ENVIRONMENTAL ENGINEERING, BS

Environmental engineering is a career path to protecting, restoring, managing, and enhancing the natural world around us and how we interact with it for today's generation and tomorrow's. Professionals in this field design, build, and operate systems and facilities to:

- Treat and distribute safe and reliable drinking water
- Recover materials, nutrients, and energy resources from wastewater and solid waste
- Protect and restore wetlands, streams, lakes, and groundwater
- Allocate water resources for urban, agricultural, and recreational use
- Protect and develop coastal shorelines and stream banks
- Manage stormwater and minimize flood risk
- Reduce, reuse, and recycle waste
- Minimize the creation of and provide treatment for industrial and agricultural waste and air emissions
- Protect us from the impacts of climate change, like rising sea levels and severe weather
- Slow down or reverse climate change by:
  - Using alternative energy sources, like solar, wind, geothermal, and biofuels
  - Recovering carbon and other greenhouse gases from industrial air emissions

Climate change, resource depletion, and older generations leaving the workforce are increasing the need for environmental engineers. With a focus on environmental, economic, and societal health and sustainability, we're guiding the next generation of environmental engineers with hands-on learning opportunities in well-equipped labs (https://engineering.wisc.edu/news/one-of-a-kind-environmental-engineering-class-overflows-with-real-world-examples/), computer facilities, on-site and field experiences, and our capstone design course (https://engineering.wisc.edu/blog/cee-capstone-course-wins-7th-ncees-award-for-renewable-energy-project/).

As an environmental engineering student, you'll learn how to ethically use engineering to protect, restore, remediate, reduce, and reuse resources on earth and in the air and water. Supportive faculty, staff, and practicing engineers will help you use and understand the tools and technology that environmental engineers use every day. And as you move forward in the program, you'll be ready for internships, co-ops, and undergraduate research opportunities to build your resume.

Required courses in this program cover the core breadth of knowledge you will need as an environmental engineer. Elective courses in facility design or operation are a way to tailor your studies and learn more about sustainability, resilience to climate change, smart infrastructure, and virtual reality in your career field. There are also certificate programs that you can pair with your degree, including two options on environmental sustainability.

Environmental engineering jobs are found in industries ranging from energy to public health; water resources; environmental protection and restoration; and resource recovery, recycling, and waste management. Employers include planning and design consulting firms; architectural firms; construction companies; manufacturers; laboratories; and local, state, and federal agencies. Entry-level job titles are environmental engineer, field engineer, environmental scientist, natural resource specialist, and hydrologist.

To stay current in the field, lifelong learning and professional licensure are key. Students are encouraged to take the FE exam before graduation or shortly after (https://engineering.wisc.edu/blog/taking-the-fe-exam-as-an-undergrad/), which is the first step in professional licensure. A pass rate of 95% among our students surpasses the national average of 70%, ensuring our graduates are well-prepared for their careers.

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.

HOW TO GET IN

HOW TO GET IN

ADMISSION TO THE COLLEGE AS A FIRST-YEAR STUDENT

Students applying to UW–Madison (https://www.admissions.wisc.edu/apply/) need to indicate an engineering major (https://engineering.wisc.edu/degrees-programs/undergraduate/) as their first choice in order to be considered for direct admission to the College of Engineering. Being directly admitted 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://engineering.wisc.edu/student-services/undergraduate-student-advising/progression/) 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 minimum admission requirements (https://engineering.wisc.edu/admissions/undergraduate/cross-campus-students/) for admission consideration to engineering degree programs. 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://engineering.wisc.edu/admissions/undergraduate/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://engineering.wisc.edu/admissions/undergraduate/transfer-from-off-campus/) 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 in the college. Transfer admission to the College of Engineering is competitive and selective, and students who have exceeded the 80 credit limit 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 & Academic Program Manager 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 student (https://engineering.wisc.edu/admissions/undergraduate/adult-students-second-degree-students/)s (https://engineering.wisc.edu/student-services/undergraduate-student-advising/) 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/#requirementsforundergraduatestudytext) 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 admitted to the environmental engineering degree program.

Code	Title	Credits
Introduction to Engineering		3
Mathematics and Statistics		19
Basic Science		16
Engineering Mechanics		9
Engineering Tools		6
Fundamental Principles		18
Advanced Principles and Practices		33
Communications		8
Liberal Studies		16
Total Credits		**128**

INTRODUCTION TO ENGINEERING

Code	Title	Credits
INTEREGR 170	Design Practicum	3
Total Credits		**3**

MATHEMATICS AND STATISTICS

Code	Title	Credits
MATH 221	Calculus and Analytic Geometry 1	5
or MATH 217	Calculus with Algebra and Trigonometry II	
MATH 222	Calculus and Analytic Geometry 2	4
MATH 234	Calculus--Functions of Several Variables	4
MATH 319	Techniques in Ordinary Differential Equations [2]	3
or MATH 320	Linear Algebra and Differential Equations	
One of the following:		*3-6*
STAT 324	Introductory Applied Statistics for Engineers	
STAT 311 & STAT 312	Introduction to Theory and Methods of Mathematical Statistics I and Introduction to Theory and Methods of Mathematical Statistics II	
Total Credits		**19-22**

BASIC SCIENCE

Code	Title	Credits
One of the following:		*5-9*
CHEM 109	Advanced General Chemistry	
CHEM 103 & CHEM 104	General Chemistry I and General Chemistry II	
One of the following:		*5*
PHYSICS 202	General Physics	
PHYSICS 208	General Physics	
One of the following:		*3*
GEOSCI 100	Introductory Geology: How the Earth Works	
GEOSCI/ ENVIR ST 106	Environmental Geology	
One of the following:		*3*
ZOOLOGY/ BIOLOGY/ BOTANY 151	Introductory Biology	
ZOOLOGY 153	Introductory Biology	
ZOOLOGY/ BOTANY/ ENVIR ST 260	Introductory Ecology	
MICROBIO 101	General Microbiology	
Total Credits		**16-20**

ENGINEERING MECHANICS

Code	Title	Credits
E M A 201	Statics (with a grade of C or better)	3
E M A 202	Dynamics	3
CIV ENGR 310	Fluid Mechanics	3
Total Credits		**9**

ENGINEERING TOOLS

Code	Title	Credits
CIV ENGR/G L E 291	Problem Solving Using Computer Tools	4
CIV ENGR 159	Civil Engineering Graphics	2-3
or M E 231	Geometric Modeling for Design and Manufacturing	
Total Credits		**6-7**

FUNDAMENTAL ENVIRONMENTAL ENGINEERING PRINCIPLES

Code	Title	Credits
CIV ENGR 311	Hydroscience	3
CIV ENGR 320	Environmental Engineering	3
CIV ENGR 324	Environmental Engineering Thermodynamics	3
CIV ENGR 325	Environmental Engineering Materials	3
CIV ENGR 494	Civil and Environmental Engineering Decision Making	3
CIV ENGR 498	Construction Project Management	3
Total Credits		**18**

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.

Code	Title	Credits
One of the following lab courses:		*3*
CIV ENGR 322	Environmental Engineering Processes	
CIV ENGR 410	Hydraulic Engineering	
BSE 365	Measurements and Instrumentation for Biological Systems	
GEOSCI/ G L E 627	Hydrogeology	
Total Credits		**3**

Senior Capstone Design

Code	Title	Credits
CIV ENGR 578	Senior Capstone Design [1]	4
Total Credits		**4**

1 At least one engineering design course as designated with an asterisk(*) must be completed before taking CIV ENGR 578 Senior Capstone Design.

2 MATH 319 Techniques in Ordinary Differential Equations preferred

Environmental Engineering Breadth Electives

Code	Title	Credits
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 (*) and must be from different sub-disciplines. At least one engineering design course (*) must be taken prior to CIV ENGR 578. If more than one course is taken from a subdiscipline, then the additional course(s) will be counted towards the Technical and Professional Electives Requirement.		12
Environmental Chemistry		
CIV ENGR 500	Water Chemistry	
ATM OCN 638		
SOIL SCI 621	Soil and Environmental 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 535	
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
CIV ENGR/ G L E 535	Wind Energy Balance-of-Plant Design *
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, excluding E P D and INTEREGR. Up to six credits of independent study (e.g. CIV ENGR 699 Independent Study and others) may be counted
- Any intermediate or advanced-level course[1] from atmospheric and oceanic sciences, botany, chemistry, geography, geoscience, mathematics[2], microbiology, molecular and environmental toxicology, physics, population health sciences, soil science, statistics[2], or zoology
- Up to three credits of any intermediate or advanced-level course from agricultural and applied economics, economics, general business, management and human resources, or INTEREGR 303 Applied Leadership Competencies in Engineering
- Up to three credits of CIV ENGR 1 Cooperative Education Program

[1] Courses with social science, humanities, or literature breadth (H, L, S, 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

Code	Title	Credits
Communications A (choose one)		*3*
ENGL 100	Introduction to College Composition	
LSC 100	Science and Storytelling	
COM ARTS 100	Introduction to Speech Composition	
ESL 118	Academic Writing II	
Speech-Related Course (choose one)		*2*
E P D 275	Technical Presentations [1]	
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)		*3*
INTEREGR 397	Engineering Communication [1]	
Total Credits		**8**

[1] E P D 275 Technical Presentations and INTEREGR 397 Engineering Communication are strongly recommended to satisfy these requirements.

LIBERAL STUDIES

Code	Title	Credits
College of Engineering Liberal Studies Requirements		**16**
Complete Requirements (http://guide.wisc.edu/undergraduate/engineering/#requirementstext) [1]		
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 an environmental engineering advisor for additional information.

HONORS IN RESEARCH

Students in environmental engineering that have completed at least two semesters on the Madison campus with a cumulative GPA of **at least** 3.5 may apply to participate in the Honors in Research program. Students may register for 1 to 3 credits per semester. A grade of P (Progress)

will be assigned each semester until the student completes the honors in research program or drops out of the program, at which time a final grade is assigned (based on research progress and the written thesis, if completed). This becomes the grade for all credits taken in CIV ENGR 489 Honors in Research.

A senior thesis worth 3 credits of CIV ENGR 489 is required. The senior thesis is a written document reporting on a substantial piece of work that is prepared in the style of a graduate thesis. The thesis advisor determines the grade which the student receives for the thesis. A bound copy of the thesis must be submitted to the Department of Civil and Environmental Engineering office to complete the program.

The designation "Honors in Research" will be recorded on the student's transcript if the following criteria are met:

1. Satisfaction of requirements for an undergraduate degree in Environmental Engineering.
2. A cumulative grade-point average of at least 3.3.
3. Completion of a total of at least 8 credits in CIV ENGR 489.
4. Completion of a senior honors thesis with a final grade of B or better.

Students interested in the Honors in Research program should contact their advisor or the BSEnvE chair for more information. Applications to the program are to be submitted to the BSEnvE chair with a supporting letter from the student's academic and thesis advisors. Decisions regarding acceptance are made by the BSEnvE chair.

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

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

FOUR-YEAR PLAN

First Year

Fall	Credits	Spring	Credits
MATH 221	5	MATH 222	4
CHEM 109	5	E M A 201[1]	3
GEOSCI 100 or 106	3	INTEREGR 170	3
Communications A	3	CIV ENGR 159	2
		Environmental Studies	3
	16		**15**

Second Year

Fall	Credits	Spring	Credits
MATH 234	4	MATH 319 or 320	3
STAT 324	3	E M A 202	3
CIV ENGR 320	3	CIV ENGR 325	3
Biology	3	CIV ENGR/G L E 291	4
Ethnic Studies	3	E P D 275	2
	16		**15**

Third Year

Fall	Credits	Spring	Credits
CIV ENGR 310	3	CIV ENGR 311	3
CIV ENGR 324	3	CIV ENGR 498	3
PHYSICS 202 or 208	5	ECON 101	4
INTEREGR 397	3	Lab Course	3
Liberal Studies	3	Env Engr Breadth #1	3
	17		**16**

Fourth Year

Fall	Credits	Spring	Credits
CIV ENGR 494	3	CIV ENGR 578	4
Env Engr Breadth #2	3	Env Engr Breadth #4	3
Env Engr Breadth #3	3	Professional Elective	3
Professional Elective	3	Professional Elective	3
Professional Elective	2	Professional Elective	3
Liberal Studies	3		
	17		**16**

Total Credits 128

[1] E M A 201 Statics requires a minimum grade of C.

ADVISING AND CAREERS

ADVISING AND CAREERS

ADVISING

Every College of Engineering undergraduate has an assigned academic advisor (https://engineering.wisc.edu/student-services/undergraduate-student-advising/). Academic advisors support and coach students through their transition to college and their academic program all the way through graduation.

Advisors help students navigate the highly structured engineering curricula and course sequencing, working with them to select courses each semester.

When facing a challenge or making a plan toward a goal, students can start with their academic advisor. There are many outstanding resources at UW–Madison, and academic advisors are trained to help students navigate these resources. Advisors not only inform students about the various resources, but they help reduce the barriers between students and campus resources to help students feel empowered to pursue their goals and communicate their needs.

Students can find their assigned advisor in their MyUW Student Center.

ENGINEERING CAREER SERVICES

Engineering Career Services (https://ecs.wisc.edu) (ECS) assists students in finding work-based learning experiences such as co-ops and summer internships, exploring and applying to graduate or professional school, and finding full-time professional employment.

ECS offers two large career fairs per year, assists students with resume building and developing interviewing skills, hosts skill-building workshops, and meets one-on-one with students to discuss offer negotiations.

Students are encouraged to engage with the ECS office early in their academic careers. For more information on ECS programs and workshops, visit: https://ecs.wisc.edu.

PEOPLE

PEOPLE

PROFESSORS

Greg Harrington (Director and Department Chair)
Robert Anex
Tracey Holloway
James Hurley
Krishnapuram Karthikeyan
William Likos
Steven Loheide
Katherine McMahon
Daniel Noguera
Jim Park
Doug Reinemann
Troy Runge
James Schauer
Anita Thompson
Chin Wu

ASSOCIATE PROFESSORS

Paul Block
Michael Cardiff
Dante Fratta
Matthew Ginder-Vogel
Andrea Hicks
Rebecca Larson
Christy Remucal
Paul Stoy
James Tinjum
Daniel Wright

ASSISTANT PROFESSORS

Nimish Pujara
Mohan Qin
Haoran Wei
Christopher Zahasky

CERTIFICATION/LICENSURE

CERTIFICATION/LICENSURE

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

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.

PROGRAM#EDUCATIONAL OBJECTIVES#FOR THE BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING

We recognize that our graduates will choose to use the knowledge and skills that they have acquired during their undergraduate years to pursue a wide variety of career and life goals, and we encourage this diversity of paths. Whatever path our graduates may choose, we expect them to be meeting the following objectives at least three to five years after graduation:

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.

Note: Undergraduate Student Outcomes, number of degrees conferred, and enrollment data are made publicly available at the Environmental Engineering#Undergraduate Program website. (In this Guide, the program's Student Outcomes are available through the "Learning Outcomes" tab.)