ENVIRONMENTAL ENGINEERING, B.S.

The Department of Civil and Environmental Engineering offers a B.S. Environmental Engineering (BSEnvE) degree program, an excellent degree choice for students who are interested in the sustainable design, construction, and operation of systems and facilities that:

- Treat and distribute safe and reliable drinking water
- Recover material, nutrient, and energy resources from wastewater and solid waste
- Protect and restore wetlands, streams, lakes, and groundwater
- Allocate water resources for urban, rural, and recreational use
- Protect and develop coastal shorelines and stream banks
- Manage stormwater and minimize risk of flood events
- Reduce, reuse, and recycle solid wastes
- Minimize the production of and provide treatment of industrial and agricultural wastes
- Minimize the production of and provide treatment of industrial air emissions
- Prepare society for the impacts of climate change
- Slow down or reverse climate change via
  - Alternative sources of energy such as solar, wind, geothermal and biofuels
  - Recovery of carbon and other greenhouse gases from industrial air emissions

The operation of these facilities is being rapidly integrated into the Internet of Things with real-time “big data” collection systems for automated control. This makes it possible for society to rely on smart infrastructure, including systems that will reduce water consumption, save energy, and improve community resiliency in the wake of natural and human-caused disasters.

All of the above items require a core knowledge in mathematics, statistics, physics, chemistry, biology, geology, computer science and computer design tools, as well as breadth in different environmental engineering disciplines. Environmental engineers perform their work in a multidisciplinary setting requiring strong written and verbal communication skills, understanding of professional and ethical obligations coupled with risk management and decision-making, and commitment to lifelong learning and professional licensure. Their daily work also requires a commitment to sustainability – the need to meet today’s needs while also allowing future generations to meet their environmental health, public health, and society’s economic health needs.

To meet accreditation policies, eligibility for the program is limited to those students who

- matriculated into UW-Madison’s College of Engineering in the Fall 2020 semester or later, and
- expect to graduate no sooner than December 2023.

Students not meeting the above criteria are encouraged to consider the Environmental Engineering Option of the BS Civil Engineering degree program. Additional options for these students include the BS Geological Engineering degree program and the Natural Resources

and Environmental Engineering Option of the BS Biological Systems Engineering degree program.

VISION
Develop and maintain a learning community that pursues new knowledge and understanding, and provides innovative and sustainable solutions to human and ecological needs.

MISSION OF BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING (BSEnvE) PROGRAM
Create, integrate, and transfer environmental engineering knowledge and practice in the development of professionals, leaders, and citizens that help define and serve societal and environmental needs by applying this knowledge and practice in an effective and sustainable manner.

ENVIRONMENTAL ENGINEERING PROGRAM EDUCATIONAL OBJECTIVES
Prepare BSEnvE graduates to contribute to their communities through the following career and professional accomplishments:

1. Design and construct both natural and built processes and systems to efficiently meet determined needs using technical knowledge, modern tools, design principles, ethical practice, and communication, leadership, and team skills.
2. Utilize measurement and analysis tools along with experimental data in investigating natural and built systems.
3. Understand and incorporate economic, environmental, political, social, safety and global considerations in design, investigation and construction of natural and built systems.
4. Engage in lifelong learning to keep pace with the continuous evolution of policies, procedures, technologies and tools for engineering analysis, design, and decision making.
5. Serve others through participation in professional and/or civic activities and responsibilities.

HOW TO GET IN

ADMISSION TO THE COLLEGE AS A FRESHMAN
Students applying to UW-Madison (https://www.admissions.wisc.edu/apply/) need to indicate an engineering major (https://www.engr.wisc.edu/academics/undergraduate-academics/choosing-a-major/) as their first choice in order to be considered for direct admission to the College of Engineering. Direct admission to a major means students will start in the program of their choice in the College of Engineering and will need to meet progression requirements (https://www.engr.wisc.edu/academics/student-services/academic-advising/first-year-undergraduate-students/progression-requirements/) at the end of the first year to guarantee advancement in that program.

CROSS-CAMPUS TRANSFER TO ENGINEERING
UW-Madison students in other schools and colleges on campus must meet the course and credit requirements for admission to engineering degree granting classifications specified in the general college requirements (https://www.engr.wisc.edu/academics/student-services/academic-advising/cross-campus-students/). The requirements are the minimum for admission consideration. Cross-campus admission is competitive and selective, and the grade point average expectations may increase as demand trends change. The student’s overall academic record at UW–Madison is also considered. Students apply to their intended engineering program by submitting the online application
by stated deadlines for spring and fall. The College of Engineering offers an online information tutorial and drop-in advising (https://www.engr.wisc.edu/academics/student-services/academic-advising/cross-campus-students/) for students to learn about the cross-campus transfer process.

**OFF-CAMPUS TRANSFER TO ENGINEERING**

With careful planning, students at other accredited institutions can transfer coursework that will apply toward engineering degree requirements at UW–Madison. Off-campus transfer applicants are considered for direct admission to the College of Engineering by applying to the Office of Admissions with an engineering major listed as their first choice. Those who are admitted to their intended engineering program must meet progression requirements (https://www.engr.wisc.edu/academics/student-services/academic-advising/transfer-students/) at the point of transfer or within their first two semesters at UW–Madison to guarantee advancement in that program. A minimum of 30 credits in residence in the College of Engineering is required after transferring, and all students must meet all requirements for their major at the college. Transfer admission to the College of Engineering is competitive and selective, and students who have earned more than 80 transferable semester credits at the time of application are not eligible to apply.

The College of Engineering has dual degree programs with select four-year UW System campuses. Eligible dual degree applicants are not subject to the 80 credit limit.

Off-campus transfer students are encouraged to discuss their interests, academic background, and admission options with the Transfer Coordinator in the College of Engineering: ugtransfer@engr.wisc.edu or 608-262-2473.

**SECOND BACHELOR'S DEGREE**

The College of Engineering does not accept second undergraduate degree applications. Second degree students (https://www.engr.wisc.edu/admissions/undergraduate-admissions/returning-adults-second-degree-students/) might explore the Biological Systems Engineering program at UW–Madison, an undergraduate engineering degree elsewhere, or a graduate program in the College of Engineering.

**REQUIREMENTS**

**UNIVERSITY GENERAL EDUCATION REQUIREMENTS**

All undergraduate students at the University of Wisconsin–Madison are required to fulfill a minimum set of common university general education requirements to ensure that every graduate acquires the essential core of an undergraduate education. This core establishes a foundation for living a productive life, being a citizen of the world, appreciating aesthetic values, and engaging in lifelong learning in a continually changing world. Various schools and colleges will have requirements in addition to the requirements listed below. Consult your advisor for assistance, as needed. For additional information, see the university Undergraduate General Education Requirements (http://guide.wisc.edu/undergraduate/#requirementsforundergraduatetestudytext) section of the Guide.

**GENERAL EDUCATION**

- Breadth—Humanities/Literature/Arts: 6 credits
- Breadth—Natural Science: 4 to 6 credits, consisting of one 4- or 5-credit course with a laboratory component; or two courses providing a total of 6 credits
- Breadth—Social Studies: 3 credits
- Communication Part A & Part B *
- Ethnic Studies *
- Quantitative Reasoning Part A & Part B *

* The mortarboard symbol appears before the title of any course that fulfills one of the Communication Part A or Part B, Ethnic Studies, or Quantitative Reasoning Part A or Part B requirements.

**SUMMARY OF REQUIREMENTS**

The following curriculum applies to students who were admitted to the environmental engineering degree program (classification changed to BSEnvE) in Fall 2021 or later.

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<tr>
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<tr>
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<td>MATHEMATICS AND STATISTICS</td>
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<td>or MATH 217</td>
<td>Calculus with Algebra and Trigonometry II</td>
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<tr>
<td>or MATH 275</td>
<td>Topics in Calculus I</td>
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</tr>
<tr>
<td>MATH 222</td>
<td>Calculus and Analytic Geometry 2</td>
<td>4</td>
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<tr>
<td>or MATH 276</td>
<td>Topics in Calculus II</td>
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<tr>
<td>MATH 234</td>
<td>Calculus–Functions of Several Variables</td>
<td>4</td>
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<tr>
<td>MATH 319</td>
<td>Techniques in Ordinary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>One of the following:</td>
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<tr>
<td>STAT 324</td>
<td>Introductory Applied Statistics for Engineers</td>
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STAT 311 & STAT 312  Introduction to Theory and Methods of Mathematical Statistics I and II

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**BASIC SCIENCE**

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**ENGINEERING MECHANICS**

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**ENGINEERING TOOLS**

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**FUNDAMENTAL ENVIRONMENTAL ENGINEERING PRINCIPLES**

<table>
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<th>Code</th>
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<td><strong>Total Credits</strong></td>
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</table>

**ADVANCED PRINCIPLES AND PRACTICES**

Environmental Engineering Experiments

Note: Courses taken to meet this requirement may not be used to meet the environmental engineering breadth requirement.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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**Senior Capstone Design**

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</thead>
<tbody>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td>4</td>
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</tbody>
</table>

**Environmental Engineering Breadth Electives**

At least one class in at least four of the following sub-disciplines. At least two of the courses must be designated as an engineering design course (*). If more than one course is taken from a sub-discipline, then the additional course(s) will be counted towards the Technical and Professional Electives Requirement.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
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<tbody>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
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</table>

Environmental Engineering Breadth Electives

Environmental Chemistry

- CIV ENGR 500 Water Chemistry
- ATM OCN 638 Atmospheric Chemistry
- SOIL SCI 621 Soil Chemistry

Health Hazards and Risk Assessment

- CIV ENGR 422 Elements of Public Health Engineering
- POP HLTH/ENVIR ST 471 Introduction to Environmental Health
- POP HLTH/ENVIR ST 502 Air Pollution and Human Health

Hydraulics

- CIV ENGR 410 Hydraulic Engineering
- CIV ENGR 411 Open Channel Hydraulics

Surface Water Resources and Hydrology

- BSE 473 Water Management Systems
- BSE 571 Small Watershed Engineering
- CIV ENGR 414 Hydrologic Design *
- CIV ENGR 415 Hydrology

Groundwater, Soils, and Sediments

- CIV ENGR 412 Groundwater Hydraulics
GEOSCI/G L E 627 Hydrogeology

Water and Wastewater
- CIV ENGR 426 Design of Wastewater Treatment Plants *
- CIV ENGR 428 Water Treatment Plant Design *

Air Quality and Control
- CIV ENGR 423 Air Pollution Effects, Measurement and Control
- ATM OCN/ ENVIR ST 535 Atmospheric Dispersion and Air Pollution

Solid and Hazardous Waste
- CIV ENGR 427 Solid and Hazardous Wastes Engineering *
- CIV ENGR 522 Hazardous Waste Management *

Energy and Environment
- BSE/ ENVIR ST 367 Renewable Energy Systems
- CBE 512 Energy Technologies and Sustainability
- CIV ENGR/ G L E 421 Environmental Sustainability Engineering
- GEOSCI/ ENVIR ST 411 Energy Resources

Total Credits 12

Professional Electives
Note: Courses taken to meet this requirement may not be used to meet the environmental engineering breadth requirement.

Select 14 credits of coursework that meets at least one of the following criteria:

- Any engineering course numbered 300 or higher. Up to six credits of independent study (e.g. CIV ENGR 699 Independent Study and others) may be counted
- Any intermediate or advanced-level course¹ from atmospheric and oceanic sciences, botany, chemistry, geography, geoscience, mathematics², microbiology, molecular and environmental toxicology, physics, population health sciences, soil science, statistics², or zoology
- Up to three credits of any intermediate or advanced-level course from agricultural and applied economics, economics, general business, or management and human resources
- Up to three credits of CIV ENGR 1 Cooperative Education Program

¹ Courses with social science, humanities, or literature breadth (H, S, L, W, X, Y, Z) cannot be used
² Transfer/test math elective credits for calculus or STAT 301 Introduction to Statistical Methods may not be used to fulfill Professional Electives

COMMUNICATIONS

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tr>
<td>ENGL 100</td>
<td>Introduction to College Composition</td>
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<tr>
<td>LSC 100</td>
<td>Science and Storytelling</td>
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<tr>
<td>COM ARTS 100</td>
<td>Introduction to Speech Composition</td>
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<tr>
<td>ESL 118</td>
<td>Academic Writing II</td>
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</tbody>
</table>

Speech-Related Course (choose one)
- E P D 275 Technical Presentations¹
- COM ARTS 105 Public Speaking
- COM ARTS 181 Elements of Speech-Honors Course
- COM ARTS 262 Theory and Practice of Argumentation and Debate
- COM ARTS 266 Theory and Practice of Group Discussion

Writing-Related Course (choose one)
- INTEREGR 397 Engineering Communication¹
- ENGL 201 Intermediate Composition

Total Credits 8

¹ E P D 275 Technical Presentations and INTEREGR 397 Engineering Communication (was EPD 397 before Fall 2020) are strongly recommended to satisfy these requirements.

LIBERAL STUDIES

<table>
<thead>
<tr>
<th>Code</th>
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<tbody>
<tr>
<td>College of Engineering Liberal Studies Requirements</td>
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<tr>
<td>Complete Requirements <a href="http://guide.wisc.edu/undergraduate/engineering/#requirementstext">link</a></td>
<td>²¹</td>
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</tbody>
</table>

Requirements specific to Environmental Engineering:
An economics course must be selected from the following list:
- ECON 101 Principles of Microeconomics
- ECON 102 Principles of Macroeconomics
- ECON 111 Principles of Economics-Accelerated Treatment

A minimum of three credits of environmental studies course that meets the breadth designations of Humanities, Literature, and/or Social Studies. Courses that also carry breadth designations of Biological Sciences, Natural Sciences, or Physical Sciences will not count towards this requirement.

Total Credits 16

¹ All liberal studies credits must be identified with the letter H, S, L, or Z. Language courses are acceptable without the letter and are considered humanities. An economics elective and an environmental studies elective are required.

Note: See a civil engineering advisor for additional information.

UNIVERSITY DEGREE REQUIREMENTS

Total Degree To receive a bachelor’s degree from UW–Madison, students must earn a minimum of 120 degree credits. The requirements for some programs may exceed 120 degree credits. Students should consult with their college or department advisor for information on specific credit requirements.
Residency
Degree candidates are required to earn a minimum of 30 credits in residence at UW–Madison. "In residence" means on the UW–Madison campus with an undergraduate degree classification. "In residence" credit also includes UW–Madison courses offered in distance or online formats and credits earned in UW–Madison Study Abroad/Study Away programs.

Quality of Work
Undergraduate students must maintain the minimum grade point average specified by the school, college, or academic program to remain in good academic standing. Students whose academic performance drops below these minimum thresholds will be placed on academic probation.

LEARNING OUTCOMES

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

FOUR-YEAR PLAN

First Year

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
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<tbody>
<tr>
<td>MATH 221</td>
<td>5</td>
<td>MATH 222</td>
<td>4</td>
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<tr>
<td>CHEM 109</td>
<td>5</td>
<td>STAT 324</td>
<td>3</td>
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<tr>
<td>GEOSCI 100 or 106</td>
<td>3</td>
<td>INTEREGR 170</td>
<td>3</td>
</tr>
<tr>
<td>Communications A</td>
<td>3</td>
<td>ME 170</td>
<td>2</td>
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<tr>
<td>Environmental Studies</td>
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<tr>
<td><strong>Total Credits</strong></td>
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Second Year

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<thead>
<tr>
<th>Fall</th>
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<th>Spring</th>
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<td>MATH 234</td>
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<td>MATH 319</td>
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<tr>
<td>E M A 201</td>
<td>3</td>
<td>E M A 202</td>
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<tr>
<td>CIV ENGR 320</td>
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<td>CIV ENGR 325</td>
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<tr>
<td>Biology</td>
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<td>ECON 101</td>
<td>4</td>
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<tr>
<td>Ethnic Studies</td>
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<td>Liberal Studies</td>
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Third Year

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<tbody>
<tr>
<td>CIV ENGR 310</td>
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<td>CIV ENGR 311</td>
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<td>CIV ENGR 324</td>
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<td>CIV ENGR/G L E 291</td>
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<td>PHYSICS 202 or 208</td>
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<td>CIV ENGR 498</td>
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<td>Liberal Studies</td>
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<td>Lab Course</td>
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<tr>
<td>E P D 275</td>
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<td>Env Engr Breadth #1</td>
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Fourth Year

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<td>CIV ENGR 494</td>
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<td>CIV ENGR 578</td>
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<tr>
<td>INTEREGR 397</td>
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<td>Env Engr Breadth #4</td>
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<td>Env Engr Breadth #2</td>
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<td>Env Engr Breadth #3</td>
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Total Credits 128

ADVISING AND CAREERS

ADVISING

Each College of Engineering program has academic advisors dedicated to serving its students. Program advisors can help current College of Engineering students with questions about accessing courses, navigating degree requirements, resolving academic issues and more. Students can find their assigned advisor on the homepage of their student center.

ENGINEERING CAREER SERVICES

Engineering Career Services (ECS) assists students in identifying pre-professional work-based learning experiences such as co-ops and summer internships, considering and applying to graduate or professional school, and finding full-time professional employment during their graduation year.

ECS offers two major career fairs per year, assists with resume writing and interviewing skills, hosts workshops on the job search, and meets one-on-one with students to discuss offer negotiations.

Students are encouraged to utilize the ECS office early in their academic careers. For comprehensive information on ECS programs and workshops, see the ECS website or call 608-262-3471.

PEOPLE

PROFESSORS
Greg Harrington (Director)
Robert Anex
Tracey Holloway
James Hurley
Krishnapuram Karthikeyan
William Likos
Steven Loheide
Katherine McMahon
Daniel Noguera
Jim Park
Environmental Engineering, B.S.

Doug Reinemann
Troy Runge
James Schauer
Anita Thompson
Chin Wu

ASSOCIATE PROFESSORS
Paul Block
Michael Cardiff
Dante Fratta
Matthew Ginder-Vogel
Rebecca Larson
Christy Remucal
Paul Stoy
James Tinjum

ASSISTANT PROFESSORS
Andrea Hicks
Nimish Pujara
Mohan Qin
Haoran Wei
Daniel Wright
Christopher Zahasky

CERTIFICATION/LICENSEURE

Licensure as a Professional Engineer is expected of environmental engineers. Information on steps needed to obtain licensure is available from the National Council for the Examination of Engineers and Surveyors (NCEES) at https://ncees.org/engineering/.

ACCREDITATION

This new program will seek accreditation from the Engineering Accreditation Commission of ABET, http://www.abet.org. Application for accreditation will be made at the earliest opportunity, in 2024, with an ABET decision in 2025. If accreditation is awarded, it may be retroactively applied to those who graduated in Academic Year 2023-24.

Note: Undergraduate Program Educational Objectives and Student Outcomes are made publicly available at the Departmental website. (In this Guide, the program’s Student Outcomes are designated by our campus as “Learning Outcomes.”)