403, 411, 422, 426, 429
3See advisor.
MINORS

Following are minors acceptable for students in the College of Engineering and Science. Students cannot major and minor in the same field or acquire a minor that is not allowed by the degree program.

Accounting
Aeronautics
African American Studies
Agricultural Business Management
Agricultural Mechanization and Business
American Sign Language Studies
Agricultural Business Management
Animal and Veterinary Sciences
Anthropology
Athletic Leadership
Biochemistry
Bioengineering
Biological Sciences
Business Administration
Chemistry
Cluster
Communication Studies
Communications
Community Recreation Management
Computer Science— not open to Computer Information Systems majors
Crop and Soil Environmental Science
East Asian Studies
Economics
Education
English
Entomology
Entrepreneurship
Environmental Engineering
Environmental Science and Policy
Equine Business
Film Studies
Financial Management
Fine Arts
Food Science
Forest Products
Forest Resource Management
Geography
Geology
Global Politics
Great Works
Health Science
History
Horticulture
Human Resource Management
International Engineering and Science
Legal Studies
Management
Mathematical Sciences
Microbiology
Military Leadership
Modern Languages
Music
Natural Resource Economics
Non-Profit Leadership
Operations Management
Packaging Science
Park and Protected Area Management
Philosophy
Physics
Plant Pathology
Political Science
Poultry Science
Psychology
Public Policy
Religion
Russian Area Studies
Science and Technology in Society
Screenwriting
Sociology
Spanish-American Area Studies
Sport Management
Textiles— not open to Polymer and Textile Chemistry or Textile Management majors
Theatre
Therapeutic Recreation
Travel and Tourism
Turfgrass
Urban Forestry
Wildlife and Fisheries Biology
Women's Studies
Writing

See pages 36–39 for details.