The College of Engineering offers baccalaureate degrees in chemical, civil, environmental, electrical, computer, and mechanical engineering. The College of Engineering and the College of Arts and Science also offer a joint five-year program which leads to a bachelor's degree from the college of Arts and Science (see page 145). Additionally, the College of Engineering and the College of Business and Economics offer a joint five-year program which leads to a baccalaureate degree in an engineering major and a Master of Business Administration degree from the College of Business and Economics. Inquiry should be made to the Assistant Dean for Undergraduate Affairs (135 du Pont Hall, 302-831-8659) by March 1 of the sophomore year of engineering study. The University's Air Force ROTC program is also administered through the College of Engineering.

In addition to academic programs, the College of Engineering also maintains the Resources to Insure Successful Engineers (RISE) Program. RISE provides financial assistance, counseling, and social support to students from minority groups which are underrepresented in Engineering. The program begins with a pre-freshman Summer Academy and continues to graduation. Interested individuals should contact the Assistant Dean and Director of the RISE Program at 302-831-6315.

ADVISEMENT

Advisement begins during New Student Orientation and continues through graduation. All engineering students are assigned faculty advisors, and students are required to consult with their advisors during the advanced registration periods. Students must also obtain approval from their advisor for courses taken during the Winter or Summer Sessions and when adding or dropping courses. Students are also encouraged to meet with their engineering faculty advisors at other times to learn more about undergraduate academic options, the engineering profession, and graduate school opportunities.

The College Undergraduate Affairs Office also provides advisement to students who experience academic difficulties or who require additional help to solve a problem. The Assistant Dean for Undergraduate Affairs conducts a preliminary degree checkout with each engineering student early in his or her senior year to help identify any impediments to graduation.

CURRICULUM ORGANIZATION

The curriculum in each engineering major consists of a core of required courses, a group of elective technical classes, and a group of elective general education courses. The core group includes courses in mathematics, chemistry, physics, computer science, and engineering. The technical electives courses allow students to investigate the sciences in more depth and to develop a concentration within their engineering discipline. The general education electives are chosen from the humanities and social sciences to provide a well-rounded education. The College's general education requirements are described in the following section. Additional requirements specified by individual engineering departments are given in the appropriate departmental sections.

GENERAL EDUCATION PROGRAM

The College of Engineering requires that six courses (minimum of 18 credits) be chosen from the humanities and social sciences subject to the constraints listed below and the approval of the student's advisor. The courses selected must provide both breadth and depth and not be limited to a selection of unrelated introductory courses. The University's multicultural course requirement may be included in this set of six courses (see p. 20). Detailed guidelines, which include a list of courses which may be used to satisfy the program's requirements, may be obtained from the Office of the Dean of Engineering.
Although the Materials Science Program offers no degrees at the undergraduate level, undergraduate students study the basic concepts associated with the engineering properties of materials in courses taught by the Materials Science Program faculty. In addition, the College offers a minor in materials science, and all engineering departments offer senior projects concerned with the properties of materials.

Courses in mathematics, science, or engineering may not be used to satisfy any General Education Program requirement. Students must consult their faculty advisors and the guidelines published by the College of Engineering for the proper classification of general education courses.

ACADEMIC STANDARDS

The engineering departments have established minimum standards for certain courses and for progression to the sophomore or junior level for each of their majors. These standards are given in the appropriate departmental sections.

In order to graduate, engineering students must satisfy the general University requirements for a baccalaureate degree (see page 20) as well as all the requirements of their engineering major. Additionally, engineering students must have at least a 2.0 average in all engineering, mathematics, and science courses used to fulfill graduation requirements. If a course is repeated, only the last grade will be used to compute the engineering grade-point average; however, all grades are used to compute the University’s cumulative grade-point index.

TRANSFER STUDENTS

The engineering curricula are very demanding, and transfer applicants must have a good record in mathematics and science. Thus, all students who wish to transfer into the College of Engineering should contact the Assistant Dean for Undergraduate Affairs (135 du Pont Hall, 302-831-8659) to discuss curriculum requirements and transfer policies before beginning the application process.

Students at the University of Delaware who wish to transfer into a major within the College of Engineering must make a formal request to the appropriate engineering department by May 1 for entrance in the Fall semester or by December 1 for entrance in the Spring semester. The student should contact the department office well in advance of these deadlines to determine the specific information which must be included in the application.

Students from outside the University of Delaware who wish to transfer into the College of Engineering must make a formal application through the University Admissions Office by March 1 for entrance in the Fall semester or by November 15 for entrance in the Spring Semester.

MATERIALS SCIENCE PROGRAM

Although the Materials Science Program offers no degrees at the undergraduate level, undergraduate students study the basic concepts associated with the engineering properties of materials in courses taught by the Materials Science Program faculty. In addition, the College offers a minor in materials science, and all engineering departments offer senior projects concerned with the properties of materials.

These technical elective courses are strongly recommended for students intending later to pursue Master’s or Doctoral degrees in Materials Science and Engineering.

REQUIREMENTS FOR A MINOR IN MATERIAL SCIENCE

A minor in material science requires the completion of 15 credits with a minimum grade of C- in all courses. MASC 302 is a required course, and the remaining may be drawn from a wide variety of materials science, engineering, physics, and chemistry courses up to the 600-level. All courses used to fulfill the requirements of the minor must be approved by a materials science advisor. A listing of commonly offered courses is maintained by the chair of the Materials Science Program. Other materials courses may be approved as appropriate.

Further information, contact the Materials Science Program Office at 302-831-2062.

CHEMICAL ENGINEERING

Chemical Engineering is the combination of the sciences biology, chemistry, mathematics and physics with the art and creativity of engineering. The department has much more inclusive descriptions of the profession for those interested.

The curriculum for chemical engineering provides an early start in the discipline. In the first year, the course CHEG 112 applies the student’s background in science and mathematics to the solution of several engineering problems. Physical chemistry is introduced earlier than at many other schools, enabling much of the chemical engineering science component to be completed by the end of the third undergraduate year. As a result, the fourth year provides opportunities for in-depth pursuit of technical topics of special interest. A student can choose the three technical electives and the three chemical engineering technical electives to concentrate or minor in a special area. Examples of these concentrations are given below.

The early introduction to the discipline enables the student who has made an inappropriate choice to transfer out of the chemical engineering without loss of status. However, it also makes it difficult for students to transfer into the program during the sophomore or junior years unless the science requirements, especially in chemistry, have been met. Students may enter Chemical Engineering after completing the eight-credit freshman Chemistry sequence CHEM 103/104. The eight credits are a required course, and the remaining may be drawn from a wide variety of courses with a minimum grade of C- in all courses. MASC 302 is a required course, and the remaining may be drawn from a wide variety of materials science, engineering, physics, and chemistry courses up to the 600-level. All courses used to fulfill the requirements of the minor must be approved by a materials science advisor. A listing of commonly offered courses is maintained by the chair of the Materials Science Program. Other materials courses may be approved as appropriate.

Further information, contact the Materials Science Program Office at 302-831-2062.

DEGREE: BACHELOR OF CHEMICAL ENGINEERING

MAJOR: CHEMICAL ENGINEERING

CURRICULUM

Superior figures indicate semester (fall or spring) and/or year or years in which the course should be taken, i.e., fall of freshman year, spring of sophomore year, etc.

UNIVERSITY REQUIREMENTS

ENGL 110, Critical Reading and Writing (minimum grade C)

Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content [see p. 20]
### COLLEGE REQUIREMENTS

#### General Education Program

See pp 133-134: College General Education Program

#### MAJOR REQUIREMENTS

### External to the College

#### Chemistry

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 111</td>
<td>General Chemistry</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 119</td>
<td>Quantitative Chemistry I</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 112</td>
<td>General Chemistry</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 443</td>
<td>Physical Chemistry</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 444</td>
<td>Physical Chemistry</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 110</td>
<td>Organic Chemistry</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 311</td>
<td>Organic Chemistry Laboratory I</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 333</td>
<td>Organic Chemistry Laboratory I (lecture only)</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 332</td>
<td>Organic Chemistry</td>
<td>3.0F</td>
</tr>
</tbody>
</table>

**Mathematics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 242</td>
<td>Analytic Geometry and Calculus B</td>
<td>2.0F</td>
</tr>
<tr>
<td>MATH 243</td>
<td>Analytic Geometry and Calculus C</td>
<td>2.0F</td>
</tr>
<tr>
<td>MATH 302</td>
<td>Ordinary Differential Equations I</td>
<td>2.0F</td>
</tr>
<tr>
<td>MATH 303</td>
<td>Ordinary Differential Equations II</td>
<td>2.0F</td>
</tr>
<tr>
<td>MATH 305</td>
<td>Applied Math for Chemical Engineering</td>
<td>3.0F</td>
</tr>
</tbody>
</table>

**Physics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 207</td>
<td>Fundamentals of Physics I</td>
<td>2.0F</td>
</tr>
<tr>
<td>PHYS 208</td>
<td>Fundamentals of Physics II</td>
<td>2.0F</td>
</tr>
</tbody>
</table>

**General Education Program**

An additional three-credit general education course must be taken in the humanities or social sciences. Furthermore, three of the general education courses (minimum of nine credits) must be in the same department or program, and at least one of these three courses must be above the introductory level. Courses classified as “Group D” by the College of Arts and Science may not be used to fulfill this requirement.

### Within the College

#### MASC 302 | Materials Science for Engineers | 4.0F

#### CHEG 009 | Chemical Engineering Freshman Seminar | 1.0F
#### CHEG 112 | Introduction to Chemical Engineering | 1.0F
#### CHEG 231 | Chemical Engineering Thermodynamics | 3.0S
#### CHEG 325 | Chemical Engineering Thermodynamics | 3.0S
#### CHEG 332 | Chemical Engineering Kinetics | 3.0S
#### CHEG 341 | Fluid Mechanics | 3.0S
#### CHEG 320 | Engineering Economics and Risk Assessment | 3.0S
#### CHEG 345 | Chemical Engineering Laboratory I | 3.0S
#### CHEG 342 | Heat and Mass Transfer | 3.0S
#### CHEG 443 | Mass Transfer Operations | 3.0S
#### CHEG 445 | Chemical Engineering Laboratory II | 3.0S

**or CHEG 473 | Chemical Engineering Projects (requires advisor’s approval) | 3.0F

CHEG 473 Chemical Engineering Projects can be substituted for CHEG 445 with advisor’s approval. This option is only available for students who received a minimum grade of B in CHEG 345. Note that UNIV 401-402 is equivalent to CHEG 473-474.

#### CHEG 401 | Chemical Process Dynamics and Control | 3.0S
#### CHEG 432 | Chemical Process Dynamics Analysis | 3.0S

### Technical Electives

#### General Technical Electives

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BISC 207</td>
<td>General Biology</td>
<td>4.0S</td>
</tr>
<tr>
<td>BISC 208</td>
<td>Introductory Biology II</td>
<td>4.0S</td>
</tr>
<tr>
<td>BISC 301</td>
<td>Molecular Biology of the Cell</td>
<td>4.0S</td>
</tr>
<tr>
<td>BISC 303</td>
<td>Genetic and Evolutionary Biology</td>
<td>4.0S</td>
</tr>
<tr>
<td>BISC 305</td>
<td>Cell Physiology</td>
<td>4.0S</td>
</tr>
<tr>
<td>BISC 306</td>
<td>General Physiology</td>
<td>4.0S</td>
</tr>
<tr>
<td>BISC 371</td>
<td>Introduction to Microbiology</td>
<td>4.0S</td>
</tr>
</tbody>
</table>
| BISC 4xx | Biology course chosen with the approval of the advisor | 3.0-4.0S

**Chemistry**

Any three-credit combination of CHEM 333 (1 credit when the 2 credit option is chosen) 334, 438, 446, and 458 may be used as an upper level technical elective.

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 334</td>
<td>Organic Chemistry Lab II</td>
<td>2.0F</td>
</tr>
<tr>
<td>CHEM 437</td>
<td>Instrumentation Methods</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 457</td>
<td>Inorganic Chemistry</td>
<td>3.0F</td>
</tr>
<tr>
<td>CHEM 523</td>
<td>Introductory Biochemistry</td>
<td>3.0F</td>
</tr>
</tbody>
</table>
| CHEM 6xx | Chemistry course chosen with the approval of the advisor | 3.0-4.0F
| CHEM 8xx | Chemistry course chosen with the approval of the advisor | 3.0-4.0F

**Computer Science**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CISC 181</td>
<td>Introduction to Computer Science</td>
<td>3.0F</td>
</tr>
<tr>
<td>CISC 220</td>
<td>Data Structures</td>
<td>3.0F</td>
</tr>
<tr>
<td>CISC 260</td>
<td>Machine Organization and Microcomputers</td>
<td>3.0F</td>
</tr>
<tr>
<td>CISC 310</td>
<td>Logic and Programming</td>
<td>3.0F</td>
</tr>
<tr>
<td>CISC 360</td>
<td>Computer Architecture</td>
<td>3.0F</td>
</tr>
<tr>
<td>CISC 361</td>
<td>Operating Systems</td>
<td>3.0F</td>
</tr>
<tr>
<td>CISC 640</td>
<td>Computer Graphics</td>
<td>3.0F</td>
</tr>
</tbody>
</table>

**Mathematics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 349</td>
<td>Elements of Linear Systems</td>
<td>3.0F</td>
</tr>
<tr>
<td>MATH 369</td>
<td>Graph Theory</td>
<td>3.0F</td>
</tr>
<tr>
<td>MATH 426</td>
<td>Introduction to Numerical Analysis and Algorithmic Computation</td>
<td>3.0F</td>
</tr>
<tr>
<td>MATH 428</td>
<td>Algorithmic and Numerical Solution of Differential Equations</td>
<td>3.0F</td>
</tr>
</tbody>
</table>
| MATH 5xx | Mathematics course chosen with the approval of the advisor | 3.0-4.0F
| MATH 6xx | Mathematics course chosen with the approval of the advisor | 3.0-4.0F

**Mechanical Engineering Applied Mathematics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEEG 361</td>
<td>Applied Engineering Analysis</td>
<td>3.0F</td>
</tr>
<tr>
<td>MEEG 863</td>
<td>Engineering Analysis I</td>
<td>3.0F</td>
</tr>
<tr>
<td>MEEG 864</td>
<td>Engineering Analysis II</td>
<td>3.0F</td>
</tr>
</tbody>
</table>

**Physics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 209</td>
<td>Fundamentals of Physics III</td>
<td>3.0F</td>
</tr>
<tr>
<td>PHYS 313</td>
<td>Physical Optics</td>
<td>3.0F</td>
</tr>
<tr>
<td>PHYS 419</td>
<td>Classical Mechanics</td>
<td>3.0F</td>
</tr>
</tbody>
</table>
| PHYS 6xx | Physics course chosen with the approval of the advisor | 3.0-4.0F

**Statistics**

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 450</td>
<td>Statistics for the Engineering and Physical Sciences</td>
<td>3.0S</td>
</tr>
</tbody>
</table>
| STAT 6xx | Statistics course chosen with the approval of the advisor | 3.0-4.0S

### Electronic Materials

(please note prerequisites)

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEG 205</td>
<td>Linear Circuit Theory</td>
<td>4.0F</td>
</tr>
<tr>
<td>CPEG 210</td>
<td>Introduction to Combinatorial Logic</td>
<td>2.0F</td>
</tr>
<tr>
<td>CPEG 211</td>
<td>Introduction to Sequential Circuits</td>
<td>2.0F</td>
</tr>
<tr>
<td>ELEG 314</td>
<td>Electronics and Instrumentation</td>
<td>4.0F</td>
</tr>
<tr>
<td>ELEG 340</td>
<td>Solid State Electronics</td>
<td>3.0F</td>
</tr>
<tr>
<td>ELEG 623</td>
<td>Electrical Properties of Matter</td>
<td>3.0F</td>
</tr>
<tr>
<td>ELEG 626</td>
<td>Integrated Circuits</td>
<td>3.0F</td>
</tr>
<tr>
<td>ELEG 629</td>
<td>Digital Structures</td>
<td>3.0F</td>
</tr>
</tbody>
</table>

### Materials Science/Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASC 406</td>
<td>Corrosion and Protection</td>
<td>3.0S</td>
</tr>
<tr>
<td>MASC 5xx</td>
<td>(except for courses that are cross-listed with CHEG)</td>
<td>3.0S</td>
</tr>
<tr>
<td>MASC 8xx</td>
<td>Materials Engineering</td>
<td>3.0S</td>
</tr>
<tr>
<td>MEEG 410</td>
<td>Experimental Mechanics for Composite Materials</td>
<td>3.0S</td>
</tr>
<tr>
<td>MEEG 617</td>
<td>Composite Materials</td>
<td>3.0S</td>
</tr>
</tbody>
</table>

### Mechanics

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIEG 301</td>
<td>Analysis of Structures</td>
<td>3.0S</td>
</tr>
<tr>
<td>CIEG 311</td>
<td>Dynamics</td>
<td>3.0S</td>
</tr>
<tr>
<td>MEEG 213</td>
<td>Principles of Mechanics I</td>
<td>3.0S</td>
</tr>
<tr>
<td>MEEG 214</td>
<td>Principles of Mechanics II</td>
<td>3.0S</td>
</tr>
<tr>
<td>MEEG 313</td>
<td>Strength of Materials</td>
<td>4.0S</td>
</tr>
<tr>
<td>MEEG 413</td>
<td>Advanced Mechanics of Materials</td>
<td>3.0S</td>
</tr>
<tr>
<td>MEEG 415</td>
<td>Finite Element Analysis</td>
<td>3.0S</td>
</tr>
</tbody>
</table>

### Environmental Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIEG 432</td>
<td>Wastewater Engineering</td>
<td>3.0S</td>
</tr>
<tr>
<td>CIEG 433</td>
<td>Hazardous Waste Management</td>
<td>3.0S</td>
</tr>
<tr>
<td>CIEG 435</td>
<td>Industrial Waste Management</td>
<td>3.0S</td>
</tr>
<tr>
<td>CIEG 437</td>
<td>Water and Wastewater Quality</td>
<td>3.0S</td>
</tr>
</tbody>
</table>

### Chemical Engineering Technical Electives

The curriculum provides three chemical engineering technical electives in the senior year. These courses are intended to provide some flexibility in selecting a chemical engineering program at the advanced level. Students should decide with the assistance of their advisor if they should conduct a program of independent research and then choose their course elective(s).
Chemical engineering technical electives are defined as follows:

Any Chemical Engineering course numbered 466 and above; UNIV 401-UNIV 402 Senior Thesis directed by a Chemical Engineering Faculty; any 600- or 800-level course in Chemical Engineering Courses at the 600 and 800-level are graduate courses open, with the consent of the instructor, to students in senior standing.

Concentrations
The technical electives and the chemical engineering electives can be coupled to provide a more intense concentration in an area of interest. The groupings below are some examples of this approach.

### Biology
- BISC 407 Molecular Biology of the Cell 4.35
- CHEM 527 Introductory Biochemistry 3.4F
- CHEG 620 Biochemical Engineering 3.45
- CHEG 650 Biomedical Engineering 3.4F

### Chemistry
- CHEM 457 Inorganic Chemistry 3.35
- CHEM 527 Introductory Biochemistry 3.4F
- CHEG 606 Introduction to Catalysis 3.45
- CHEG 610 Industrial and Engineering Chemistry 3.45
- CHEG 836 Applied Chemical Kinetics 3.4F

**CREDITS TO TOTAL A MINIMUM OF 128**

### HONORS BACHELOR OF CHEMICAL ENGINEERING

A recipient of the Honors Bachelor of Chemical Engineering must satisfy the following:
1. All requirements for the Bachelor of Chemical Engineering degree
2. All generic University requirements for the Honors Degree (see p. 30)

Graduate courses approved for this purpose by the department may be counted as Honors courses.

### DEPARTMENTAL STANDARDS

The department has rigorous standards for admission into the courses in the department. These standards have evolved over time and are intended to promote success in the sequential development of the material. In general, students must have a minimum grade of C- in all chemical engineering prerequisite courses to qualify for admission to the next course.

**Admission to CHEG 231:**
1. A minimum grade of C- in CHEG 112.
2. A minimum grade of C- in MATH 243.

**Admission to CHEG 320:**
1. A minimum grade of C- in MATH 302.

**Admission to CHEG 325:**
1. A minimum grade of C- in CHEG 231.

**Admission to CHEG 332:**
1. A minimum grade of C- in CHEG 325.
2. A minimum grade of C- in MATH 302.

**Admission to CHEG 341:**
1. A minimum grade of C- in CHEG 231.
2. A minimum grade of C- in MATH 302.

**Admission to CHEG 342:**
1. A minimum grade of C- in CHEG 341.

**Admission to CHEG 345:**
1. A minimum grade of C- in CHEG 325.
2. Admission to CHEG 342.

**Admission to CHEG 443:**
1. A minimum grade of C- in CHEG 345.
2. Admission to CHEG 443.

**Admission to CHEG 445:**
1. A minimum grade of C- in CHEG 345.
2. A minimum grade of C- in CHEG 332.
3. Admission to CHEG 443.

**CHEMICAL ENGINEERING CURRICULUM—MASTER'S-BACHELOR'S PROGRAM**

Under unusual circumstances, a highly qualified student may earn a Bachelor of Chemical Engineering and a Master of Chemical Engineering in four years. This program assumes that the student enters with advanced sophomore standing and is able to cope with at least one term of a substantial overload. Interested students should contact the department for further information and a sample schedule. It should be noted that, in order to ensure a broad educational experience, the Department does not admit Delaware undergraduates to its Ph.D. program unless they have at least three years of industrial experience or have earned a master's degree at another institution.

### CIVIL AND ENVIRONMENTAL ENGINEERING

Traditionally, civil engineering has been identified with the planning and design of constructed facilities such as dams, bridges, buildings, roads, waterways, and tunnels. Modern civil engineering now addresses larger segments of societal infrastructure such as mass transportation systems, water resource exploration and management, environmental protection, coastal management protection, and offshore structures. Areas concerned with pollution control, water supply, and water resource management are now considered to comprise the distinct discipline of Environmental Engineering.

The Civil and Environmental Engineering Department offers programs which lead to the degrees of Bachelor of Civil Engineering and Bachelor of Environmental Engineering. The Civil Engineering curriculum includes specialization options in structural engineering, geotechnical engineering, environmental engineering, hydraulic and ocean engineering, and transportation engineering as shown by the listed Technical Electives. The Environmental Engineering curriculum is focused on causes, control, and prevention of environmental contamination, environmental facilities design and construction, and pollution transport and control processes. Each of these degrees is described separately below.

### DEPARTMENTAL POLICIES

To be enrolled in 300- or 400-level civil engineering or mechanics courses, civil and environmental engineering majors must have attained at least a C- grade in MATH 241, MATH 242, and PHYS 207. Furthermore, civil engineering majors must attain at least a C- in CHEM 103 and CHEM 104, and environmental engineering majors must earn at least a C- in CHEM 111 and CHEM 112.

In general, 300- and 400-level courses in civil engineering are open only to students majoring in civil or environmental engineering. Students who have declared a civil engineering minor and students enrolled in other departments of the College of Engineering can be enrolled in 300 and 400-level civil engineering courses with the approval of their home department advisor. In some instances, other students may be permitted to enroll in selected 300 and 400-level courses, but they must have the permission of both the course instructor and the chair of the Civil and Environmental Engineering Department.
Degree: Bachelor of Civil Engineering
Major: Civil Engineering

Curriculum

CREDITS TO TOTAL A MINIMUM OF 131

Technical Electives

The required course curriculum gives students a broad introduction to all the major areas of civil engineering offered by the program: Structural and Geotechnical Engineering, Environmental Engineering and Water Resources, Hydraulics and Ocean Engineering, and Transportation Engineering.

In addition, four technical elective courses in the Civil Engineering curriculum give students the opportunity to complete their education by concentrating in an area of special interest. The technical electives can also be chosen to provide a more general civil engineering education.

The following is a list of departmental technical electives approved for a concentration in one of the above mentioned areas or in general civil engineering. Some of these courses may not be offered a particular year. A current list is available in the department office. Some courses offered in other departments may also be approved as technical electives. Students should check with their advisors before selecting courses.

General Civil Engineering
CIEG 223 Surveying 3
CIEG 401 Computer Methods of Structural Engineering 3
CIEG 402 Steel Design 3
CIEG 403 Concrete Design 3
CIEG 421 Foundations and Substructures 3
CIEG 432 Water Supply Engineering 3
CIEG 433 Hazardous Waste Management 3
CIEG 435 Industrial Wastes Management 3
CIEG 437 Water and Wastewater Quality 3
CIEG 441 Hydraulic Engineering 3
CIEG 442 Hydraulic Engineering 3
CIEG 443 Transportation Facilities Design 3
CIEG 471 Introduction to Coastal Engineering 3
EGGG 432 Principles of Computer-Aided Drawing 3

Environmental Engineering
CIEG 403 Concrete Design 3
CIEG 421 Foundations and Substructures 3
CIEG 432 Water Supply Engineering 3
CIEG 433 Hazardous Waste Management 3
CIEG 435 Industrial Wastes Management 3
CIEG 437 Water and Wastewater Quality 3
CIEG 441 Hydraulic Engineering 3
CIEG 442 Hydraulic Engineering 3
CIEG 443 Transportation Facilities Design 3
AGEG 428 Land Application of Wastes 3
BISC 471 Introduction to Microbiology 4
BISC 472 Principles of Infectious Diseases 4
BISC 481 Microbial Ecology 3
CHEM 418 Introduction to Physical Chemistry 3
ELEG 881 Remote Sensing in Environment 3
CHEM 418 Introduction to Physical Chemistry 3
GEOL 413 Fundamentals of Well Logging 3
GEOL 421 Environmental and Applied Geology 3
GEOL 428 Hydrogeology 3
MEEG 307 Thermodynamics I 3

Hydraulic and Ocean Engineering
CIEG 441 Hydrology 3
CIEG 401 Computer Methods of Structural Engineering 3
CIEG 422 Earth Structures Engineering 3
CIEG 431 Water Supply Engineering 3
CIEG 401 Computer Methods of Structural Engineering 3
CIEG 403 Concrete Design 3
CIEG 471 Introduction to Coastal Engineering 3
CIEG 442 Hydraulic Engineering 3
MEEG 307 Applied Engineering Analysis 3

Structures and Geotechnical Engineering
CIEG 223 Surveying 3
CIEG 401 Computer Methods of Structural Engineering 3
CIEG 402 Steel Design 3
CIEG 403 Concrete Design 3
CIEG 404 Prestressed Concrete Design 3
CIEG 405 Matrix Structural Analysis 3
CIEG 406 Structural Materials 3
CIEG 411 Structural Dynamics Design 3
CIEG 415 Reliability Design 3
CIEG 416 Random Vibration 3
HONORS BACHELOR OF CIVIL ENGINEERING

A recipient of the Honors Bachelor of Civil Engineering must satisfy the following:
1. All requirements for the Bachelor of Civil Engineering degree.
2. All generic University requirements for the Honors Degree (see p. 30). Graduate courses approved for this purpose by the department may be counted as Honors courses.
3. The Honors Thesis must be within the disciplines of Civil and Environmental Engineering. It must be supervised by a faculty member from the Department of Civil and Environmental Engineering and successfully presented orally in front of a committee approved by the department Undergraduate Committee.

MINOR IN CIVIL ENGINEERING

A minor in civil engineering may be earned by a student in any University bachelor's degree program through successful completion of a minimum of 21 credits in civil engineering and engineering mechanics. Before beginning the civil engineering courses, the student must meet the required mathematics and physics prerequisites, and before being admitted to the minor, the student must have successfully completed CHEM103, 104, MATH 242, 243, 302, PHYS 207 and 208. A grade point average of at least 2.0 is required in the 21 credits of engineering courses of the minor and in the mathematics and science courses listed above.

The required civil engineering and engineering mechanics courses are the following:
CIEG 211 Statics
CIEG 212 Strength of Materials, (lab optional)
CIEG 311 Dynamics
MECH 305 Fluid Mechanics, (lab optional)

Further, an additional 9 credits (3 courses) in civil engineering must be taken of which at least 6 credits must be at the 300 or higher level. Those courses shall be selected with the specific advice of an advisor in the Civil and Environmental Engineering Department to meet each student's objectives. For students oriented toward earth sciences these might include CIEG 420 and CIEG 421; for those interested in the environment, CIEG 331 and 431; for those interested in urban topics, CIEG 331 and 351; for those with interests in construction and structures, CIEG 301, 303 and 402 or 403; for those interested in the oceans, CIEG 442, and CIEG 471.

Accomplishment of a minor in civil engineering has many advantages for students who are earning degrees in other sciences such as geology or in other professional areas such as business administration, but it must be understood that meeting the requirements for a minor in civil engineering without fulfilling the remaining requirements for an accredited engineering degree does not provide the breadth and depth of knowledge required to be a civil engineer.
three technical electives can then be chosen to further pursue this
direction of study, or to provide a more diversified environmental
engineering education. All technical electives must be upper level
courses in engineering, the sciences, computer science, or mathemati-
cs. Students should select their area of concentration and desired
technical electives with the assistance of their academic advisor. It is
advisable to select these courses in the spring of the sophomore year
to avoid scheduling conflicts and to insure that prerequisite courses
are taken.

The core technical electives and additional technical electives
for the environmental engineering concentrations are shown below.

Environmental Facilities Design and Construction
Core Technical Electives
CIEG 301 Analysis of Structures ........................................ 4
CIEG 403 Concrete Design .................................................. 3
CIEG 420 Soil Mechanics ................................................... 4

Additional Related Technical Electives
CIEG 402 Steel Design ...................................................... 3
CIEG 404 Prestressed Concrete Design .................................. 3
CIEG 421 Foundations and Substructures ............................... 3
CIEG 485 Engineering Management ..................................... 3

Pollution Transport and Control Processes
Core Technical Electives
CHEG 332 Chemical Engineering Kinetics ............................ 3
CHEG 342 Heat and Mass Transfer ........................................ 4
CHEM 443 Physical Chemistry .............................................. 3

Additional Related Technical Electives
CIEG 433 Hazardous Waste Management ............................. 3
CIEG 435 Industrial Waste Management ................................ 3
MEEG 424 Air Pollution Processes ....................................... 3

Additional Recommended Technical Electives
AGEG 628 Land Application of Wastes ................................. 3
BISC 371 Introduction to Microbiology ................................ 4
CHEM 331 Organic Chemistry .............................................. 3
CHEM 444 Physical Chemistry .............................................. 3
CIEG 482 Systems Design and Operation ............................... 3
GEOL 421 Environmental and Applied Geology .................... 3
GEOL 446 General Geochimistry ......................................... 3
PSIC 608 Soil Chemistry ................................................... 3

Note: This list is not exhaustive. Consult your advisor.

HONORS BACHELOR OF ENVIRONMENTAL ENGINEERING
A recipient of the Honors Bachelor of Environmental Engineering
must satisfy the following:
1. All requirements for the Bachelor of Environmental Engineering
degree.
2. All generic University requirements for the Honors Degree (see
p. 30). Graduate courses approved for this purpose by the
department may be counted as Honors courses.
3. The Honors Thesis must be within the disciplines of Civil and
Environmental Engineering and successfully presented orally in
front of a committee approved by the department Undergraduate
Committee.

ELECTRICAL AND COMPUTER ENGINEERING
The Department of Electrical Engineering offers programs which
lead to the degrees of Bachelor of Electrical Engineering and Bach-
elor of Computer Engineering. The Electrical Engineering curricu-
lum prepares graduates to enter the broad profession of modern
electrical engineering. The Computer Engineering curriculum is
more focused on the application of electrical engineering principles
to the design of computers, networks of computers, or sometimes
systems that include computers.

Coursework in electrical and computer engineering starts with
the first term of the freshman year, with successive years building
on prerequisite courses and including an unusually high number of
courses with laboratories.

There are three basic parts to the Delaware curriculum in engi-
neering: (1) a core group of courses; (2) an elective group of techni-
cal courses in an area of concentration; and (3) a “general education”
component that includes six courses in the humanities and social sci-
ences and two in written communications.

The core group includes four courses in mathematics, two in
physics, one in chemistry, two in computer science, and sixteen in
electrical engineering. MATH 242 is the first mathematics course in
the regular program. It is the incoming student’s responsibility to
assess his/her own mathematics background and proficiency (using
materials supplied by our Math Department). If you are not ready to
start with MATH 242, you must take MATH 241 (and possibly other
earlier mathematics courses). If you have had some calculus, but are
not certain that you are ready for MATH 242, start with MATH 242.
In this case it is easier to drop back to MATH 241 during the first two
weeks of MATH 242 if this is where you belong. If you need addi-
tional mathematics, at least one Winter and/or Summer sessions
will be required to complete the four year electrical engineering
program on schedule. To remain on schedule with your program,
you must be on schedule in mathematics by the start of the sopho-
more year.

The technical electives must be chosen to form an area of con-
centration. Four examples of acceptable concentrations (emphasizing
computer engineering, systems and signals, devices and materials,
and power systems) are shown on the following pages. In planning
their technical elective programs, students must also consider the
requirement for a design course in the senior year in which one
design project is at least 50% of the course work.

The general education program must include courses from the
humanities and from the social sciences, including courses at an
advanced level. Electrical engineering students must include a course
in microeconomics, two writing courses (ENGL 110 and ENGL
301), and a one-credit course in ethics (PHIL 341).

DEPARTMENTAL REQUIREMENTS
To qualify for sophomore standing, students must have satisfactorily
completed MATH 242-243, CISC 181, PHYS 207, and CPEG 210-
211 by the end of the summer session of their freshman year.

DEGREE: BACHELOR OF ELECTRICAL ENGINEERING
MAJOR: ELECTRICAL ENGINEERING

CURRICULUM
CREDITS
Superior figures indicate semester (fall or spring) and/or year or years
in which the course should be taken, i.e. 1 =fall of freshman year,
2 =spring of sophomore year, etc.

UNIVERSITY REQUIREMENTS
ENGL 110 Critical Reading and Writing (minimum grade C) .......... 3
Three credits in an approved course or courses stressing
multicultural, ethnic, and/or gender-related content (see p. 20) ....... 3

COLLEGE REQUIREMENTS
General Education Program .................................................. 18
See pp. 133-134, College General Education Program

MAJOR REQUIREMENTS
External to the College
ENGL 301 Expository Writing .............................................. 3
PHIL 341 Ethics of Engineering Profession ................................ 4

Mathematics
MATH 242 Analytic Geometry and Calculus B .......................... 4
MATH 243 Analytic Geometry and Calculus C ......................... 4
MATH 341 Differential Equations with Linear Algebra I ............ 3
MATH 342 Differential Equations with Linear Algebra II ........... 3
Within the Department

CPEG 210 Introduction to Combinatorial Logic 2 1F
CPEG 211 Introduction to Sequential Circuits 2 2F
CPEG 220 Microprocessor Based Systems I 2 2S
CPEG 221 Microprocessor Based Systems II 2 2S
ELEG 205 Linear Circuit Theory 4 2F
ELEG 309 Electronic Circuit Analysis I 4 2S
ELEG 302 Electrical Properties of Materials 4 2S
ELEG 305 Signal Processing I 3 3F
ELEG 312 Electronic Circuit Analysis II 3 3F
ELEG 320 Field Theory I 3 3F
ELEG 306 Signal Processing II 3 3S
ELEG 310 Random Signals and Noise 3 3S
ELEG 340 Solid State Electronics 3 3S
ELEG 417 Feedback Control Systems 3 3F
ELEG 413 Field Theory II 3 3S
ELEG 433 Energy Systems 3 3S
Note: ELEG 310 may be taken in the senior year(s) and ELEG 413 and/or ELEG 433 in the junior year(s) when appropriate to a plan for a technical concentration.

Design Requirement

In addition to the design content of the normal program, every student must take at least one course in the senior year in which one design project is at least 50% of the coursework. Regularly offered courses that presently meet this requirement are ELEG 420, 422, 650, and 654. Other special courses are offered that will meet this requirement. The design requirement may also be met with special projects carried out in conjunction with faculty research with the prior approval of the Departmental Undergraduate Representative. Students must consult with their advisors for the proper selection of design courses.

Technical Electives

Technical Electives

Each student must select a concentration to structure his/her technical elective program. Four concentrations are defined (computer engineering, systems and signals engineering, electronic devices and materials engineering and power systems engineering). Students with a special interest may define their own concentrations in conjunction with their advisor. With some exceptions, upper-level engineering, computer science, physics, science and mathematics courses are acceptable technical electives. However, students planning their own programs of concentration must realize that there must be a theme holding together at least most of the courses chosen. Any special concentrations must be approved by the Departmental Undergraduate Representative prior to the start of the senior year.

Each of the four regular concentrations specifies 15 or more of the 21 technical elective credits in the core program. Students should note that the requirement for a senior design project will, in some cases, further constrain the choice of technical electives. The technical electives chosen must be from an area of concentration. The technical elective program is under constant review by the faculty. An updated list is available in the department office. Students should check with their advisors before selecting courses and should be aware that a formal mechanism exists to provide additional flexibility in the selection of their technical elective courses. The four concentrations follow:

Technical Electives—Computer Engineering

CISC 220 Data Structures 3 3F
CISC 360 Computer Architecture 3 3S
CPEG 322 Digital System Design I 3 3S
CPEG 422 Digital System Design II 3 3F
ELEG 618 Modern Control Engineering 3 3S
or
ELEG 631 Digital Signal Processing 3 3F
Technical electives chosen with the approval of an advisor 6 4

Technical Electives—Systems and Signals Concentration

CISC 220 Data Structures 2 2F
MATH 426 Introduction to Numerical Analysis and
Algorithmic Computation 3 3F
ELEG 403 Communication Systems Engineering 3 3F

ELEG 415 Digital Systems Design I 3 3S
ELEG 417 Feedback Control Systems 3 3F
ELEG 618 Modern Control Engineering 3 3S
ELEG 640 Optoelectronics 3 4S
ELEG 642 Special Topics in Electro-optics 3 3S

Courses must be taken as a sequence.

Students whose primary interest is in electronic devices should take:

ELEG 410 Solid State Electronics 3 4F
ELEG 450 Integrated Circuits 3 4F
ELEG 440 Introduction to Power Systems Analysis 3 4F
ELEG 414 Electrical Machines, Motors and Generators 3 4S
ELEG 618 Modern Control Engineering 3 4S
ELEG 408 Power Generation System Design 3 3S
ELEG 323 Digital Systems Design I 3 3S
Technical electives chosen with the approval of an advisor 6 4

CREDITS TO TOTAL A MINIMUM OF ........................................ 128

HONORS BACHELOR OF ELECTRICAL ENGINEERING

A recipient of the Honors Bachelor of Electrical Engineering must satisfy the following:
1. All requirements for the Bachelor of Electrical Engineering degree.
2. All generic University requirements for the Honors Degree (see p. 30). Graduate courses approved for this purpose by the department may be counted as Honors courses.

DEGREE: BACHELOR OF COMPUTER ENGINEERING

MAJOR: COMPUTER ENGINEERING

Superior figures indicate semester (fall or spring) and/or year or years in which the course should be taken, i.e. 1F fall of freshman year, 2S spring of sophomore year, etc.

CURRICULUM

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing (minimum grade C-) 3 15
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 20).

COLLEGE REQUIREMENTS

General Education Program
See pp. 133-134: College General Education Program

MAJOR REQUIREMENTS

External to the College

General Education

ECON 151 Introduction to Microeconomics 3 2F
ENGL 201 Expository Writing 3 3F
PHIL 434 Ethics in the Engineering Profession 4 3F

Mathematics

MATH 201 Discrete Mathematics 3 1F
MATH 242 Analytical Geometry and Calculus B 4 1F
MATH 243 Analytical Geometry and Calculus C 4 1F
MATH 341 Differential Equations & Linear Alg I 3 2F
MATH 342 Differential Equations & Linear Alg II 3 2F
MATH 245 Introduction to Numerical Analysis and
Algorithmic Computation 3 3F

Technical Electives chosen with the approval of an advisor 6 4

Technical Electives—Devices and Materials Concentration

PHYS 209 Fundamentals of Physics III 3 2F
PHYS 313 Physical Optics 3 3S
ELEG 523 Electronic Properties of Matter 4 3F

Students whose primary interest is in optoelectronics and electro-optics should take:

ELEG 440 Optoelectronics 3 4F
ELEG 450 Integrated Circuits 3 4F
ELEG 410 Solid State Electronics 3 4F
ELEG 420 Special Topics in Electro-optics 3 3F

Courses must be taken as a sequence.

Students whose primary interest is in electronic devices should take:

ELEG 410 Solid State Electronics 3 4F
ELEG 440 Introduction to Power Systems Analysis 3 4F
ELEG 414 Electrical Machines, Motors and Generators 3 4S
ELEG 618 Modern Control Engineering 3 4S
ELEG 408 Power Generation System Design 3 3S
ELEG 323 Digital Systems Design I 3 3S
Technical electives chosen with the approval of an advisor 6 4

CREDITS TO TOTAL A MINIMUM OF ........................................ 128
Physics
PHYS 207 General Physics 4
PHYS 208 General Physics 4

External to the College
Computer Science
CISC 105 General Computer Science 3
CISC 181 Introduction to Computer Science II 3
CISC 220 Data Structures 3
CISC 361 Operating Systems 3

Students with adequate programming experience may substitute the CISC 181, CISC 220 and CISC 280 sequence for the CISC 105, CISC 181 and CISC 220 sequence. Students taking CISC 105 must take the C language section.

Within the Department
CPEG 210 Introduction to Combinational Logic 2
CPEG 211 Introduction to Sequential Circuits 2
ELEG 205 Linear Circuit Theory 2
ELEG 220 Microprocessor Based Systems I 2
ELEG 309 Electronic Circuit Analysis I 4
ELEG 321 Microprocessor Based Systems II 2
ELEG 305 Signal Processing 3
ELEG 312 Electronic Circuit Analysis 4
ELEG 320 Field Theory 3
CPEG 323 Introduction to Computer System Engineering 3
ELEG 306 Random Signals and Noise 3
CPEG 324 Computer Systems Design I 3
ELEG 413 Field Theory II 4
CPEG 422 Computer Systems Design II 4

Design Requirement
In addition to the design content of the normal program, every student must take at least one course in their senior year in which one design project is at least 50% of the coursework. Regularly offered courses that presently meet this requirement are CPEG 422, ELEG 450 and CPEG 464. Other special courses are offered which will meet this requirement. The design requirement may also be met with special projects carried out in conjunction with faculty research with the prior approval of the Department Undergraduate Representative. Students must consult with the advisors for the proper selection of design courses.

Technical Electives
The choice of technical program electives must have the approval of the student's advisor and must include at least three of the following courses:
CPEG 444 VLSI Systems
CPEG 419 Computer Communications Systems
CPEG 421 Compiler Design
CPEG 418 Modern Control Engineering

The technical elective program is under constant review by the faculty. An updated list is available in the department office. Students should check with their advisors before selecting courses and should be aware that a formal mechanism exists to provide additional flexibility in selection of their Technical Elective courses.

CREDITS TO TOTAL A MINIMUM OF 127

HONORS BACHELOR OF COMPUTER ENGINEERING

A recipient of the Honors Bachelor of Computer Engineering must satisfy the following:
1. All requirements for the Bachelor of Computer Engineering degree
2. All generic University requirements for the Honors Degree (see p. 30) Graduate courses approved for this purpose by the department may be counted as Honors courses.

MECHANICAL ENGINEERING

Mechanical engineers receive one of the broadest educations of any of the modern engineering disciplines and consequently are well prepared to apply basic engineering principles to a wide variety of society's needs.

The educational program is structured around a basic core program that will enable the Bachelor of Mechanical Engineering graduate to follow many career paths, including research, development, design, production, maintenance, management, patent law, or education. The curriculum nevertheless also allows a student to select engineering fields of particular interest for study, such as aerospace, materials, biomechanics, controls, design and systems, robotics, energy, and fluids.

The degree course is designed to serve not only those students who go into industry or government directly after the B.M.E. degree, but also those who go on to a graduate program in engineering or continue their education in other professions such as medicine, law or business administration. Undergraduates are encouraged to participate in research projects with faculty and graduate students involving the use of state-of-the-art instrumentation, electronics and networked computers.

TECHNICAL ELECTIVE PROGRAM

Technical electives in the senior year of the Bachelor of Mechanical Engineering curriculum provide the student with an opportunity to pursue areas of particular interest. The technical electives are taken after much of the basic engineering science has been mastered and comprise four coordinated courses (a minimum of 12 credits). Although the majority of the available electives are drawn from the Mechanical Engineering department, courses at the 400-level and above from other departments and colleges can be selected with the advisor's approval.

There are four suggested major areas of concentration, Aerospace Engineering, Fluids and Thermal Engineering, Solid Mechanics and Materials, and Design, Dynamics and Manufacturing. However, technical elective programs can be structured to meet individual interests and students are encouraged to discuss their educational objectives with their advisor early in the junior year and to develop an agreed selection of technical electives.

DEGREE: BACHELOR OF MECHANICAL ENGINEERING
MAJOR: MECHANICAL ENGINEERING

CREDITS

CURRICULUM
Superior figures indicate semester (fall or spring) and/or year or years in which the course should be taken, i.e. fall of freshman year, spring of sophomore year, etc

UNIVERSITY REQUIREMENTS
ENGL 110 Critical Reading and Writing (minimum grade C) 3
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content (see p. 20) 3

COLLEGE REQUIREMENTS
General Education Program 18
See pp. 127-128: College General Education Program

MAJOR REQUIREMENTS

External to the College
An additional course (minimum of three credits) that can be either a course outside the College of Engineering (not including mathematics or science or courses in the "Group D" classification of the College of Arts and Science).

Chemistry
CHEM 101 General Chemistry 4
CHEM 104 General Chemistry 4

Computer and Information Sciences
CISC 103 General Computer Science for Engineers 3

Mathematics
MATH 241 Analytic Geometry and Calculus A 4
MATH 242 Analytic Geometry and Calculus B 4
MATH 243 Analytic Geometry and Calculus C 4
MATH 302 Ordinary Differential Equations 3

Physics
PHYS 207 Fundamentals of Physics I 4
PHYS 208 Fundamentals of Physics II 4
Within the College

- EGGG 132 Engineering Graphics/Analysis: 2.5
- MASC 302 Materials Science for Engineers: 4.25
- MEEG 305 Fluid Mechanics: 3.5
- MEEG 306 Fluid Mechanics Laboratory: 3.5
- ELEG 314 Electronics and Instrumentation: 4.25

Within the Department

- MEEG 125 Introduction to Mechanical Engineering: 0.15
- MEEG 213 Principles of Mechanics I: 2.25
- MEEG 214 Principles of Mechanics II: 2.25
- MEEG 307 Thermodynamics I: 3.5
- MEEG 308 Thermodynamics II: 3.5
- MEEG 313 Strength of Materials: 4.25
- MEEG 316 Materials Engineering: 3.5
- MEEG 347 Mechanical Design I: 3.5
- MEEG 348 Mechanical Design II: 3.5
- MEEG 361 Applied Engineering Analysis: 3.5
- MEEG 391 Engineering Science Laboratory I: 3.5
- MEEG 392 Fluid Mechanics II: 3.5
- MEEG 427 System Dynamics I: 3.45
- MEEG 447 Design and Systems Synthesis I: 3.45
- MEEG 448 Design and Systems Synthesis II: 3.45

Technical Electives

- Technical Electives: 12.5

Technical Electives: 400-level courses in engineering, science or mathematics selected by the student with the approval of their advisor.

CREDITS TOTAL A MINIMUM OF 131

TECHNICAL ELECTIVES

There are four suggested areas of concentration in the technical elective offerings. Students should select a minimum of 12 credits from the following courses or substitute other courses in consultation with their advisor. All technical elective selections must be approved by an advisor.

I. Aerospace Engineering

- MEEG 411 Structural Mechanics for Mechanical and Aerospace Engineering: 3
- MEEG 413 Advanced Mechanics of Materials: 3
- MEEG 415 Finite Element Analysis: 3
- MEEG 425 Fluid Machinery: 3
- MEEG 445 Senior Research: 3-6
- MEEG 623 Nonlinear Dynamics and Chaos: 3
- MEEG 625 Vehicle Dynamics: 3
- MEEG 626 Random Vibration: 3
- MEEG 633 Computer Aided Design: 3
- MEEG 6xx Multidisciplinary Design: 3
- MEEG 6xx High Temp Composites: 3
- MEEG 6xx Robotic Systems: 3
- MEEG 6xx Automatic Control of Mechanical Systems: 3
- MEEG 6xx Designs and Manufacture of Flexible Composite Structures: 3
- MEEG 6xx Expert Systems: 3

HONORS BACHELOR OF MECHANICAL ENGINEERING

A recipient of Honors Bachelor of Mechanical Engineering must satisfy the following:

1. All requirements for the Bachelor of Mechanical Engineering degree.
2. All generic University requirements for the Honors degree (see p. 30) Graduate courses approved for this purpose by the department may be counted as Honors courses.

DEPARTMENT OF AIR FORCE ROTC

The Air Force Reserve Officer Training Corps (AFROTC) provides a program for qualified college men and women to earn commissions as Second Lieutenants in the United States Air Force while completing their University course requirements. Commissioning follows the award of a University bachelor's degree. Questions concerning applicant qualifications should be directed to the unit's admission counselor.

PROGRAMS OFFERED

Four-Year Program. The four-year program is composed of a General Military Course (GMC) and a Professional Officer Course (POC). The first two years, the GMC, provide a general introduction to the Air Force and the various career fields. Students enrolled in the GMC who are not receiving an Air Force Scholarship incur no reserve or active duty service obligation to the Air Force and may elect to discontinue the program at any time. The final two years, the POC, concentrate on developing leadership and management skills and on a study of American defense policy. Students must compete for entry into the POC. If accepted, they must attend four weeks of field training at a designated Air Force base during the summer following their sophomore year of college. When they return to the University in the Fall, they are placed under contract with the Air Force to complete the program and serve a minimum of four years on active duty. Pilot and navigator candidates incur an additional obligation because of specialized training following commissioning. All students under contract receive approximately $1,500 tax free annually.

Two-Year Program. The two-year program is normally offered to prospective juniors and graduate students. The academic requirements for this program are identical to the final two years of the four-year program. During the summer preceding entry into the two-year program, all candidates must complete a six-week field training session at a designated Air Force base.

General Requirements for POC Acceptance. Students competing for acceptance as POC cadets must complete the four-year or two-year program prerequisites, pass the Air Force Officer Qualifying Test, be physically qualified, meet certain age requirements, be in good academic standing, and be able to meet all Air Force enlistment standards.
THE CURRICULUM

General Military Course (GMC)

Freshman year: The Development of Air Power I/II—AFSC 100 (fall) and AFSC 101 (spring). Each of these one-credit courses consists of approximately one hour of academic class each week. These two GMC courses survey the history of air power from the 18th century to the present.

Sophomore year: The Air Force Today I/II—AFSC 200 (fall) and AFSC 201 (spring). Each of these one-credit courses consists of approximately one hour of academic class each week. In combination, these two courses survey the roles of the Department of Defense and the U.S. Air Force in our society.

GMC courses are open to all freshman and sophomore students. Leadership activities are open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the Professor of Aerospace Studies. Leadership activities are scheduled for one-and-a-half hours each week.

Professional Officer Course (POC)

Junior year: Leadership and Management I/II—AFSC 310 (fall) and AFSC 311 (spring). Each of these three-credit courses consists of two-and-a-half hours of academic classes each week. Here the student is introduced to leadership and management concepts. The courses are designed to provide a foundation for basic leadership and management skills, with emphasis on communications.

Senior year: National Security Forces in U.S. Society I/II—AFSC 410 (fall) and AFSC 411 (spring). Each of these three-credit courses consists of two-and-a-half hours of academic classes each week. These courses focus on our national security policy—its evolution, actors, processes, and current issues. Emphasis is also given to military professionalism, military justice, and communication skills.

POC courses are open to all juniors and seniors. Leadership activities are open to students who are members of the Reserve Officer Training Corps or are eligible to pursue a commission as determined by the Professor of Aerospace Studies. Leadership activities are scheduled for one-and-a-half hours each week.

Scholarships Available. The AFROTC College Scholarship Program provides four- to eight-semester scholarships to students on a competitive basis. Scholarships are available in technical and nontechnical fields and are based on the whole-person concept and certain age restrictions. Any University of Delaware student may apply for these scholarships. Opportunity for scholarship selection is enhanced by enrolling in AFROTC. Those selected may receive full tuition, lab expenses, incidental and textbook fees, plus a $150 monthly, nontaxable allowance during the school year. Students who accept a scholarship enter the AFROTC program as a contract cadet.

Professional Officer Course Incentive (POCI) Scholarships are available for all students who meet certain age and academic requirements and are under contract as a POC cadet. These students receive $850 per semester towards tuition, plus $150 per semester for books. All majors are eligible to receive the POCI scholarship.

Air Force ROTC Nurse Program. Air Force ROTC makes it possible for qualified nursing school applicants to enroll in its programs and, upon completion of all academic requirements, receive a commission as a Second Lieutenant in the United States Air Force Medical Corps. Four- to eight-semester scholarships are available to highly qualified applicants.