DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

UNDERGRADUATE PROGRAM
CLASS OF 2018

University of Delaware
August 2014
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Introduction

Welcome to the University of Delaware. The Department of Civil and Environmental Engineering is part of the College of Engineering. In the 2014 fall semester, over 2,500 undergraduates will be registered in the College, of which approximately 550 are undergraduate civil and environmental engineering students. The graduate student enrollment in the department is around 115 students.

You will find that a strong working relationship exists within the departments of the College of Engineering, and interdepartmental programs broaden the opportunities for research and coursework. Vigorous, well-staffed departments of chemistry, physics, biology, geology, mathematics, and computer science are closely allied, and some of your first courses will be taught by those departments. Joint appointments of our faculty with the College of Earth, Ocean, and Environment exemplify the interdisciplinary relationships you'll find across campus. Engineering research centers create a background of scholarly and research activities from which our students benefit. The University's Undergraduate Research Program further enhances the opportunities by bringing students in active contact with faculty research.

You will also get to use Morris Library, which contains over 2.8 million volumes and subscribes to over 40,000 journals and newspapers, as well as the university's outstanding computing facilities.

Less tangible, but very important, is the friendly and intellectually stimulating atmosphere that exists on campus. It is enhanced by the many honor societies and student chapters of professional engineering societies as well as opportunities for sports and outdoor activities offered by the University and the surrounding area. Of particular interest are the student chapters of the American Society of Civil Engineers (ASCE), the Institute of Transportation Engineers (ITE), Chi Epsilon, the Environmental Engineering Student Association (EESA), the American Society of Highway Engineers (ASHE), and Engineers Without Borders (EWB).

Common First Semester in Engineering

The University of Delaware offers seven degrees in engineering: Civil, Environmental, Mechanical, Electrical, Chemical, Computer, and Biomedical Engineering. Freshman engineering majors have the opportunity to learn about and experience all seven of these disciplines through a common first semester and the course EGGG101 - Introduction to Engineering. Broken down into modules, this course is taught by a team of faculty representing all of the respective majors. There you will learn more about each of the disciplines. You will also learn skills to help you be successful in your college career. During your first semester, you will take the same courses as all other first-semester engineering majors. At the end of your first semester you will have the opportunity to request a change of major into a different engineering major, should you decide that civil or environmental engineering is not for you, provided you meet the academic requirements and there is space available in the major. Please consult with your academic advisor or the College of Engineering Assistant Dean for Undergraduate Services for an up-to-date list of the restricted engineering majors.
Undergraduate Degree Programs

The Department of Civil & Environmental Engineering offers two major undergraduate degree programs, one in Civil Engineering and one in Environmental Engineering, as well as four minors in these two subjects.

Civil Engineering Bachelor’s Degree Program

The Bachelor of Civil Engineering (BCE) program at the University of Delaware offers training in all of the major disciplines of civil engineering: structural, geotechnical, transportation, environmental, infrastructure systems, railroad, and coastal engineering. The curriculum gives our students a unique opportunity to acquaint themselves with the various disciplines within the profession. Civil engineering students may select technical electives in one field or take a variety of courses to explore several areas of civil engineering. Students are encouraged to meet with their faculty advisors regularly to discuss their progress and discuss any curricular matters.

You will spend a good deal of your time during the early part of your studies learning about the mathematics and science that forms the foundation of practical engineering. A second important component in your education as an engineer is the development of your understanding of mechanics, a branch of physics, through special courses in the engineering science disciplines of statics, solid mechanics, dynamics, and fluid mechanics. Based on these tools of the trade, you’ll spend much of the final year or two of your studies with courses that teach you the skills of analysis and design of engineering structures, as well as provide insights into the modern disciplines of civil engineering.

Finally, woven into the curriculum is a requirement to supplement your science and engineering skills with courses in communication, humanities, and social sciences. These courses will broaden your cultural background and improve your capabilities to function in a modern society.

The undergraduate program prepares our graduates for entry-level positions. After four years of work experience, you can qualify for a license to practice by passing a Principles and Practice of Engineering (PE) examination administered by a State Board. You can take the introductory Fundamentals of Engineering (FE) exam, which is a prerequisite for the PE, as a senior Civil or Environmental Engineering student. In Delaware, the PE license is administered by the Delaware Association of Professional Engineers (DAPE). Information about the exam can be found at www.dape.org or www.ncees.org.

A complete description of the undergraduate curriculum can be found in the current Undergraduate & Graduate Catalog. A brief overview is given on the check sheet shown on the next page, which shows the recommended courses for each semester and helps you keep track of your progress toward graduation. You can also check your progress on UDSIS using the “degree audit” tool, or by reviewing your unofficial transcript.

Department of Civil and Environmental Engineering
FRESHMAN YEAR

**FALL TERM** | 16 credits
---|---
Intro to Engineering | EGGG 101 (2)
Analytic Geom. & Calc. A | MATH 241 (4)
General Chemistry | CHEM 103 (4)
Computer Science | CISC 106 (3)
Breadth Requirement | (3)

**SPRING TERM** | 17 credits
---|---
Freshman Design | CIEG 161 (3)
Analytic Geom. & Calc. B | MATH 242 (4)
Critical Reading & Writing | ENGL 110 (3)
Science Elective | (4)
Breadth Requirement | (3)

**SOPHOMORE YEAR**

**FALL TERM** | 17 credits
---|---
Analytic Geom. & Calc. C | MATH 243 (4)
Oral Communication | COMM 212 (3)
Statics | CIEG 211 (3)
General Physics I | PHYS 207 (4)
Breadth Requirement | (3)

**SPRING TERM** | 16 credits
---|---
Solid Mechanics | CIEG 212 (3)
CE Materials Lab | CIEG 213 (1)
Dynamics | CIEG 311 (3)
Materials Science | MSEG 302 (3)
Engineering Math I | MATH 351 (3)
Breadth Requirement | (3)

**JUNIOR YEAR**

**FALL TERM** | 15 credits
---|---
Structural Analysis | CIEG 301 (4)
Soil Mechanics | CIEG 320 (3)
Soil Mechanics Lab | CIEG 323 (1)
Fluid Mechanics | CIEG 305 (3)
Fluid Mechanics Lab | CIEG 306 (1)
Engineering Math III | MATH 353 (3)

**SPRING TERM** | 17 credits
---|---
Structural Design | CIEG 302 (4)
Geotechnical Engineering | CIEG 321 (3)
Environmental Engineering | CIEG 331 (3)
Transportation Engineering | CIEG 351 (3)
Transportation Eng. Lab | CIEG 451 (1)
Prob. & Stats. for Engineers | CIEG 315 (3)

**SENIOR YEAR**

**FALL TERM** | 14 credits
---|---
Senior Design Project | CIEG 461 (2)
Eng. Project Management | CIEG 486 (3)
Water Resources Eng. | CIEG 440 (3)
Technical Elective | (3)
Technical Writing | ENGL 410 (5)

**SPRING TERM** | 14 credits
---|---
Senior Design Project | CIEG 461 (2)
Technical Elective | (3)
Technical Elective | (3)
Breadth Requirement | (3)
Breadth Requirement | (3)

*Grade of “C-“ or better required in these courses as degree requirements or as prerequisites for other courses

**BREADTH REQUIREMENTS** (18 Credit Hours); All Breadth Requirements C- or better

See [http://www.engr.udel.edu/advise/breadth_req.html](http://www.engr.udel.edu/advise/breadth_req.html)

<table>
<thead>
<tr>
<th>Creative Arts &amp; Humanities</th>
<th>History &amp; Cultural Change</th>
<th>Social &amp; Behavioral Sciences</th>
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<tr>
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<tr>
<td>Three additional courses (9 credit hours) from the College of Engineering Breadth Requirement List</td>
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</tbody>
</table>

**OTHER BREADTH REQUIREMENTS**

- General Education plan approved ( )
- Course (3 credits) for multicultural requirement ( )
- 2 courses (6 credits) above introductory level ( )

**SCIENCE ELECTIVE:** One course from: BISC 207, BISC 208, CHEM 104, GEOL 107, PHYS 208, PHYS 245

**Science Elective**

**IMPORTANT NOTES:**

Additional details and up-to-date information are available from the office of the Chairperson. Students may arrange (with faculty advisor’s approval) the sequence of these and other courses when prerequisites (if any) have been met. Number of credits per term may also be adjusted to individual needs.

**SYMBOLS:**

- Pre-registered ( )
- Course in Progress ( )
- Completed and Passed ( )
- Not Required (N)
- Transfer Credit (T)

08/2014
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. A grade of C- or better is required in all of the courses completed for the minor.

The required civil engineering and engineering mechanics courses are as follows:

- CIEG 211 Statics
- CIEG 212 Solid Mechanics (Lab optional)
- CIEG 305 Fluid Mechanics (Lab optional)
- CIEG 311 Dynamics

An additional 9 credits (3 courses) in civil engineering must be taken of which at least 6 credits must be at the 300-level or higher. Those courses should be selected in consultation with an advisor in the Department of Civil and Environmental Engineering to meet each student's objectives. For students oriented toward earth sciences these might include CIEG 320, CIEG 323 and CIEG 321; for those interested in the environment, CIEG 331 and CIEG 438; for those interested in urban topics, CIEG 331 and CIEG 351; for those interested in construction and structures, CIEG 301 and CIEG 302; for those interested in the oceans, CIEG 440 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. However, 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 necessary to practice engineering or to become a licensed professional engineer.
**Minor in Sustainable Infrastructure**

The objective of this minor is to provide the basic knowledge and skills required in balancing civil infrastructure development with environmental and societal impacts, so that sustainability can be methodically defined and attained. Students will learn the principles of sustainability and the fundamental tools needed to assess sustainability; be able to evaluate the impact of proposed infrastructure development on limited natural resources; recognize and assess the political, economic, environmental, and social impacts of infrastructure development; and develop the insight needed to find solutions that minimize the effect of infrastructure development on the local community and across global boundaries.

A minor in Sustainable Infrastructure may be earned by a student in any University bachelor’s degree program. To receive a minor in Sustainable Infrastructure, the student must successfully complete a minimum of 15 credits as described below with a minimum grade of C- in each course.

All students must complete the following core course:
- CIEG 402 Introduction to Sustainability Principles in Civil Engineering

All students must complete one of the following core courses:
- CIEG 403 Sustainability Applications in Infrastructure
- CIEG 465 Engineers Without Borders

All students must complete three of the following sustainability-related breadth courses:
- APEC 343 Environmental Economics
- BUAD 429 Selected Topics in Management: Sustainability and Green Business
- ECON 311 Economics of Developing Countries
- ELEG 415 Electric Power and Renewable Energy Systems
- ELEG 491 Ethics/Impacts of Engineering
- ENEP 410 Environmental Sustainability: Economic and Policy Analysis
- GEOG 422 Resources, Development and the Environment
- GEOG 434 Plan Sustainable Communities and Regions
- LEAD 451 Leadership for Sustainability
- MAST 676 Environmental Economics
- MEEG 435 Wind Power Engineering
- PHIL 448 Environmental Ethics
- POSC 311 Politics of Developing Nations
- POSC 350 Politics and the Environment
- SOCI 471 Disasters, Vulnerability, and Development
- UAPP 452 International Development Policy and Administration

The minor is open to all majors, though several courses included as electives in the minor may require completion of prerequisite courses for students in some majors.
Civil Engineering Program Technical Electives

In addition to specific required technical courses, three technical elective courses must be completed. Technical electives include upper-level courses in engineering, mathematics, computer science, and the sciences, subject to advisor approval. Graduate-level courses may also be taken as technical electives. The following is a list of technical electives for 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 401 Introduction to the Finite Element Method
CIEG 402 Introduction to Sustainability Principles in Civil Engineering
CIEG 403 Sustainability Applications in Infrastructure
CIEG 407 Building Design
CIEG 409 Forensic Engineering
CIEG 413 Advanced Structural Analysis
CIEG 417 Introduction to Railroad Safety and Derailment Engineering
CIEG 418 Introduction to Railroad Engineering
CIEG 429 Concrete Design
CIEG 465 Engineers Without Borders

Environmental and Water Resource Engineering

BISC 641 Microbial Ecology
CHEM 213 Elementary Organic Chemistry
CHEM 214 Elementary Biochemistry
CHEM 220 Quantitative Analysis
CHEM 443 Physical Chemistry I
CIEG 415 Meteorologic Processes in Air Pollution
CIEG 430 Water Quality Modeling
CIEG 433 Hazardous Waste Management
CIEG 434 Air Pollution Control
CIEG 436 Processing, Recycling, Management of Solid Wastes
CIEG 437 Water and Wastewater Quality
CIEG 438 Water and Wastewater Engineering
CIEG 439 Biosustainability and Public Health
CIEG 442 Stormwater Management
CIEG 444 Microbiology of Engineered Systems
CIEG 445 Industrial Ecology
CIEG 468 Principles of Water Quality Criteria
CIEG 498 Groundwater Flow & Contaminant Transport
ELEG 681 Remote Sensing of Environment
GEOL 421 Environmental and Applied Geology
Hydraulic and Ocean Engineering

CIEG 471  Introduction to Coastal Engineering
CIEG 661  Introduction to Ocean Modeling
CIEG 670  Physics of Cohesive Sediment
CIEG 672  Water Wave Mechanics
CIEG 675  MATLAB for Engineering Analysis
CIEG 678  Transport and Mixing Processes
CIEG 679  Sediment Transport Mechanics
CIEG 680  Littoral Processes
CIEG 681  Water Wave Spectra
CIEG 682  Nearshore Hydrodynamics

Structures and Geotechnical Engineering

CIEG 401  Introduction to the Finite Element Method
CIEG 407  Building Design
CIEG 408  Introduction to Bridge Design
CIEG 409  Forensic Engineering
CIEG 421  Foundation Engineering
CIEG 422  Earth Structures Engineering
CIEG 427  Deep Foundations
CIEG 428  Ground Improvement Methods

Transportation and Construction Engineering

CIEG 452  Transportation Facilities Design
CIEG 453  Roadway Geometric Design
CIEG 454  Urban Transportation Planning
CIEG 456  Regional Analysis Method
CIEG 458  Pavement Analysis and Design
GEOG 328  Transportation Geography
STAT 420  Data Analysis and Nonparametric Statistics
Environmental Engineering Bachelor’s Degree Program

The Bachelor of Environmental Engineering (BENV) program educates students in the causes, control, and prevention of environmental contamination so that they may analyze those processes and improve the quality of our earth’s atmospheric, water, and land resources.

The curriculum provides a broad background in mathematics and sciences common to all engineering disciplines. This includes a background in the fundamentals of physical, biological, and chemical processes. Students take courses in environmental engineering beginning in the first semester of their sophomore year, while simultaneously developing a strong foundation in mathematical, scientific, and engineering fundamentals. The core curriculum also includes important aspects of chemical thermodynamics and ecology, as well as courses on treating water and wastewater, controlling air pollution, and managing solid wastes. Laboratory coursework emphasizes the current methods for pollutant analysis and treatment.

These offerings are integrated into a plan of study that also provides many essential courses from the civil engineering curriculum, such as solid mechanics and fluid mechanics. Beyond the common core curriculum, students select one of three concentrations:

- **environmental biological and chemical processes**, providing a background in chemical engineering kinetics, thermodynamics, heat and mass transfer, and physical chemistry
- **environmental facilities design and construction**, including training in structural analysis, structural design, and soil mechanics
- **water resources and water quality**, providing background in stormwater management and the modeling of water and pollutant movement on the land surface (e.g., rivers) and below ground (i.e., groundwater)

Students in each concentration also take additional technical electives, allowing them to obtain greater depth within their concentration or to broaden their training through additional upper-level courses in engineering, the sciences, or mathematics.

Through these courses, students develop an understanding of the fate of environmental contaminants; an ability to apply methods of modeling and simulation to environmental processes and the ability to assess risk and estimate cost. The program emphasizes teaching students to apply knowledge to the conception, analysis, and design of solutions to real-world environmental problems. Students develop the ability to implement technology-based solutions to real-world environmental problems through design, construction, and operation. Graduates will be competent in basic environmental engineering laboratory skills and will have received training in oral and written communications.

The curriculum guides students from solid basics in math and science to a strong understanding of the fundamental design principles employed in engineering practice. While the minimum number of credit hours for the Environmental Engineering major is 125, we encourage students to consider additional courses to expand their training and to make the most of their time while at the university.
The undergraduate program prepares our graduates for entry-level positions. After four years of work experience, graduates can qualify for a license to practice by passing the Principles and Practice of Engineering (PE) examination administered by a State Board. In Delaware, the PE license is administered by the Delaware Association of Professional Engineers (DAPE). Students can take the introductory Fundamentals of Engineering (FE) exam, which is a prerequisite for the PE, as undergraduates.

A complete description of the undergraduate curriculum can be found in the current university Undergraduate & Graduate Catalog. A brief overview is given for each of the concentrations on the check sheets shown on the next pages. The sheets show how we recommend that courses be selected each semester, and may also be used to keep track of progress toward graduation. You can also check your progress on UDSIS by using the “degree audit” tool or by reviewing your unofficial transcript.

Following the check sheet is a list of technical electives that are frequently taken by students in their junior and senior years. Depending on the environmental engineering concentration selected, students are required to take two to four technical electives. These courses are typically upper-level (300-400 level) and can be taken from mathematics, science, and engineering departments. Students should select technical electives in consultation with their faculty advisor.

Because a number of our students seek either MS or PhD degrees following the undergraduate program, a separate list of courses that should be considered in preparation for advanced studies in environmental engineering is also provided.
### FRESHMAN YEAR

**FALL TERM** | 16 credits | **SPRING TERM** | 15 credits
---|---|---|---
Analytic Geom. & Calc. A | MATH 241 | * Analytic Geom & Calc B | MATH 242
General Chemistry | CHEM 103 | * General Chemistry | CHEM 104
Computer Science | CISC 106 | * General Physics | PHYS 207
Intro to Engineering | EGGG 101 | * Critical Reading & Writing | ENGL 110
Breadth Requirement | (3) | * | (3)

### SOPHOMORE YEAR

**FALL TERM** | 17 credits | **SPRING TERM** | 16 credits
---|---|---|---
Analytic Geom. & Calc. C | MATH 243 | * Engineering Math I | MATH 351
Statics | CIEG 211 | * Introductory Biology I | BISC 207
Quantitative Analysis | CHEM 220 | * Prob. & Stats. for Eng. | CIEG 315
Quantitative Analysis Lab | CHEM 221 | * Physical Chemistry II | CHEM 444
Env. Engineering Processes | CIEG 233 | * Breadth Requirement | (3)
Breadth Requirement | (3) | * | (3)

### JUNIOR YEAR

**FALL TERM** | 16 credits | **SPRING TERM** | 16 credits
---|---|---|---
Chem. Eng. Thermo. | CHEG 231 | * Introduction to Microbiology | BISC 300
Fluid Mechanics | CIEG 305 | Chem. Eng. Thermo. | CHEG 325
Fluid Mechanics Lab | CIEG 306 | Technical Writing | ENGL 410
Water & WW Engineering | CIEG 438 | Technical Elective | (3)
Environmental Eng. Lab | CIEG 337 | * Breadth Requirement | (3)
Breadth Requirement | (3) | a | b

### SENIOR YEAR

**FALL TERM** | 15 credits | **SPRING TERM** | 14 credits
---|---|---|---
Senior Design | CIEG 461 | Senior Design | CIEG 461
Chemical Eng. Kinetics | CHEG 332 | Air Pollution Control | CIEG 434
Water Resource Eng. | CIEG 440 | Introductory Biochemistry | CHEM 527
Organic Chemistry | CHEM 321 | Technical Elective | (3)
Water and WW Quality | CIEG 437 | * Breadth Requirement | (3)
Breadth Requirement | (3) | c | d

* Grade of “C-“ or better required in these courses as degree requirement or as prerequisite for other courses.
† Substitute CHEM111/CHEM112 if chemistry background is sufficiently strong. Consult advisor.
a) Courses alternate - these classes taught in even years;
b) Engineering Topic - must consult advisor;
c) Course alternates - this class taught in odd years;
d) Earth Science – must consult advisor

**BREADTH REQUIREMENTS (18 Credit Hours): All Breadth Requirements C- or better**

See [http://www.engr.udel.edu/advise/breadth_req.html](http://www.engr.udel.edu/advise/breadth_req.html)

Three additional courses (9 credit hours) from the College of Engineering Breadth Requirement List

**OTHER BREADTH REQUIREMENTS**

- General Education plan approved ( )
- Course (3 credits) for multicultural requirements
- 2 courses (6 credits) above introductory level
- (course numbers)

**TECHNICAL ELECTIVES:** Must include 3 credits of Engineering Topics and 3 credits of Earth Science

08/2014
# ENVIRONMENTAL ENGINEERING PROGRAM

Effective for EG14 and subsequent classes

The required courses of the program are normally taught in fall or spring semesters as indicated below. Each student is responsible for tracking future changes in this schedule.

## FRESHMAN

### FALL TERM

<table>
<thead>
<tr>
<th>Course</th>
<th>Credits</th>
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<tr>
<td>Analytic Geom. &amp; Calc. A</td>
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<tr>
<td>General Chemistry</td>
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<tr>
<td>Computer Science</td>
<td>3</td>
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<tr>
<td>Critical Reading &amp; Writing</td>
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<tr>
<td>Intro to Engineering</td>
<td>2</td>
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### SPRING TERM

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
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<td>General Chemistry</td>
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<tr>
<td>General Physics I</td>
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<td>Breadth Requirement</td>
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## SOPHOMORE YEAR

### FALL TERM

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Analytic Geom. &amp; Calc. C</td>
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<td>Statics</td>
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<td>Env. Engineering Processes</td>
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<td>Breadth Requirement</td>
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### SPRING TERM

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<th>Course</th>
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<tr>
<td>Engineering Math I</td>
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<tr>
<td>Introductory Biology I</td>
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<tr>
<td>Solid Mechanics</td>
<td>3</td>
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<td>CE Materials Lab</td>
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<tr>
<td>Prob. &amp; Stats, for Engineers</td>
<td>3</td>
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<tr>
<td>Computer Elective</td>
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## JUNIOR YEAR

### FALL TERM

<table>
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<th>Course</th>
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<tr>
<td>Thermodynamics I</td>
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<td>Fluid Mechanics</td>
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<tr>
<td>Fluid Mechanics Lab</td>
<td>3</td>
</tr>
<tr>
<td>Structural Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Env. Engineering Lab</td>
<td>3</td>
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<tr>
<td>Water &amp; WW Engineering</td>
<td>3</td>
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### SPRING TERM

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<th>Course</th>
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<td>Structural Design</td>
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<td>Technical Writing</td>
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## SENIOR YEAR

### FALL TERM

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<td>Senior Design</td>
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<tr>
<td>Water Resources Eng</td>
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<td>Soil Mechanics</td>
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<tr>
<td>Soil Mechanics Lab</td>
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<tr>
<td>Water/Wastewater Quality</td>
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<tr>
<td>Recycling &amp; Waste Mgt.</td>
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### SPRING TERM

<table>
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<tr>
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<tbody>
<tr>
<td>Senior Design</td>
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<tr>
<td>Air Pollution Control</td>
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<tr>
<td>Technical Elective</td>
<td>3</td>
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<tr>
<td>Breadth Requirement</td>
<td>3</td>
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</tbody>
</table>

*Grade of “C–” or better required in these courses as degree requirements or as prerequisites for other courses

† Substitute CHEM111/112 if chemistry background is sufficiently strong. Consult advisor.

**a** APECC480, GEOG250 or GEOG372; **b** Courses alternate - these classes taught in even years; **c** Courses alternate - these classes taught in odd years; **d** Earth Science – must consult advisor

## BREADTH REQUIREMENTS (18 Credit Hours); All Breadth Requirements C- or better

See [http://www.engr.udel.edu/advise/breadth_req.html](http://www.engr.udel.edu/advise/breadth_req.html)

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<td>Three additional courses (9 credit hours) from the College of Engineering Breadth Requirement List</td>
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</table>

## OTHER BREADTH REQUIREMENTS

- General Education plan approved (T)
- 2 courses (6 credits) above introductory level (course numbers)
- Course (3 credits) for multicultural requirement

## TECHNICAL ELECTIVES (must include 3 credits Earth Science)

<table>
<thead>
<tr>
<th>Course</th>
<th>Course</th>
</tr>
</thead>
</table>

08/2014

Department of Civil and Environmental Engineering

12
The required courses of the program are normally taught in fall or spring semesters as indicated below. Each student is responsible for tracking future changes in this schedule.

### FRESHMAN

**FALL TERM** | 16 credits | **SPRING TERM** | 15 credits
--- | --- | --- | ---
General Chemistry | CHEM 103 (4) | General Chemistry | CHEM104 (4) |
Intro to Engineering | EGGG 101 (2) | General Physics I | PHYS 207 (4) |
Computer Science | CISC 106 (3) | Critical Reading & Writing | ENGL110 (3) |
Breadth Requirement | (3) |  |  |

### SOPHOMORE YEAR

**FALL TERM** | 16 credits | **SPRING TERM** | 16 credits
--- | --- | --- | ---
Analytic Geom. & Calc. C | MATH 243 (4) | Engineering Math I | MATH 351 (3) |
Statics | CIEG 211 (3) | Introductory Biology I | BISC 207 (4) |
Env. Engineering Processes | CIEG 233 (3) | Prob. & Stats. For Engineers | CIEG315 (3) |
Breadth Requirement | (3) | Computer Elective | (3) |
Breadth Requirement | (3) | Breadth Requirement | (3) |

**JUNIOR YEAR**

**FALL TERM** | 16 credits | **SPRING TERM** | 15 credits
--- | --- | --- | ---
Thermodynamics I | CIEG 231 (3) | Grdwr Flw & Cont Trans | CIEG-498 (3) |
Fluid Mechanics | CIEG 305 (3) | Air Pollution Control | CIEG 434 (3) |
Fluid Mechanics Lab | CIEG 306 (1) | Technical Writing | ENGL 410 (3) |
Environmental Engr. Lab | CIEG 337 (3) | Breadth Requirement | (3) |
Water & Wastewater Qual | CIEG 438 (3) | Technical Elective | (3) |
Princ of Wtr Qual Criteria | CIEG 468 (3) |  |  |

**SENIOR YEAR**

**FALL TERM** | 14 credits | **SPRING TERM** | 17 credits
--- | --- | --- | ---
Senior Design | CIEG 461 (2) | Senior Design | CIEG 461 (2) |
Technical Elective | (3) | Water Quality Modeling | CIEG 430 (3) |
Recycling & Waste Mgmt | CIEG436 (3) | Breadth Requirement | (3) |
Water/Wastewater Qual | CIEG 437 (3) | Stormwater Management | CIEG 442 (4) |
Water Resources Eng. | CIEG 440 (3) | Technical Elective | (3) |

*Grade of "C-" or better required in these courses as degree requirement or as prerequisite for other courses
† Substitute CHEM111/CHEM112 if chemistry background is sufficiently strong. Consult advisor.

**BREADTH REQUIREMENTS (18 Credit Hours):** All Breadth Requirements C- or better

See [http://www.engr.udel.edu/advise/breadth_req.html](http://www.engr.udel.edu/advise/breadth_req.html)

Creative Arts & Humanities (3) | History & Cultural Change (3) | Social & Behavioral Sciences (3) |
--- | --- | --- |
Three additional courses (9 credit hours) from the College of Engineering Breadth Requirement List

### OTHER BREADTH REQUIREMENTS

- General Education plan approved (T)
- 2 courses (6 credits) above introductory level (course numbers)

### TECHNICAL ELECTIVES

<table>
<thead>
<tr>
<th>Course</th>
<th>Course</th>
</tr>
</thead>
</table>

8/2014
Minor in Environmental Engineering

A minor may be earned by a student in any University bachelor's degree program through the successful completion of a minimum of 18 credits as described below. Before beginning the Environmental Engineering courses, the student must meet the required mathematics, physics, and other prerequisites for each course. A grade of C- or better is required in all of the courses completed for the minor.

One chemistry course is required:

CHEM 104* General Chemistry
*Can be replaced with CHEM 112 (3 credits)

Two environmental engineering courses (6 credits) are required:

CIEG 233* Environmental Engineering Processes
CIEG 305** Fluid Mechanics (Lab optional)
*Can be replaced with CIEG 331 or CHEG 112
**Can be replaced with MEEG 331 or CHEG 341

Further, an additional three courses in environmental engineering must be taken from the following:

CIEG 430 Water Quality Modeling
CIEG 433 Hazardous Waste Management
CIEG 434 Air Pollution Control
CIEG 436 Processing, Recycling, Management of Solid Wastes
CIEG 438* Water and Wastewater Engineering
CIEG 440 Water Resources Engineering
CIEG 498 Groundwater Flow and Containment Transport
*Will not count if CIEG 331 is taken in place of CIEG 233

Courses should be selected from the above list with the specific advice of an advisor in the Department of Civil and Environmental Engineering to meet each student's objectives. Other courses in civil and environmental engineering may be included in the above list with prior approval of a representative from the Department of Civil and Environmental Engineering.

Civil and Chemical Engineering majors would be able to pursue the minor by selecting their required technical and science electives appropriately. No additional credits beyond what is required by their major would be necessary to obtain an Environmental Engineering minor for these students. Mechanical Engineering students would need to select their required technical electives appropriately and take one additional course: CHEM 104.
Minor in Environmental Sustainability

The objective of this minor is to provide basic knowledge and skills required in balancing technological development and environmental impacts, so that sustainability can be methodically defined and attained. Students will have the opportunity to assess sustainability using tools such as life cycle analysis, risk assessment, and the triple bottom line of economic, environmental, and societal effects; recognize and specify engineering solutions to resource, pollution, and sanitation problems that are in harmony with local cultures; relate environmental issues to local political, societal, and economic factors to provide a proper context for sustainable solutions; and evaluate and compare “appropriate technologies” and other sustainable solutions across global boundaries.

To receive a minor in Environmental Sustainability the student must complete a total of 15 credits in accordance with the requirements specified below. Before beginning these courses, the student must meet the required course prerequisites. A minimum grade of C- must be achieved in each course qualifying for the minor.

Recommended prerequisite:
To be accepted into the minor, the student is recommended to have completed an introductory course in mass and energy balances such as CHEG112, CIEG233, or MEEG331.

Two of the following core courses:
- CIEG 439 Biosustainability and Public Health
- CIEG 445 Industrial Ecology
- CIEG 465 Engineers Without Borders

One of the following pollution control technology courses:
- CIEG 433 Hazardous Waste Management
- CIEG 436 Processing, Recycling, and Management of Solid Wastes
- CIEG 438 Water and Wastewater Engineering

Two of the following sustainability-related breadth courses:
- BUAD 429 Selected Topics in Management: Sustainability and Green Business
- ECON 311 Economics of Developing Countries
- ENEP 410 Environmental Sustainability: Economic and Policy Analysis
- FREC 343 Environmental Economics
- GEOG 320 Water and Society
- GEOG 422 Resources, Development, and the Environment
- MAST 676 Environmental Economics
- PHIL 448 Environmental Ethics
- POSC 311 Politics of Developing Nations
- POSC 350 Politics and the Environment
- SOCI 471 Disasters, Vulnerability, and the Environment

Department of Civil and Environmental Engineering
Environmental Engineering Technical Electives

The Environmental Engineering program has a common core curriculum and three concentrations: environmental biological and chemical processes, environmental facilities design and construction, and water resources and water quality. Each concentration requires four or five courses beyond the core curriculum that provide additional training specific to the selected concentration. In addition to these courses, students select two to four technical electives. These courses must be upper-level courses in engineering, science, computer science, or mathematics and must combine for sufficient credit hours to satisfy the requirements of each concentration. In addition, one of the technical electives must satisfy an earth science requirement or be an upper level engineering course. Students should select their 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 ensure that any prerequisite courses are taken.

Courses that satisfy the technical electives requirements are listed below. You must select courses not otherwise required for your degree concentration. This list is not comprehensive. Many other courses may qualify as technical electives, provided they are approved by your faculty advisor. Your advisor can also help you select technical electives that are most suitable for the concentration that you've chosen.

**Technical electives satisfying the earth science requirement:**
- CIEG 430 Water Quality Modeling
- CIEG 498 Groundwater Flow and Contaminant Transport
- GEOL 107 General Geology
- PLSC 419 Soil Microbiology

**Other recommended technical electives:**
- BISC 300 Introduction to Microbiology
- BISC 641 Microbial Ecology
- CHEG 332 Chemical Engineering Kinetics
- CHEG 342 Heat and Mass Transfer
- CHEG 622 Chemicals, Risk and the Environment
- CHEM 443 Physical Chemistry I
- CHEM 444 Physical Chemistry II
- CHEM 331 Organic Chemistry
- CHEM 333 Organic Chemistry Lab
- CHEM 527 Introductory Biochemistry
- CIEG 311 Dynamics
- CIEG 321 Geotechnical Engineering
- CIEG 430 Water Quality Modeling
- CIEG 433 Hazardous Waste Management
- CIEG 439 Biosustainability and Public Health
- CIEG 465 Engineers Without Borders
- CIEG 445 Industrial Ecology
Recommended for advanced study:
After completing an undergraduate degree in Environmental Engineering, students may pursue advanced studies in environmental engineering or related fields. For such students, courses in engineering, the sciences, and mathematics are recommended to provide the foundation for more advanced study. The specific courses that will be most beneficial to each student depend upon their area(s) of interest. Below is a list of courses that students should consider. Students interested in advanced study should consult with their advisor about which courses would be most beneficial. Most courses may be counted as technical electives.

BISC 300 Introduction to Microbiology
BISC 641 Microbial Ecology
CHEG 332 Chemical Engineering Kinetics
CHEG 342 Heat and Mass Transfer
CHEM 443 Physical Chemistry I
CHEM 444 Physical Chemistry II
CHEM 331 Organic Chemistry
CHEM 333 Organic Chemistry Lab
CHEM 527 Introductory Biochemistry
MATH 352 Engineering Mathematics II
MATH 353 Engineering Mathematics III
MATH 426 Intro to Numerical Analysis and Algorithmic Computation
Well-qualified Civil and Environmental Engineering majors may apply to the 4+1 program which culminates in the student earning a Bachelor degree in Civil Engineering (BCE) or Environmental Engineering (BENV) and a Master of Civil Engineering (MCE) degree within five years. The program is limited to University of Delaware undergraduates pursuing the BCE or BENV degree, with a minimum grade point average of 3.25 at the time of application. Students must complete at least 90 credits toward the undergraduate degree before they can be enrolled in the program. Only full-time students at the time of application are eligible.

Additionally, the College of Engineering and the College of Business and Economics offer a joint five-year program that leads to a baccalaureate degree in an engineering major and a Master of Business Administration degree from the College of Business and Economics. Talk to your advisor if you are interested in this option, and visit the web for more information (http://graduate.lerner.udel.edu/mba-programs/mba-41-options).

### Civil and Environmental Engineering Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Office</th>
<th>Title</th>
<th>Ph.D.</th>
<th>Areas of Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nii Attoh-Okiné</td>
<td>354 DuPont Hall</td>
<td>Professor</td>
<td>University of Kansas</td>
<td>Pavement management, design, and performance modeling</td>
</tr>
<tr>
<td>Daniel Cha</td>
<td>346A DuPont Hall</td>
<td>Professor</td>
<td>University of California, Berkeley</td>
<td>Control of population dynamics and performance of biological wastewater treatment processes; biotransformation of organic and inorganic toxic pollutants</td>
</tr>
<tr>
<td>Michael Chajes</td>
<td>358A DuPont Hall</td>
<td>Professor</td>
<td>University of California, Davis</td>
<td>Structural engineering, bridge evaluation and rehabilitation, application of composites</td>
</tr>
<tr>
<td>Pei Chiu</td>
<td>468 ISE Building</td>
<td>Professor</td>
<td>Stanford University</td>
<td>Environmental transformation, fate of organic pollutants, remediation and water treatment processes</td>
</tr>
<tr>
<td>Rachel Davidson</td>
<td>360B DuPont Hall</td>
<td>Professor</td>
<td>Stanford University</td>
<td>Natural disaster risk assessment and management, civil infrastructure systems</td>
</tr>
<tr>
<td>Steven Dentel</td>
<td>348 DuPont Hall</td>
<td>Professor</td>
<td>Cornell University</td>
<td>Application of colloid and interface science to water and wastewater treatment processes</td>
</tr>
<tr>
<td>Dominic DiToro</td>
<td>356A DuPont Hall</td>
<td>Edward C. Davis Professor</td>
<td>Princeton University</td>
<td>Water quality modeling, development and application of mathematical and statistical analyses to stream, lake, estuarine, and coastal water quality and sediment problems</td>
</tr>
<tr>
<td>Ardeshir Faghri</td>
<td>355B DuPont Hall</td>
<td>Professor</td>
<td>University of Virginia</td>
<td>Transportation systems, urban congestion, work zone safety, traffic signal control systems</td>
</tr>
<tr>
<td>John Gillespie, Jr.</td>
<td>201C Composite Center</td>
<td>Donald C. Phillips Professor</td>
<td>University of Delaware</td>
<td>Composite materials, experimental mechanics, fracture mechanics, infrastructure rehabilitation</td>
</tr>
<tr>
<td>Domenico Grasso</td>
<td>344B DuPont Hall</td>
<td>Provost and Professor</td>
<td>University of Michigan</td>
<td>Fate of contaminants in the environment</td>
</tr>
<tr>
<td>Patrick Harker</td>
<td>104 Hullihen Hal</td>
<td>President and Professor</td>
<td>University of Pennsylvania</td>
<td>Service operations management and economics; financial services operations and technology; nonprofit management; operations research methodology; mathematical programming</td>
</tr>
<tr>
<td>Name</td>
<td>Office</td>
<td>Title</td>
<td>Ph.D.</td>
<td>Areas of Expertise</td>
</tr>
<tr>
<td>--------------------</td>
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<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Tom Hsu</td>
<td>205 Ocean Eng. Lab</td>
<td>Associate Professor</td>
<td>Cornell University</td>
<td>Coastal engineering, sediment transport and environmental fluid mechanics, multi-phase flow</td>
</tr>
<tr>
<td>Chin-Pao Huang</td>
<td>352A DuPont Hall</td>
<td>Donald C. Phillips Professor</td>
<td>Harvard University</td>
<td>Industrial wastewater management, aquatic chemistry, water and wastewater engineering, environmental remediation engineering</td>
</tr>
<tr>
<td>Paul Imhoff</td>
<td>344A DuPont Hall</td>
<td>Professor</td>
<td>Princeton University</td>
<td>Transport of fluids and contaminants in multiphase systems; mass transfer processes in soil, groundwater, surface water, and landfills; mathematical modeling</td>
</tr>
<tr>
<td>Allen Jayne</td>
<td>307 DuPont Hall</td>
<td>Assistant Professor</td>
<td>University of Delaware</td>
<td>Structural engineering</td>
</tr>
<tr>
<td>Victor Kaliakin</td>
<td>360F DuPont Hall</td>
<td>Professor</td>
<td>University of California, Davis</td>
<td>Computational geomechanics, constitutive modeling of geomaterials, numerical simulation of composite materials</td>
</tr>
<tr>
<td>James Kirby</td>
<td>201 Ocean Eng. Lab</td>
<td>Edward C. Phillips Professor</td>
<td>University of Delaware</td>
<td>Water wave mechanics</td>
</tr>
<tr>
<td>Nobuhisa Kobayashi</td>
<td>207 Ocean Eng. Lab</td>
<td>Professor</td>
<td>Massachusetts Institute of Technology</td>
<td>Hydrodynamics, coastal engineering, and arctic engineering</td>
</tr>
<tr>
<td>Kalehiwot Manahiloh</td>
<td>360C DuPont Hall</td>
<td>Assistant Professor</td>
<td>Washington State University</td>
<td>Geotechnical engineering, unsaturated soils, constitutive modeling, digital image processing</td>
</tr>
<tr>
<td>Earl “Rusty” Lee</td>
<td>308 DuPont Hall</td>
<td>Assistant Professor</td>
<td>Rensselaer Polytechnic Institute</td>
<td>Applied operations research, homeland security, hazards mitigation and vulnerability, technologies for collaborative decision making</td>
</tr>
<tr>
<td>Julia Maresca</td>
<td>344B DuPont Hall</td>
<td>Assistant Professor</td>
<td>Penn State University</td>
<td>Environmental microbiology, biogeochemistry, microbial physiology</td>
</tr>
<tr>
<td>Jennifer Righman-McConnell</td>
<td>360H DuPont Hall</td>
<td>Associate Professor</td>
<td>West Virginia University</td>
<td>Structural and bridge engineering</td>
</tr>
<tr>
<td>Sue McNeil</td>
<td>360D DuPont Hall</td>
<td>Professor</td>
<td>Carnegie Mellon University</td>
<td>Transportation infrastructure management, planning and land use</td>
</tr>
<tr>
<td>Chris Meehan</td>
<td>360A DuPont Hall</td>
<td>Bentley Systems Inc. Chaired Professor</td>
<td>Virginia Tech</td>
<td>Geotechnical engineering, shear behavior of soils under static and dynamic loadings</td>
</tr>
<tr>
<td>Dennis Mertz</td>
<td>358B DuPont Hall</td>
<td>Professor</td>
<td>Lehigh University</td>
<td>Structural engineering, concrete and steel structures, bridges</td>
</tr>
<tr>
<td>Jack Puleo</td>
<td>203 Ocean Eng. Lab</td>
<td>Associate Professor</td>
<td>University of Florida</td>
<td>Nearshore hydrodynamics and sediment transport</td>
</tr>
<tr>
<td>Thomas Schumacher</td>
<td>360G DuPont Hall</td>
<td>Assistant Professor</td>
<td>Oregon State University</td>
<td>Structural engineering, non-destructive evaluation, wood-concrete composite structures, system reliability</td>
</tr>
</tbody>
</table>

Department of Civil and Environmental Engineering
<table>
<thead>
<tr>
<th>Name</th>
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<th>Ph.D.</th>
<th>Areas of Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harry “Tripp” Shenton</td>
<td>301 DuPont Hall</td>
<td>Chair and Professor</td>
<td>Johns Hopkins University</td>
<td>Structural dynamics, structural health monitoring, bridge engineering</td>
</tr>
<tr>
<td>Fengyan Shi</td>
<td>204 Ocean Eng. Lab</td>
<td>Associate Professor</td>
<td>Ocean University of Qingdao</td>
<td>Numerical modeling; nearshore processes; coastal ocean hydrodynamics &amp; sediment transport; tsunamis</td>
</tr>
<tr>
<td>Allan Zarembski</td>
<td>343B DuPont Hall</td>
<td>Research Professor</td>
<td>Princeton University</td>
<td>Railroad engineering and rail safety</td>
</tr>
</tbody>
</table>

**Administrative and Support Staff**

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Office</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marikka Beach</td>
<td>Staff Assistant</td>
<td>301 DuPont Hall</td>
<td>302-831-2442</td>
<td><a href="mailto:marikka@udel.edu">marikka@udel.edu</a></td>
</tr>
<tr>
<td>Michael Davidson</td>
<td>Senior Electronics Specialist</td>
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<td>302-831-6814</td>
<td><a href="mailto:michaeld@udel.edu">michaeld@udel.edu</a></td>
</tr>
<tr>
<td>Karen Greco</td>
<td>Assistant to the Chair</td>
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<td>302-831-3017</td>
<td><a href="mailto:kgreco@udel.edu">kgreco@udel.edu</a></td>
</tr>
<tr>
<td>Rovshan Mahmudov</td>
<td>Environmental Lab Manager</td>
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<td>302-831-4457</td>
<td><a href="mailto:mrovshan@udel.edu">mrovshan@udel.edu</a></td>
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<tr>
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<td>Undergraduate Academic Advisor</td>
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<td><a href="mailto:sbpalmer@udel.edu">sbpalmer@udel.edu</a></td>
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<tr>
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<td><a href="mailto:creoli@udel.edu">creoli@udel.edu</a></td>
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<tr>
<td>Gary Wenczel</td>
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<td>302-831-6936</td>
<td><a href="mailto:wenczel@udel.edu">wenczel@udel.edu</a></td>
</tr>
</tbody>
</table>

**Advisement**

Students are assigned faculty advisors as soon as they arrive on campus and will normally have the same advisor for the entire time they are enrolled in the undergraduate program in Civil or Environmental Engineering. However, any student can freely select his/her advisor, with the permission of that advisor, as soon as he/she feels ready to do so.

**Advisors for the Class of 2018**

<table>
<thead>
<tr>
<th>Student Group</th>
<th>Name</th>
<th>Office</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Eng. Students A-J</td>
<td>Professor J. Maresca</td>
<td>344 DuPont Hall</td>
<td><a href="mailto:jmaresca@udel.edu">jmaresca@udel.edu</a></td>
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<tr>
<td>Environmental Eng. Students K-R</td>
<td>Professor P. Chiu</td>
<td>468 ISE Building</td>
<td><a href="mailto:pei@udel.edu">pei@udel.edu</a></td>
</tr>
<tr>
<td>Environmental Eng. Students S-Z</td>
<td>Professor D. Cha</td>
<td>346A DuPont Hall</td>
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</tr>
<tr>
<td>Civil Eng. Students A – C</td>
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<td>307 DuPont Hall</td>
<td><a href="mailto:ajayne@udel.edu">ajayne@udel.edu</a></td>
</tr>
<tr>
<td>Civil Eng. Students D – H</td>
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<td><a href="mailto:shenton@udel.edu">shenton@udel.edu</a></td>
</tr>
<tr>
<td>Civil Eng. Students I–M</td>
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<td><a href="mailto:schumact@udel.edu">schumact@udel.edu</a></td>
</tr>
<tr>
<td>Civil Eng. Students N – Z</td>
<td>Prof. N. Kobayashi</td>
<td>207 Ocean Eng. Lab</td>
<td><a href="mailto:nk@udel.edu">nk@udel.edu</a></td>
</tr>
<tr>
<td>Civil Eng. Honors Students</td>
<td>Prof. J. Puleo</td>
<td>203 Ocean Eng. Lab</td>
<td><a href="mailto:jpuleo@udel.edu">jpuleo@udel.edu</a></td>
</tr>
<tr>
<td>Env. Eng. Honors Students</td>
<td>Prof. D. Cha</td>
<td>346A DuPont Hall</td>
<td><a href="mailto:cha@udel.edu">cha@udel.edu</a></td>
</tr>
</tbody>
</table>
It is suggested that you set up an appointment to meet with your advisor during your first semester and that you seek help from your advisor if you have any questions regarding your schedule or any other problems that may arise.

Every semester there is a two-week advising period, just prior to the time when you will be registering for courses for the following semester. At that time you are required to sign up for an appointment with your advisor (schedules will be posted on each faculty member’s door, some faculty set up appointments by email or via the web) to plan your next semester schedule. The University will assign you a registration appointment, after which you are free to go online, through UDSIS, and request the courses you and your advisor have decided upon.

Computing Facilities
Computers have become an essential tool in engineering, and thus play a central role in engineering education. The University maintains general access computing sites throughout the campus. The list is available at http://www.it.udel.edu/computingsites.

Engineering Microcomputer Laboratories
The College maintains a microcomputing site specifically for engineering students in 010 Spencer Lab. Students can also use eCALC I (046 Colburn Lab), eCalc III (010 Spencer Lab) and eCalc IV (101-D Pearson Hall) when they are not in use for teaching.

College of Engineering Network
The College of Engineering maintains its own computing network. The network is primarily used for research computing by faculty and graduate students, but is also available to undergraduates working with faculty on their research projects.

Personal Computers
The College of Engineering does not require undergraduates to purchase personal computers. Important information about computing needs and purchasing a computer for student use at the University of Delaware can be found at www.udel.edu/help.

Some software products used in civil and environmental engineering courses will only operate under the Windows environment. For their convenience and where appropriate per the license agreement, students who use an Apple computer are encouraged to install “Boot Camp” on their computers if they wish to use these products on their personal computer.

Computer-Aided Design (CAD) Software
Computer-Aided Design, otherwise known as CAD, is commonly used today in engineering practice. Years ago engineers would hand off their preliminary designs and sketches to CAD operators or technicians for them to produce a professional drawing. Today, however, having proficiency in CAD as an engineer is as critical as using a word processor, email, or spreadsheet: CAD is simply another tool in the modern engineer’s toolbox. Engineering students need to develop a certain level of competency in using CAD programs while they are in school. You will

Department of Civil and Environmental Engineering
also find that you are more in demand and marketable for internships, summer jobs, co-ops, and full-time employment if you have CAD experience.

There are two major CAD programs in use today in the civil and environmental engineering professions – Bentley Systems Inc. “MicroStation” and AutoDesk’s “AutoCAD.” Neither is an industry standard, but Microstation tends to be used more in the transportation and civil/site development fields (the “horizontal” fields) and AutoCAD tends to be used more in the structural/building fields (the “vertical” fields). The platform choice, however, often times is dictated by the client, and therefore, consulting firms very often will run both programs.

As an engineering major at the University of Delaware students may download and install an academic version of both of these programs on their personal computers (students should understand the license agreement and limitations that come with these free editions, which limit their use to work related to your courses and educational activities). Civil engineering majors will be introduced to MicroStation in CIEG161 Freshmen Design.

At the end of this document are instructions and information to get you started on how to download and install these programs. The information on MicroStation includes an access code that you will need to activate the software. Students are asked to not copy or distribute this code – it is provided as a benefit to you as a UD student and CEE major and should not be shared with others. Students are encouraged to become familiar with the programs and integrate their use in all of the work that they do.

Frequently Asked Questions

How do the CEE degree programs at UD differ from those offered at other universities?

One important distinction from programs at many other universities is that your coursework is specific to your chosen engineering major. By sophomore year, you will be taking engineering courses taught by faculty in your own department, with a curriculum directed toward your chosen major rather than generalized engineering. This allows you to make the most of a four year program, being better prepared for in-depth study during your junior and senior years.

Another distinct feature of our Department is the availability of a Bachelor’s Degree in Environmental Engineering. This degree allows even greater specialization for students desiring training and credentials in this professional direction.

Is it difficult to change to a different major once you have started in one area of engineering?

The process to request a change of major is fairly simple and done entirely online. In UDSIS you will complete a “Change of Major request” form. This form will ask you to select your current major, the new major, your GPA and to provide comments on why you want to change your major. Once submitted, the form is routed to the new major department for a decision. This same process is used even if you wish to switch to a different engineering major.

Note that some majors at UD are restricted because of limitations on capacity. This includes
most engineering majors. For a complete list of restricted majors, and the requirements for transfer into the major, see http://www.udel.edu/registrar/students/restmajorsinfo.html.

Of course, the further along you are with one degree program, the more difficult it becomes to utilize the credit hours you have already taken toward your preferred major. Transferring students find the availability of our winter and summer sessions to be particularly helpful, because it allows missed courses to be taken without interfering with the course schedule during the regular semesters.

If you decide to transfer to a major outside of Engineering, your credentials will be evaluated by the department you wish to join. Our students are commonly accepted into a variety of non-engineering majors.

**What if I don't know what type of engineering I would like to go into?**

All freshman engineering majors take *EGGG101 - Introduction to Engineering* in the College of Engineering’s common first semester. This course exposes students to the seven engineering majors/disciplines that the college offers. This is a modular course that is taught by a team of faculty representing the seven degrees. Students have the chance to ask questions and learn about the disciplines through this course. They are also free to speak with faculty who are able to provide more details about the options available. In addition, those who may be undecided about a specific engineering field may find our Civil Engineering major to be a good choice because it opens doors to a variety of specializations later in the curriculum: structural engineering, geotechnical engineering, transportation engineering, coastal engineering, water resources engineering, and environmental engineering.

**I’m starting the degree program in Environmental Engineering, but I understand there is also a degree available in Environmental Science. What’s the difference?**

Environmental Engineering utilizes quantitative and technological tools to address problems of public health and environmental impact brought about by pollution. The profession overlaps with some areas of Environmental Science. For example, the environmental engineer might characterize the chemical impacts of an industrial waste flow on a wetland area and attempt to minimize the impact, while the environmental scientist will address the consequent effects on species diversity. The environmental engineer is often action-oriented, while an environmental scientist may study intrinsic properties of pristine ecosystems. There are also differences in job opportunities and starting salaries; faculty from these two programs can provide more information about these issues. Refer to the Undergraduate Catalog for details on the degree requirements for Environmental Science. (Note: *Environmental Studies* is a general term, encompassing both of these areas as well as others such as Environmental Policy.)

**Will I need to buy a computer before I start courses?**

As an engineering student you will be learning to use computer software such as word processors, spreadsheets, computer-aided drafting, and other application-specific software. If you have your own computer with the necessary software, you will be able to do this type of work wherever you are. While very convenient, however, this is not required as there are
computers on campus available for your use.

Is it good to minor in a subject in addition to having a major?

If you have the time and interest, you can take enough courses to have a minor in a subject area. Requirements for a minor can often be met while using many of the same courses to meet the breadth requirements or technical elective requirements for your major degree. Upon graduation, the minor will appear on your transcript and may enhance your job qualifications. Environmental Engineering majors often minor in Civil Engineering, and vice-versa, but non-engineering minors, such as Music and Economics, are also popular.

What is the Fundamentals of Engineering exam, and do I have to take it?

Many engineers, and especially civil and environmental engineers, want to enhance their credentials by earning the license to be a Professional Engineer (P.E.). The requirements vary by state, but the usual path to the P.E. certification is to obtain an accredited engineering degree, pass the Fundamentals of Engineering (F.E.) exam, obtain four years of work experience as an engineer, and then pass the P.E. exam. None of these steps are required as part of any degree program at UD. However, our courses prepare you to do well on the F.E. exam, and most of our students take the exam and pass it during their senior year.

How large are the classes?

You will encounter your largest classes the first several semesters. The enrollment in our senior-level courses averages 40 students. This does not include independent study courses, which are one-on-one. All courses are taught by faculty or, for upper-level courses, qualified professionals. Our Senior Design Project course is taught by five licensed Professional Engineers.

If I have other questions, who can I contact?

When you enroll, you will be assigned a faculty advisor. Generally, this same professor will be available for guidance through your four years on campus. Your faculty advisor will help you select courses and locate other types of assistance for you if needed.
Student Organizations

There are dozens of clubs and organizations on campus. Organizations of specific relevance to Civil and Environmental Engineers are:

<table>
<thead>
<tr>
<th>Organization</th>
<th>Faculty Advisor</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Society of Civil Engineers (ASCE)</td>
<td>Allen Jayne</td>
<td><a href="mailto:ajayne@udel.edu">ajayne@udel.edu</a></td>
</tr>
<tr>
<td>Institute of Transportation Engineers (ITE)</td>
<td>Rusty Lee</td>
<td><a href="mailto:elee@udel.edu">elee@udel.edu</a></td>
</tr>
<tr>
<td>Chi Epsilon Civil Engineering Honor Society</td>
<td>Jack Puleo</td>
<td><a href="mailto:jpuleo@udel.edu">jpuleo@udel.edu</a></td>
</tr>
<tr>
<td>Environmental Engineering Student Association (EESA)</td>
<td>Daniel Cha</td>
<td><a href="mailto:cha@udel.edu">cha@udel.edu</a></td>
</tr>
<tr>
<td>Engineers Without Borders (EWB)</td>
<td>Steve Dentel</td>
<td><a href="mailto:dentel@udel.edu">dentel@udel.edu</a></td>
</tr>
<tr>
<td>American Society of Highway Engineers (ASHE)</td>
<td>Matheu Carter</td>
<td><a href="mailto:matheu@udel.edu">matheu@udel.edu</a></td>
</tr>
<tr>
<td>National Society of Black Engineers (NSBE)</td>
<td>Marianne Johnson</td>
<td><a href="mailto:mtj@udel.edu">mtj@udel.edu</a></td>
</tr>
<tr>
<td>National Society of Professional Engineers (NSPE)</td>
<td>Carmine Balascio</td>
<td><a href="mailto:carmine@udel.edu">carmine@udel.edu</a></td>
</tr>
<tr>
<td>Society of Women Engineers (SWE)</td>
<td>Pam Cook</td>
<td><a href="mailto:cook@math.udel.edu">cook@math.udel.edu</a></td>
</tr>
</tbody>
</table>

Useful Web Sites

University of Delaware homepage: [www.udel.edu](http://www.udel.edu)
Department of Civil and Environmental Engineering: [www.ce.udel.edu](http://www.ce.udel.edu)
American Society of Civil Engineers: [www.asce.org](http://www.asce.org)
Environmental Engineering Student Association (EESA): [www.ce.udel.edu/eesa](http://www.ce.udel.edu/eesa)

For up to date news and information that are important to students, and to also see what is happening in the department, you can also follow the department on Facebook (University of Delaware, Department of Civil and Environmental Engineering) and Twitter (@UDelawareCEE).

University Resources

The University of Delaware offers a variety of resources to help all students succeed. Please see below for a list of departments and offices that can help you maximize your college experience. Successful students take advantage of University resources.

**Career Services Center, 401 Academy Street**: fosters partnerships with employers to increase their participation in providing opportunities for the career development of students [http://www.udel.edu/CSC/](http://www.udel.edu/CSC/)

**Center for Counseling & Student Development, 261 Perkins Student Center**: programs are all designed to contribute to the personal, educational, and career development of our students [http://www.udel.edu/Counseling/](http://www.udel.edu/Counseling/)

**Disability Support Services, Alison Hall 130**: works with students who have a physical, medical, or psychological disability, as well as a learning disability or ADHD [http://www.udel.edu/DSS/](http://www.udel.edu/DSS/)
ISE labs: drop-in tutoring for a variety of subjects including BISC, CHEM, PHYS, MATH and CISC courses
http://www.cas.udel.edu/isll/learning-community-center/Pages/default.aspx

Math Tutorial Lab, 106 Ewing Hall: provides tutorial support for many introductory math courses, including MATH 010, 117, and 241
http://www.math.udel.edu/resources/ugrad/tutorial_site.html

Office of Academic Enrichment, 148-150 S. College Ave: promotes student success with a variety of programs such as tutoring, skills workshops and courses, and supplemental instruction
http://ae.udel.edu/

Office of the Dean of Students, 101 Hullihen Hall: offers counseling and referrals for students contemplating withdrawal from or re-enrollment to the university
http://www.udel.edu/studentlife/deanofstudents.html

Physics Help Center, 101A Sharp Lab: staffed by graduate students
http://web.physics.udel.edu/undergrad/resources

Student Health Services, Laurel Hall: programs and services are aimed at maintaining the physical and emotional well-being of University of Delaware students
http://www.udel.edu/studenthealth/

Student Support Services Program, 148-150 S. College Ave: federally funded comprehensive support service designed to provide academic assistance and advising, personal counseling, and cultural enrichment opportunities for eligible undergraduate students at the University of Delaware
http://sssp.ae.udel.edu/

Student Wellness & Health Promotion, 231 S. College Ave: engages all members of the University community in health promotion and prevention strategies that empower students to develop skills and competencies which support healthy choices and academic success as a foundation for life-long development
http://www.udel.edu/studentwellness/

University Student Centers, Trabant University Center and Perkins Student Center: enhance student life and complement the academic experience through an extensive variety of cultural, educational, social, and recreational programs
http://www.udel.edu/usc/

Writing Center, 016 Memorial Hall: individualized consultations for any level writer at no cost
http://www.english.udel.edu/wc/
As part of University of Delaware's Bentley Academic subscription, educators and students are entitled to receive software, training, and support from Bentley Systems.

To access the resources, educators and students must first create accounts at http://apps.bentley.com/studentserver/ and use the "School Code" below when setting up their account.

**School Code for STUDENTserver**

MH+bPBe6rf8waE7+yKDA6uRE4dnjxFALY9YMPCB3B/3v8bali8Fh0g==

**Unlimited Home Software Use**

Free, unlimited home use of all of the software included in your school's Bentley Academic SELECT subscription is available with STUDENTserver. Over 50 software titles can be downloaded and activated for use on your home computer or laptop.

See What software products are available

Learn how to download & activate Bentley software

**On Demand Software Training**

The path to expert knowledge of Bentley's software products includes training created by Bentley for Bentley users. Access to the complete library of Bentley On Demand learning awaits. Each On Demand training course contains multiple lessons, which easily lead the viewer to real examples of how to use the software of interest.

Learn how to access On Demand Training

**Training Transcript**

Transcripts are great ways to track training progress, along with providing documentation of completed training for educators and potential employers. Each Training course completed is added to your transcript.

Learn more about Transcripts

**Bentley Support Community**

Access to the largest Bentley support and professional networking community, to help with learning and using Bentley software, awaits.

Learn about the support communities available to help Bentley software users
How to set up your STUDENTserver Account

To access the benefits and materials available to you, as part of the Academic SELECT program subscription your school has with Bentley, you need to have your school’s unique School Code.

Visit STUDENTserver
Visit STUDENTserver at http://apps.bentley.com/StudentServer and click JOIN NOW to create your account.

Create Your Account
Add your school code to that field, as requested in the registration form. Add your personal information in the other form fields. Submit the form. An email will be sent from becareers@bentley.com for further verification.

Verify Your Account
Click the link in the account verification email to activate your STUDENTserver account.
Once you are logged in you have access to all that STUDENTserver has to offer.

More Resources

http://STUDENTserver.becareers.net - Program details and complete instructions about the resources included in STUDENTserver. Simply click on the word Student at the top of the page.

Be Careers program pages - About Bentley’s Academic programs
https://www.facebook.com/BentleySystemsStudentCenter - Latest information
http://www.youtube.com/BentleyStudentCenter - YouTube videos and software tutorials
How to register for the Autodesk Education Community

The Autodesk Education Community is a password-protected website that provides direct access to student versions of Autodesk software.

Before you register, make sure you're eligible to join the Education Community.

To register for the Education Community, follow the below steps:

1. Go to the Autodesk Education Community (www.autodesk.com/education/free-software/all) and click on Sign In on the top right corner of the homepage. Select Need an education account?

2. Select your Country, enter your Birthdate and indicate that you are a Student at University of Delaware. You do not need to list the school's website.
3. You'll receive an email from the Education Community containing a link. Click this to activate your account.

   Note: If you don't see this email, check your Junk folder.

4. Once your account is activated, you can edit your profile.