Engineering is a profession which combines mathematics and science with creativity and design to serve the technological needs of our society. The solutions provided by engineers must be technically sound, economically viable, and socially responsible. Thus, the training engineers receive is extensive and rigorous.

A sound high school preparation in mathematics, science, and English is an essential foundation for any undergraduate engineering curriculum. Prospective engineering students should take advantage of high school honors and advanced placement courses when they are available and seek to apply mathematics and computer programming in their science courses. Students considering chemical engineering or the environmental area of civil engineering should take advanced courses in the biological sciences. All engineers must be skilled in reading and composition. Therefore, students should begin the study of engineering with a good high school preparation in critical reading and writing. Additionally, although a foreign language is not required for an engineering major, proficiency in a foreign language can be valuable in an engineering profession, and there are opportunities to continue foreign language study in an engineering curriculum.

**COLLEGE OF ENGINEERING**

- Materials Science Program
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering
- Department of Air Force ROTC

The standard four-year undergraduate curricula of the College of Engineering lead to the degrees of Bachelor of Chemical Engineering, Bachelor of Civil Engineering, Bachelor of Electrical Engineering, and Bachelor of 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 in one of the engineering majors as well as a bachelor's degree from the College of Arts and Science. (See page 165.) Additionally, the College of Engineering and the College of Business and Economics offer a joint 5 1/2-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. Admission to this program is by application to the Dean of Engineering during the third year of engineering study. All engineering programs are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (ABET). 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 RISE Program Director in the Office of the Dean of Engineering.

**CURRICULUM ORGANIZATION**

The curriculum in each engineering major consists of three basic parts: (1) a core group of technical courses, (2) an elective group of technical courses, and, (3) an elective group of general education courses.

The core group generally includes courses in mathematics, chemistry, physics, computer science, and engineering. The engineering courses begin in the first year and culminate in design-oriented courses in the senior year. Because the technical courses build upon one another, it is very important that a good foundation is established in prerequisite mathematics, science, and engineering courses before the follow-on technical courses are attempted.

The technical elective courses allow students to investigate the sciences in more depth and to develop a concentration within their own discipline. Technical electives also allow students to broaden their perspective in related areas outside their primary field of study.

The general education courses are chosen from the liberal arts to provide a well-rounded education. The complete general education program consists of 24 or 25 credit hours that include the University freshman writing and multicultural course requirements, the College
compute the University's cumulative grade-point index,
matics, and science courses used to fulfill graduation requirements.
engineering grade-point average; however, all grades are used to
mum academic standards for certain courses and for progression to
the sophomore or junior level. The specific standards for each depart-
ments for graduation as stated on page 23. Additionally, engineering
students must have at least a 2.0 average in all engineering, mathe-
versity advanced registration periods. Students must also obtain
record in mathematics, science, and engineering courses taken during
other engineering courses may not be used to satisfy any General
social sciences requirements are described in the following section.
The College of Engineering admits a small number of transfer students
each year during the fall and spring semesters. Because enrollment in
eering courses is normally restricted to departmental majors,
perspective transfer students may not register for engineering courses
without prior approval from the chairperson of the appropriate engineer-
department. The need to control class size and total enrollment in
each of the departments frequently requires that nonmajors be admin-
istratively removed from class lists following the registration period.
transfer into other colleges at the University with the intention of
horing and has relatively little flexibility. Engineering courses begin in
the first semester of the freshman year. Once a freshman class has
been admitted, only a limited number of spaces become available
within that cohort as it moves through to graduation. Transfer stu-
dents from outside the University who wish to enter the programs of
the College of Engineering are considered along with freshman
applicants unless it is judged that they have completed sufficient
work to be able to finish their engineering program in three years or
less. Candidates for admission as sophomores or juniors will be con-
sidered in competition with students transferring internally at the
University of Delaware. Since the number of openings is limited in
each engineering department, selection for transfer into the College is
very competitive. Successful transfer applicants will have a good
record in mathematics, science, and engineering courses taken during
their last year as a full-time student.
University of Delaware students who wish to transfer into a
department of the College of Engineering must make a formal
request to the appropriate chairperson 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 that must be
included in the application.
Transfer students from outside the University of Delaware who wish to
transfer into the College of Engineering must make a formal applica-
tion through the University Admissions Office by March 1 for entrance in the
fall semester or by November 15 for entrance in the spring semester.
All students who wish to transfer into the College of Engi-
would contact the Assistant Dean (135 du Pont Hall, (302) 831-
the appropriate departmental section.

college general education program
A broad outline of the College of Engineering General Education
Program is given below. 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.
The College of Engineering requires that six courses (minimum
of 18 credits) be chosen from the humanities and social sciences sub-
ject to the constraints listed below and the approval of the student's
faculty adviser. 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 page 23)
a) At least two courses (minimum of six credits) must be in the
humanities. Humanities include Art History, English (except
ENGL 110 and other writing skills courses), Foreign Lan-
guages and Literatures (except introductory skills courses),
Foreign Languages (except the student's native language and
introductory skills courses), History, Music (except skills and
performance courses), Philosophy, and Theatre (except skills
and performance courses).
b) At least two courses (minimum of six credits) must be in the
social sciences. The social sciences include Economics (EE
majors require ECON 151 or another approved course), Lin-
guistics (except introductory skills courses), Political Science,
Psychology, and Sociology.
c) At least two courses (minimum of six credits) must be above
the introductory level, and each must build upon the content of
a previous course, as approved by the faculty adviser.
d) At least two of the six courses (minimum of six credits) must be
thematically related, typically in the same department or program.
(Chemical Engineering majors have an additional requirement.)
Courses classified as "Group D" (mathematics and science) by
the College of Arts and Science may not be used to satisfy any General
Education Program requirement. Students must consult their faculty
advisers and the guidelines published by the College of Engineering
for the proper classification of general education courses.

college regulations
The College requires each engineering student to consult with his or
her academic adviser at least twice a year during the designated Uni-
versity advanced registration periods. Students must also obtain
approval from their advisers to take courses during the Winter or
Summer Sessions and when adding or dropping courses.
Each of the four engineering departments has established mini-
imum academic standards for certain courses and for progression to
the sophomore or junior level. The specific standards for each depart-
ment are given in the appropriate departmental section.
To graduate, all students must satisfy the University's require-
ments for graduation as stated on page 23. Additionally, engineering
students must have at least a 2.0 average in all engineering, mathe-
mathics, 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.
# CHEMICAL ENGINEERING

Chemical engineering is particularly identified with applied chemistry, materials science, and increasingly with biology. Engineering occurs when these basic sciences are transformed into quantitative models and reliable systems are built. Chemical engineering is in the forefront of many areas of current technology, including genetic engineering, the development of artificial organs, and the development of superconducting materials. Other areas in which the BS chemical engineer is involved include process development, product development, manufacturing, research and development, process design, and sales. Many research opportunities, however, require an advanced degree.

Chemical engineering analysis is creative, quantitative, applied, and specific. A high degree of creativity is needed to express problems in chemical engineering in ways that give new and effective solutions. It is quantitative, with solutions that state "how much," "how many," and "at what cost." Chemical engineering is applied in that the work product almost always is aimed toward problems that are to be solved within five years and typically lead to commercial products. Chemical engineering models apply to a specific configuration of equipment or to a defined product.

Delaware’s curriculum in chemical engineering reflects a strong commitment to an early start in the profession. In the freshman 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 in many other schools, enabling much of the chemical engineering science background 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.

This early encounter with the discipline enables the student who has made an inappropriate choice to transfer out of chemical engineering. However, it also makes it difficult for students to transfer into this curriculum during their sophomore or junior years unless the science requirements, especially in chemistry, have been met. Students should note that the course CHEG 112 is a prerequisite for CHEG 231, which in turn is a prerequisite for the courses CHEG 325 and 341. These courses are available only in the semesters indicated in the curriculum outlined below.

## DEGREE: BACHELOR OF CHEMICAL ENGINEERING
### MAJOR: CHEMICAL ENGINEERING

<table>
<thead>
<tr>
<th>CURRICULUM</th>
<th>CREDITS</th>
</tr>
</thead>
</table>
| CHEM 111  | General Chemistry*** | 3.0
| CHEM 119  | Quantitative Chemistry I. | 3.0
| CHEM 112  | General Chemistry | 3.0
| CHEM 443  | Physical Chemistry | 3.0
| CHEM 444  | Physical Chemistry | 3.0
| CHEM 445  | Physical Chemistry Laboratory I | 1.0
| CHEM 331  | Organic Chemistry | 3.0
| CHEM 333  | Organic Chemistry Laboratory I (lecture only) | 1.0
| CHEM 332  | Organic Chemistry | 3.0
| MATH 242  | Analytic Geometry and Calculus | 3.0
| MATH 243  | Analytic Geometry and Calculus C | 3.0
| MATH 302  | Ordinary Differential Equations I | 3.0
| MATH 303  | Ordinary Differential Equations Lab | 2.0
| MATH 305  | Applied Math for Chemical Engineering | 3.0
| PHYS 207  | General Physics | 3.0
| PHYS 208  | General Physics | 3.0

### 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

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEG 009</td>
<td>Chemical Engineering Freshman Seminar</td>
<td>0.0</td>
</tr>
<tr>
<td>CHEG 112</td>
<td>Introduction to Chemical Engineering</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 231</td>
<td>Chemical Engineering Thermodynamics</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 325</td>
<td>Chemical Engineering Thermodynamics</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 332</td>
<td>Chemical Engineering Kinetics</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 341</td>
<td>Fluid Mechanics</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 342</td>
<td>Heat and Mass Transfer</td>
<td>4.0</td>
</tr>
<tr>
<td>CHEG 443</td>
<td>Mass Transfer Operations</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 445</td>
<td>Chemical Engineering Laboratory II</td>
<td>3.0</td>
</tr>
</tbody>
</table>

### Within the Department

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEG 432</td>
<td>Chemical Engineering Projects</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 433</td>
<td>Chemical Process Dynamics and Control</td>
<td>3.0</td>
</tr>
<tr>
<td>CHEG 434</td>
<td>Chemical Process Analysis</td>
<td>4.0</td>
</tr>
</tbody>
</table>

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* 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.

** Minimum grade of C required.

# This requirement may be fulfilled through a course or courses taken to complete other degree requirements; it cannot be fulfilled by a course taken pass/fail. See page 23.

*** Students may enter Chemical Engineering after completing the eight-credit freshmen Chemistry sequence, CHEM 102-104. May not be adequate preparation for CHEM 443-444.

$MATH 242 is the first mathematics course in our regular program. It is the incoming student's responsibility to ensure his/her own Mathematics background and proficiency (using materials supplied by the 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 uncertain that you are ready for MATH 242, you should start with MATH 241. In this case, it is easy to drop back to MATH 241 after a few weeks of MATH 242 if that is where you belong. If you need additional mathematics, at least one winter and/or summer session will be required to complete the four-year program on schedule. To remain on schedule with the CHEG courses, you must be on schedule in mathematics by the start of your sophomore year.

1 Credit value for CHEG 342 changes from 3 to 4, effective in term 95F.

2 Credit value for CHEG 433 changes from 3 to 4, effective in term 96F.

3 Credit value for CHEG 434 changes from 3 to 4, effective in term 97F.
Technical Electives

General Technical Electives

The purpose of the technical electives is to advance the scientific or engineering background of the chemical engineers. The technical electives program consists of a minimum of nine credits taken from courses in the following list, normally three courses. At least two of these courses (six credits) must be at the intermediate level (generally 300-600). Students should select their technical electives in the spring of sophomore year to avoid scheduling conflicts. Students should formulate an academic plan for their technical and chemical engineering electives with the assistance of their academic advisor.

Biology

BISC 207 Introductory Biology***... 4
BISC 208 Introductory Biology II***... 4
BISC 301 Molecular Biology of the Cell... 4
BISC 303 Genetic and Evolutionary Biology... 4
BISC 305 Cell Biology... 4
BISC 306 General Physiology... 4
BISC 4xx Biology course chosen with the approval of the adviser... 3

Chemistry

CHEM 334 Organic Chemistry Lab II... 2
CHEM 437 Instrumentation Methods... 3
CHEM 457 Inorganic Chemistry... 3
CHEM 527 Introductory Biochemistry... 3
CHEM 6xx Chemistry course chosen with the approval of the adviser... 3
CHEM 8xx Chemistry course chosen with the approval of the adviser... 3

Computer Science

CISC 180 Introduction to Computer Science I***... 3
CISC 181 Introduction to Computer Science II***... 3
CISC 220 Data Structures... 3
CISC 260 Machine Organization and Microcomputers... 3
CISC 310 Logic and Programming... 3
CISC 360 Computer Architecture... 3
CISC 361 Operating Systems... 3
CISC 640 Computer Graphics... 3

Mathematics

MATH 349 Elements of Linear Systems... 3
MATH 389 Graph Theory... 3
MATH 426 Introduction to Numerical Analysis and... 3
MATH 428 Algorithmic and Numerical Solution of Differential Equations... 3
MATH 5xx Mathematics course chosen with the approval of the adviser... 3
MATH 6xx Mathematics course chosen with the approval of the adviser... 3

Mechanical Engineering Applied Mathematics

MEEG 361 Applied Engineering Analysis... 3
MEEG 863 Engineering Analysis I... 3
MEEG 864 Engineering Analysis II... 3

Physics

PHYS 209 General Physics III***... 3
PHYS 313 Physical Optics... 3
PHYS 419 Analytical Mechanics... 3
PHYS 6xx Physics course chosen with the approval of the adviser... 3

Statistics

STAT 450 Statistics for the Engineering and Physical Sciences... 3
STAT 6xx Statistics course chosen with the approval of the adviser... 3

Electronic Materials

[just note prerequisites]
ELEG 205 Linear Circuit Theory***... 4
ELEG 210 Introduction to Combinatorial Logic***... 2
ELEG 211 Introduction to Sequential Circuits***... 2
ELEG 314 Electronics and Instrumentation... 4
ELEG 340 Solid State Electronics... 3
ELEG 623 Electrical Properties of Matter I... 3
ELEG 626 Integrated Circuits... 3
ELEG 629 Digital Structures... 3

Materials Science/Engineering

MASC 406 Corrosion and Protection... 3
MASC 6xx (except for courses that are cross-listed with CHEG)... 3
MASC 8xx With approval of adviser... 3

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.

Mechanics

CIEG 301 Analysis of Structures***... 3
CIEG 311 Dynamics***... 3
CIEG 213 Principles of Mechanics I***... 3
CIEG 214 Principles of Mechanics II***... 3
CIEG 313 Strength of Materials... 4
CIEG 413 Advanced Mechanics of Materials... 4
CIEG 415 Finite Element Analysis... 4

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 adviser 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 301 Molecular Biology of the Cell... 3
CHEG 231Introductory Biochemistry... 3
CHEG 650 Biomedical Engineering... 3

Chemistry

CHEG 457 Inorganic Chemistry... 3
CHEG 527 Introductory Biochemistry... 3
CHEG 606 Introduction to Catalysis... 3
CHEG 610 Industrial and Engineering Chemistry... 3
CHEG 836 Applied Chemical Kinetics... 3

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

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 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 342.

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.

Admission to CHEG 401:
1) A minimum grade of C- in CHEG 443.

Admission to CHEG 432:
1) A minimum grade of C- in CHEG 320.
2) A minimum grade of C- in CHEG 332.
3) A minimum grade of C- in CHEG 443.

Graduation Requirements:
1) A "P" (pass) in CHEG 009.
2) A minimum grade of C- in all other Chemical Engineering courses counted towards graduation.

TRANSFER STUDENTS

Students within the University who wish to transfer as sophomores in the fall semester should make a formal request to the Chair by May 1. Unless the case is exceptional, a change-of-major application will only be considered after completion of the following minimum requirements:
1) An overall grade-point index of 2.0.
2) A minimum grade of C- in CHEG 112, Introduction to Chemical Engineering, is required if the course has been taken.
3) A minimum grade of C- in each of the following groups of courses: CHEM 111, CHEM 112, General Chemistry; MATH 242 and 243, Analytic Geometry and Calculus; and PHYS 207, General Physics.

Completion of these minimum requirements does not guarantee admission as a chemical engineering major.

Prospective students who contemplate beginning the program in Chemical Engineering in February, rather than in September, should consult with the Chemical Engineering Department.

Chemical Engineering courses designated by the CHEG prefix are closed to nonmajors. Students seeking exception should contact the Chemical Engineering Department.

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

This four-year program is designed to enable exceptional students with excellent high school backgrounds to obtain a Bachelor of Chemical Engineering degree and a Master of Chemical Engineering degree in four years. This allows students to take maximum advantage of their high school education, gives them a considerable jump over students going the normal bachelor’s degree-master’s degree route, including a year gained, and reduces redundancy in the total educational program. The program is designed for each individual; the following is considered typical.

The requirements and procedures of the program are:
1) The student is assumed to be qualified for a sufficient amount of credit by advanced placement to omit the entire freshman year on the basis of demonstrated ability in mathematics, chemistry, physics, English and humanities. Certification of the level of the advanced standing is made in the usual way on the basis of CEEB (College Board) examinations. CHEG 112, Introduction to Chemical Engineering, is waived upon evidence of suitable self-study.
2) Formal admission to the program and provisional admission to graduate school are provided to students upon request at the end of their second year in the program, or to those who have attained the status of such students, provided an overall grade-point average of at least 3.25 has been attained.
3) If differences exist between graduate and undergraduate fees for a particular student, the undergraduate fee structure applies through the end of the first semester of the third year.
4) Credit toward the B.Ch.E. degree for two technical electives is provided by the graduate-level work. The omitted technical electives would normally be the two senior project (thesis) courses. Thus, the combined program represents a contraction of 9 credits from the normal sequence of a B.Ch.E. degree followed by enrollment in the usual 30-credit graduate program; 6 credits are saved by the student’s carrying out only one thesis and the other 3 from waiving CHEG 112, as noted earlier.
5) The program involves a light course load in the final year to enable the student to meet the demands of the graduate thesis at that time.
6) It is desirable for purposes of professional registration that a student be graduated from an accredited undergraduate program and for this reason both degrees (B.Ch.E. and M.Ch.E.) are to be awarded. The student will receive the B.Ch.E. degree upon completion of the third year of the sample program below with a grade-point average at least 2.0. (This program exceeds the normal credit requirements for a B.Ch.E. degree.)

A student who elects to return to a standard B.Ch.E. program and to omit the M.Ch.E. degree will be awarded the B.Ch.E. upon completion of the regular requirements for that degree.
7) To obtain the M.Ch.E. degree the student must meet a grade-point average of at least 3.0 in the 30 credits of graduate work.

| DEGREE: BACHELOR OF CHEMICAL ENGINEERING and MASTER OF CHEMICAL ENGINEERING |
| MAJOR: CHEMICAL ENGINEERING |

<table>
<thead>
<tr>
<th>CURRICULUM</th>
<th>CREDITS*</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSITY REQUIREMENTS</td>
<td></td>
</tr>
<tr>
<td>ENGL 110 Critical Reading and Writing**</td>
<td>3 1/2</td>
</tr>
<tr>
<td>Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content II</td>
<td>3 1/4</td>
</tr>
</tbody>
</table>

| COLLEGE REQUIREMENTS | |
| General Education Program | 18 1/4 |

See page 154: College General Education Program.

MAJOR REQUIREMENTS

External to the College

| Chemistry | |
| CHEM 443 Physical Chemistry | 3 1/2 |
| CHEM 444 Physical Chemistry | 3 1/5 |

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

** Minimum grade of C- required

This requirement may be fulfilled through a course or courses taken to complete other degree requirements; it cannot be fulfilled by a course taken pass/fail. See page 23.

This curriculum assumes that the following courses have been granted by advanced placement or the equivalent. It is necessary to have 28-30 credits of advanced placement to participate in the program outlined above. The schedule will be adjusted for the accomplishments of the student by the faculty adviser.

AP Chemistry—8 credits, AP Calculus—4 credits, AP Physics—4 credits, AP English—6 credits, AP Humanities—6 credits. | 157 |
CHEM 445 Physical Chemistry Laboratory I .......................... 1 15
CHEM 331 Organic Chemistry ...................................... 2 F
CHEM 333 Organic Chemistry Laboratory I ..................... 2 F
CHEM 332 Organic Chemistry ...................................... 2 S

Mathematics
MATH 243 Analytic Geometry and Calculus C ................. 4 1 F
MATH 302 Ordinary Differential Equations ..................... 3 1 S
MATH 303 Ordinary Differential Equations Laboratory ....... 1 S
MATH 305 Applied Math for Chemical Engineering .......... 3 2 0

Physics
PHYS 208 General Physics ....................................... 4 1 F

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 2 F
MEEG 863 Engineering Analysis I .................................. 3 S
MEEG 864 Engineering Analysis II .................................. 3 S

Within the Department
CHEG 009 Chemical Engineering Freshman Seminar ........ 0 1 F
CHEG 112 Introduction to Chemical Engineering Analysis .... 3 1 S
CHEG 231 Chemical Engineering Thermodynamics .......... 3 1 F
CHEG 325 Chemical Engineering Thermodynamics .......... 3 1 S
CHEG 341 Fluid Mechanics ......................................... 3 2 F
CHEG 332 Chemical Engineering Dynamics ..................... 2 2 5
CHEG 342 Chemical Engineering Laboratory I ................. 3 2 S
CHEG 343 Chemical Engineering Laboratory II ................. 3 2 S
CHEG 443 Mass Transfer Operations .............................. 3 3 F
CHEG 445 Chemical Engineering Laboratory II ................. 3 3 F
CHEG 868 Research .................................................. 3 3 S
CHEG 401 Chemical Process Dynamics and Control ........... 3 3 S
CHEG 432 Chemical Process Analysis ............................ 4 3 S
CHEG 825 Chemical Engineering Thermodynamics .......... 3 4 F
CHEG 830 Fluid Mechanics ......................................... 3 4 F
CHEG 835 Applied Chemical Thermodynamics .................. 3 4 S
CHEG 863 Diffusional Operations .................................. 3 4 S
CHEG Graduate Electives .......................................... 12 3 4
CHEG 869 Master's Thesis .......................................... 6 4

CIVIL ENGINEERING

Traditionally, civil engineering has been identified with the planning and design of constructed facilities such as dams, bridges, buildings, transportation networks, harbors, waterways, and tunnels. Students receive solid background for working in areas such as structural engineering, soil mechanics, and hydraulics. Modern civil engineering has expanded into a variety of other areas and deals with large proportions of the infrastructure of modern industrialized societies including cities, highways and traffic control, mass transportation systems, utilities networks, irrigation systems, water resources exploration and management, environmental protection facilities, coastal management and protection works, and offshore structures. Applying technical competence to problems that are central to society’s environmental needs and concerns represents challenges and opportunities for civil engineers.

The Civil Engineering Department offers a program with a balanced content varying from the fundamental disciplines to practical engineering methods. Students during the first semester begin to solve civil engineering problems on computers using mathematics and science. Throughout the four year curriculum, the Department emphasizes the application of the methods of engineering science to civil engineering problems and gradually upgrades students’ analytical and computational skills to satisfy the needs of the engineering courses. This curriculum of required core courses provides a background in the entire field of civil engineering. The emphasis on developing a sound theoretical foundation also provides a basis for continual learning throughout students’ professional careers.

In the junior and senior year, there is opportunity to gain a deeper insight into one of the civil engineering disciplines through a number of technical electives. A wide variety of courses are available for this part of the program. Below, under the heading of Technical Electives, are listed some courses that, together with the required course curriculum, will give an in-depth knowledge in each of the listed areas.

DEPARTMENTAL REGULATIONS

To be enrolled in 300- or 400-level civil engineering or mechanics courses, civil engineering majors must have attained at least a C- grade in the following courses: CHEM 103, CHEM 104, MATH 241, MATH 242, and PHYS 207. If courses are repeated to meet this requirement, only the most recent grade received in any given course will be used in computing the average for the purposes of this requirement.

Students also must have a 2.0 grade-point average in all required courses in mathematics, the sciences, and engineering. If courses are repeated to meet this requirement, only the most recent grade received in any repeated course will be used by the department in computing the average.

In general, 300- and 400-level courses in civil engineering are open only to Civil Engineering majors. Students who have declared a Civil Engineering Minor and students enrolled in other departments in the College of Engineering who wish to take civil engineering courses as technical electives can, with the approval of their home department advisor, be enrolled in 300- or 400-level courses in the Civil Engineering Department. In some instances, others 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 Engineering Department.

DEGREE: BACHELOR OF CIVIL ENGINEERING

MAJOR: CIVIL ENGINEERING

CURRICULUM

UNIVERSITY REQUIREMENTS
ENGL 110 Critical Reading and Writing** ..................... 3 1 S
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content # 3 1 4

COLLEGE REQUIREMENTS

General Education Program

See page 154: College General Education Program

MAJOR REQUIREMENTS

External to the College
ENGL 410 Technical Writing ........................................ 3 4 S

Chemistry
CHEM 103 General Chemistry ...................................... 4 1 F
CHEM 104 General Chemistry ...................................... 4 1 S

CISC 106 General Computer Science for Engineers ........... 3 2 F

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

**Minimum grade of C required.

#This requirement may be fulfilled through a course or courses taken to complete other degree requirements; it cannot be fulfilled by a course taken pass/fail. See page 23.

1CHEG 320 is offered in terms 96S, 96T.

2Credit value for CHEG 342 changes from 3 to 4, effective in term 96S.

3CHEG 473 Chemical Engineering Projects can be substituted for CHEG 445 with adviser’s permission. This option is only available for students who received a minimum grade of B in CHEG 445.

4Credit value for CHEG 432 changes from 3 to 4, effective in term 97F.
GEOL 107 General Geology I 43S
STAT 450 Statistics for the Engineering and Physical Sciences 31S

Mathematics
MATH 241 Analytic Geometry and Calculus A 41S
MATH 242 Analytic Geometry and Calculus B 41S
MATH 243 Analytic Geometry and Calculus C 41S
MATH 302 Ordinary Differential Equations 31S

Physics
PHYS 207 General Physics 41S
PHYS 208 General Physics 41S

Within the College
EGGG 132 Engineering Graphics/Analysis 21F
MASC 302 Materials Science for Engineers 41S
MECH 305 Fluid Mechanics 31S
MECH 306 Fluid Mechanics Laboratory 31S

Within the Department
CIEG 125 Introduction to Engineering (CE) 21F
CIEG 211 Statics 32F
CIEG 212 Strength of Materials 32F
CIEG 213 Materials Laboratory I 32S
CIEG 301 Analysis of Structures 42F
CIEG 311 Dynamics 32F
CIEG 331 Introduction to Environmental Engineering 32F
CIEG 351 Transportation Engineering 32S
CIEG 381 Civil Engineering Analysis 32F
CIEG 420 Soil Mechanics 41F
CIEG 461 Senior Design Project 34S
CIEG 482 System Design and Operation 31S

One of:
CIEG 402 Steel Design 34F
or
CIEG 403 Concrete Design 3

One of:
CIEG 431 Water Supply Engineering 34S

CIEG 432 Wastewater Engineering 3

One of:
CIEG 441 Hydrology 34F
or
CIEG 442 Hydraulic Engineering 3

Technical Electives!

Technical Electives
Four courses giving a total of at least four additional design points must be satisfied; see current departmental technical elective listing.

CREDITS TO TOTAL A MINIMUM OF 131

TECHNICAL ELECTIVES

The Civil Engineering curriculum contains four technical elective courses that give students the opportunity to complete their education by concentrating in an area of special interest.

The required course curriculum provides the basis in mathematics, science, the applied engineering sciences, and engineering design that students need for future work and enhances their general education background. However, it only gives students an introduction to each of 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.

The following are suggestions for courses to choose from if the student wants to concentrate in one of the above mentioned areas or wants a general civil engineering degree that further supports the breadth of the required course curriculum.

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 431 Water Supply Engineering 3
CIEG 432 Wastewater Engineering 3
CIEG 441 Hydrology 3
CIEG 442 Hydraulic Engineering 3
CIEG 452 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 431 Water Supply Engineering 3
CIEG 432 Wastewater Engineering 3
CIEG 433 Hazardous Waste Management 3
CIEG 435 Industrial Wastes Management 3
CIEG 437 Water and Wastewater Quality 3
CIEG 441 Hydrology 3
CIEG 442 Hydraulic Engineering 3
CIEG 526 Land Application of Wastes 3
BISC 371 Introduction to Microbiology 4
BISC 472 Principles of Infectious Diseases 3
BISC 641 Microbial Ecology 3
CHEM 213 Elementary Organic Chemistry 4
CHEM 214 Elementary Biochemistry 4
CHEM 220 Quantitative Analysis 3
CHEM 418 Introduction to Physical Chemistry 3
ELEG 681 Remote Sensing in Environment 3
GEOL 413 Fundamentals of Well Logging 3
GEOL 421 Environmental and Applied Geology 3
GEOL 428 Hydrogeology 3
MEEG 350 Thermodynamics I 3

Hydraulic and Ocean Engineering
CIEG 441 Hydrology 3
CIEG 421 Foundations and Substructures 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 361 Applied Engineering Analysis 3

Structures and Geotechnical Engineering
CIEG 223 Surveying 3
CIEG 401 Computer Methods of Structural Analysis 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
CIEG 417 Advanced Structural Analysis 3
CIEG 418 Continuously Supported Structures 3
CIEG 421 Foundations and Substructures 3
CIEG 422 Earth Structures Engineering 3
CIEG 459 Railroad Engineering 3
CIEG 467 Introduction to Bridge Design 3

Transportation Engineering
CIEG 223 Surveying 3
CIEG 452 Transportation Facilities Design 3
CIEG 454 Urban Transportation Planning 3
CIEG 459 Railroad Engineering 3
CIEG 486 Engineering Management 3
GEOG 328 Transportation Geography 3
STAT 420 Data Analysis and Nonparametric Statistics 3

TRANSFER STUDENTS

Students wishing to transfer into the Department of Civil Engineering from other colleges outside the University are considered along
with freshman applicants unless it is judged that they have completed sufficient work to be able to finish their engineering program in three years or less. Candidates for admission as sophomores or juniors will be considered in competition with students transferring internally at the University of Delaware. Successful transfer applicants will have a good record, maintaining at least a “B” average overall and in math, science, and engineering courses taken during their last year as a full-time student.

Students wishing to transfer internally into the Department of Civil Engineering from other departments or colleges within the University of Delaware must have at least sophomore status and have completed MATH 241, 242, CHEM 103, 104 and PHYS 207 with a grade of “C” or better and must have maintained at least an overall average of “B” during their last year as a full-time student. To initiate a request for transfer, a change of major form must be turned in to the department prior to May 1 for fall admission and prior to December 1 for spring admission. Compliance with the minimum requirements does not guarantee acceptance for transfer.

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 24 credits in civil engineering and engineering mechanics in accord with the following list and requirements. In addition, before beginning the civil engineering courses, the student must have credit for MATH 241, 242 and PHYS 207; must meet the usual course prerequisites; must complete successfully, CHEM 103, 104, MATH 243, 302 and PHYS 208 before being certified for the minor in civil engineering; and must have a 2.0 average in the 21 credits of the civil engineering minor and in the eight mathematics and science courses listed above.

The required engineering courses are:

- Statics, CIEG 211 ........................................ 3
- Strength of Materials, CIEG 212 [lab optional] ... 3
- Dynamics, CIEG 311 ........................................... 3
- Fluid Mechanics, MECH 305 [lab optional] ........ 3

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 adviser in the Civil 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.

ELECTRICAL ENGINEERING

Electrical engineering involves energy and information and their control, transformation and distribution. It is based on the electrical and information sciences and the related field of materials science. Recognized as a profession since the development of telegraphy, it has since grown to include power systems, telephony, electronics, radio, communications systems, computers, microelectronics, lasers and fiber optics, solar electric energy, and many other related areas.

To prepare the student for the constantly changing scope and emphases of the discipline, the Delaware program emphasizes the basics: that is, basic mathematics and science and the equally important basic principles of engineering analysis and design. To the study of the basics, the Delaware electrical engineering program adds in-depth study of an area or areas of current practice.

Coursework in electrical 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 electrical engineering: (1) a core group of technical courses; (2) an elective group of technical courses in an area of concentration; and (3) a “general education” component that includes six courses in the humanities and social sciences and two in written communications.

The core group includes four courses in mathematics (starting with the second calculus course, MATH 242), two in physics, one in chemistry, two in computer science, and sixteen in electrical engineering.

The technical electives must be chosen to form an area of concentration. 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 180-181, CHEM 103, PHYS 207, and ELEG 210-211 by the end of the summer session of their freshman year. With few exceptions, electrical engineering students are expected to complete the program in eight regular semesters. With electrical engineering courses being offered only once each year, it is imperative that students follow as closely as possible the course sequence outlined in the following pages.

DEGREE: BACHELOR OF ELECTRICAL ENGINEERING

MAJOR: ELECTRICAL ENGINEERING

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<th>CURRICULUM</th>
<th>CREDITS*</th>
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<td>UNIVERSITY REQUIREMENTS</td>
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<tr>
<td>ENGL 110  Critical Reading and Writing**</td>
<td>3 1/2</td>
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<tr>
<td>Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #</td>
<td>3 1/4</td>
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<td>COLLEGE REQUIREMENTS</td>
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<td>General Education Program</td>
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<tr>
<td>ENGL 301  Expository Writing</td>
<td>3 F</td>
</tr>
<tr>
<td>PHIL 341  Ethics of Engineering Profession</td>
<td>1 F</td>
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</tbody>
</table>
Mathematics

MATH 242 Analytic Geometry and Calculus B1 41F
MATH 243 Analytic Geometry and Calculus C 41S
MATH 341 Differential Equations with Linear Algebra I 32F
MATH 342 Differential Equations with Linear Algebra II 32S

Chemistry

CHEM 103 General Chemistry 41F

Physics

PHYS 207 General Physics 41S
PHYS 208 General Physics 42F

Computer Science

CISC 190 Introduction to Computer Science I 31F
CISC 181 Introduction to Computer Science II 31S

Technical Electives

Each student must select a concentration to structure his or her technical elective program. Four concentrations are currently defined: computer engineering, systems and signal processing, electronic devices and materials engineering, and power systems engineering. Students with a special interest may define their own concentrations in conjunction with their adviser. 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 should 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 concentration specifications 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 must be chosen from an area of concentration, and the four concentrations follow:

Technical Electives—Computer Engineering

CISC 220 Data Structures 32F

Technical Electives—Systems and Signals Concentration

CISC 220 Data Structures 32F
MATH 426 Introduction to Numerical Analysis and Algorithmic Computation 33F
ELEG 403 Communication Systems Engineering 34F
ELEG 618 Modern Control Engineering 34F
ELEG 631 Digital Signal Processing 34F

Technical Electives—Devices and Materials Concentration

Students whose primary interest is in the Devices and Materials Engineering concentration should take:
ELEG 640 Optoelectronics 34F
ELEG 642 Special Topics in Electrooptics*** 34S

Technical Electives—Power Systems Concentration

MEEG 307 Thermodynamics I 34F
MEEG 412 Introduction to Power Systems Analysis 34F
MEEG 414 Electrical Machines, Motors, and Generators 34F
MEEG 618 Modern Control Engineering 34F
MEEG 408 Power Generation System Design 34F

CREDITS TO TOTAL A MINIMUM OF 128

TRANSFER STUDENTS

Transfer students fall into two categories. Regular transfer students are those students who have obtained college or university course credits after completion of high school, but who cannot be expected to complete their degrees in less than four years. These students will be considered for admission along with normal applicants for the freshman class and will be selected by the Admissions Office. The criteria for admission will be the same as used for all other freshman applicants.

Transfer students with advanced standing in electrical engineering are those students with enough appropriate math, science and engineering transfer credits who can be expected to complete their degrees with three or fewer years of additional study. This group includes both students from other programs at the University as well as those from other colleges and universities. The admission of these students will be decided by the faculty of the electrical engineering department and will be determined by the number of student slots available and the student’s record in math, science and engineering courses as well as his or her overall academic record.
Students in other disciplines within the College of Engineering will be automatically transferred into electrical engineering provided they have met the following requirements:

1. They have completed at least one year in their original major.
2. They have achieved cumulative and engineering GPA's of at least 2.5.

The above guidelines are provided as general information for transfer applicants. The department’s detailed transfer policy is available from the departmental office in 140 Evans Hall.

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. Challenging fields requiring the talents of mechanical engineers in both the design and development of new technology are energy, environmental engineering, manufacturing, materials engineering, bio-mechanical engineering, transportation, and exploration and use of the space environment and the oceans.

Since many technologies will reach their zenith and wane in less than the duration of an individual's career, mechanical engineers must have a firm foundation in the more basic and durable engineering sciences to be able to adapt and contribute to new and evolving fields. 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 adviser'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 adviser early in the junior year and to develop an agreed selection of technical electives.

DEGREE: BACHELOR OF MECHANICAL ENGINEERING

MAJOR: MECHANICAL ENGINEERING

CURRICULUM CREDITS*

UNIVERSITY REQUIREMENTS

ENGL 110 Critical Reading and Writing** 3 15
Three credits in an approved course or courses stressing multicultural, ethnic, and/or gender-related content #

COLLEGE REQUIREMENTS

General Education Program

See page 154: College General Education Program.

MAJOR REQUIREMENTS

External to the College

An additional course (minimum of three credits) that can be either Air Force ROTC or 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 103 General Chemistry 4 1F
CHEM 104 General Chemistry 4 1S

Computer and Information Sciences

CISC 106 General Computer Science for Engineers 3 2F

Mathematics

MATH 241 Analytic Geometry and Calculus A 4 1F
MATH 242 Analytic Geometry and Calculus B 4 1S
MATH 243 Analytic Geometry and Calculus C 4 2F
MATH 302 Ordinary Differential Equations 3 2S

Physics

PHYS 207 General Physics 4 1F
PHYS 208 General Physics 4 1S

Within the College

EGEE 132 Engineering Graphics/Analysis 2 15
MASC 302 Materials Science for Engineers 3 2S
MECH 305 Fluid Mechanics 3 2F
MECH 306 Fluid Mechanics Laboratory 3 2F
ELEEG 314 Electronics and Instrumentation 4 4F

Within the Department

MEEG 125 Introduction to Mechanical Engineering 0 1F
MEEG 213 Principles of Mechanics I 3 1F
MEEG 214 Principles of Mechanics II 3 2F
MEEG 307 Thermodynamics I 3 2F
MEEG 308 Thermodynamics II 3 2S
MEEG 313 Strength of Materials 3 2F
MEEG 316 Materials Engineering 3 3F
MEEG 347 Mechanical Design I 3 3S
MEEG 348 Mechanical Design II 3 3F
MEEG 361 Applied Engineering Analysis 3 3F
MEEG 391 Engineering Science Laboratory I 3 3S
MEEG 336 Fluid Mechanics I 3 3F
MEEG 337 Fluid Mechanics II 3 3F
MEEG 447 Design and Systems Synthesis I 3 4S
MEEG 448 Design and Systems Synthesis II 3 4S

Technical Electives

Technical Electives* 12 4

400 level or above courses in engineering, science or mathematics selected by the student with the approval of their adviser.

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 adviser.

* 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.
** Minimum grade of C required.
# This requirement may be fulfilled through a course or courses taken to complete other degree requirements; it cannot be fulfilled by a course taken pass/fail. See page 23
† Students are encouraged to develop a technical elective program that meets their own interests and career plans, but all technical elective selections must be approved by an adviser.
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 commis-
sion 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 non-technical fields and are based on the whole-person concept. Any University of Delaware student may apply for these scholarships. Opportunity for scholarship selection is enhanced by enrolling in AFROTC. Those selected receive full tuition, lab expenses, incidental and textbook fees, plus a $100 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.