

BACHELOR OF SCIENCE IN ENVIRONMENTAL ENGINEERING (BSEnVE) DEGREE

Program Learning Outcomes (Student Outcomes) for the BSEnVE Degree

Upon completing the BSEnVE degree, students will be able to demonstrate:

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.

Program Educational Objectives for the BSEnVE Degree

Within 3 to 5 years of graduation, graduates with a Bachelor of Science in Environmental Engineering (BSEnVE) degree are expected to attain the following Program Educational Objectives (PEOs):

1. Excel in problem-solving and communication skills.
2. Achieve leadership positions in technical or managerial areas.
3. Demonstrate initiative and innovation in professional endeavors.
4. Demonstrate engagement in addressing ethical, social, environmental, and global concerns.
5. Remain engaged in continuing learning, including advanced degrees.
6. Obtain a Professional Engineering license, if appropriate.

Requirements for the BSEnVE Degree

For general university requirements, see [Graduation Requirements \(https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/\)](https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/). Students pursuing the BSEnVE degree must complete:

- A minimum of 33 courses (91 credit hours) to satisfy major requirements.

- A minimum of 124 credit hours to satisfy degree requirements.
- A minimum of 19 courses (50 credit hours) taken at the 300-level or above.
- The requirements for one area of specialization (see below for areas of specialization). When students [declare the major \(https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text\)](https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/#text) in Environmental Engineering (associated with the BSEnVE degree), students must additionally identify and declare one of four areas of specialization, either in:
 - [Area I - Water Quality](#) (p. 2): Environmental chemistry, environmental restoration, smart materials, fate and transport of contaminants, sustainable water treatment, environmental microbiology, **or**
 - [Area II - Air, Energy, Climate, and Sustainability](#) (p. 3): Watershed and aquifer management, flood prediction, data analysis, GIS, and hydrologic modeling, **or**
 - [Area III - Environmental Infrastructure, Disasters, and Risk](#) (p. 3): Climate risk management, systems reliability, transportation systems, hydrogeology, infrastructure resilience, **or**
 - [Area IV - Environmental Management](#) (p. 3): Environmental law, engineering economics, engineering leadership, ethics, and project management.
- A minimum of 14 courses (36 credit hours) from the General Math and Science courses.
- A minimum of 10 courses (25 credit hours) from the Core Requirements.

Because of the common core requirements, it is possible for students to change their area of specialization at any time, even after initially declaring the major. To do so, please contact the [Office of the Registrar \(registrar@rice.edu\)](mailto:registrar@rice.edu).

Civil and Environmental Engineering's innovative and challenging BSEnVE degree's engineering curriculum is designed to provide significant flexibility to the student. Specific details and typical course layouts by semester can be found on the [departmental website \(http://ceve.rice.edu/\)](http://ceve.rice.edu/).

The courses listed below satisfy the requirements for this major. In certain instances, courses not on this official list may be substituted upon approval of the major's academic advisor, or where applicable, the department's Director of Undergraduate Studies. (Course substitutions must be formally applied and entered into Degree Works by the major's [Official Certifier \(https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/\)](https://registrar.rice.edu/facstaff/degreeworks/officialcertifier/).) Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

Code	Title	Credit Hours
Total Credit Hours Required for the Major in Environmental Engineering		91
Total Credit Hours Required for the BSEnVE Degree		124

Degree Requirements

Code	Title	Credit Hours
General Math and Science Requirements ¹		
BIOS 201	INTRODUCTORY BIOLOGY I	3

CHEM 121	GENERAL CHEMISTRY I	3	Total Credit Hours Required for the Major in Environmental Engineering	91
or CHEM 111	AP/OTH CREDIT IN GENERAL CHEMISTRY I		Additional Credit Hours to Complete Degree Requirements *	2
CHEM 123	GENERAL CHEMISTRY LABORATORY I	1	University Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/) *	31
or CHEM 113	AP/OTH CREDIT IN GENERAL CHEMISTRY LAB I		Total Credit Hours	124
CHEM 122	GENERAL CHEMISTRY II	3	Footnotes and Additional Information	
CHEM 124	GENERAL CHEMISTRY LABORATORY II	1	* Note: <u>University Graduation Requirements</u> include 31 credit hours, comprised of Distribution Requirements (Groups I, II, and III), FWIS, and LPAP coursework. In some instances, courses satisfying FWIS or distribution requirements may additionally meet other requirements, such as the Analyzing Diversity (AD) requirement, or some of the student's declared major, minor, or certificate requirements. <u>Additional Credit Hours to Complete Degree Requirements</u> include general electives, coursework completed as upper-level, residency (hours taken at Rice), and/or any other additional academic program requirements.	
CMOR 220	INTRODUCTION TO ENGINEERING COMPUTATION	3	1 Or an equivalent approved course.	
or EEPS 220	INTRODUCTION TO COMPUTATION IN THE EARTH, ENVIRONMENT AND PLANETARY SCIENCES		2 The Civil and Environmental Engineering department has determined that credit awarded for PHYS 141 <i>CONCEPTS IN PHYSICS I</i> is not eligible for meeting the requirements of Environmental Engineering major.	
EEPS 107	CLIMATE CHANGE AND EXTREME WEATHER	3	3 Courses that introduce fundamentals of civil and environmental engineering primarily targeted at students with diverse science, engineering, and humanities backgrounds (CEVE 101, CEVE 211, CEVE 310).	
MATH 101	SINGLE VARIABLE CALCULUS I	3	4 See also the University Graduation Requirements footnote above denoted with an *.	
or MATH 105	AP/OTH CREDIT IN CALCULUS I		Areas of Specialization	
MATH 102	SINGLE VARIABLE CALCULUS II	3	To fulfill the remaining BSEnvE degree requirements, students must complete a total of 10 courses (30 credit hours) from the four areas of specialization as follows:	
or MATH 106	AP/OTH CREDIT IN CALCULUS II		<ul style="list-style-type: none"> • 8 courses (24 credit hours), consisting of a minimum of 2 courses (6 credit hours) from each of the four areas of specialization as breadth. • 2 additional courses (6 credit hours) from one of the four areas of specialization for a total of 4 courses (12 credit hours, including breadth) in that specific area as an area of specialization. 	
MATH 211	ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3	Please Note: Of the 10 required courses (30 credit hours) for the area of specialization, a minimum of 7 courses (21 credit hours) must be taken from departmental (CEVE) course offerings.	
MATH 212	MULTIVARIABLE CALCULUS	3	Area of Specialization: Area I - Water Quality	
or MATH 232	HONORS MULTIVARIABLE CALCULUS		All students must select a minimum of 2 courses (6 credit hours) from Area I. Students pursuing the Area I - Water Quality area of specialization must complete:	
PHYS 101	MECHANICS (WITH LAB)	4	<ul style="list-style-type: none"> • 4 courses (12 credit hours) from Area I - Water Quality • 2 courses (6 credit hours) from Area II - Air, Energy, Climate, and Sustainability • 2 courses (6 credit hours) from Area III - Environmental Infrastructure, Disasters, and Risk • 2 courses (6 credit hours) from Area IV - Environmental Management 	
& PHYS 103	and MECHANICS DISCUSSION ²			
STAT 310 /	PROBABILITY AND STATISTICS	3		
ECON 307 /				
STAT 305				
Core Requirements				
CEVE 101	FUNDAMENTALS OF CIVIL AND ENVIRONMENTAL ENGINEERING ³	2		
CEVE 211 /	ENGINEERING MECHANICS ³	3		
MECH 211				
CEVE 310	PRINCIPLES OF ENVIRONMENTAL ENGINEERING ³	3		
CEVE 315	URBAN WATER SYSTEMS: SOURCES, TREATMENT, DISTRIBUTION, RESOURCE RECOVERY AND REUSE	3		
CEVE 316	URBAN WATER SYSTEMS LAB: WATER QUALITY PARAMETERS AND TREATMENT TECHNIQUES	1		
CEVE 363	APPLIED FLUID MECHANICS	3		
CEVE 411	ATMOSPHERIC CHEMISTRY AND CLIMATE	3		
CEVE 412	HYDROLOGY AND WATER RESOURCES ENGINEERING	3		
CEVE 481	INTRODUCTION TO SENIOR DESIGN	1		
CEVE 482	SENIOR DESIGN	3		
Area of Specialization				
Select 1 from the following Areas of Specialization (see Areas of Specialization below):			30	
Area I - Water Quality				
Area II - Air, Energy, Climate, and Sustainability				
Area III - Environmental Infrastructure, Disasters, and Risk				
Area IV - Environmental Management				
Elective Requirements				
Select electives to fulfill the remaining BSEnvE degree requirements (see below for suggested elective courses) ⁴				

Please Note: Of the 10 required courses (30 credit hours) for the area of specialization, a minimum of 7 courses (21 credit hours) must be taken from departmental (CEVE) course offerings.

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i> 12		
CEVE 314 / BIOE 365 / GLHT 314	SUSTAINABLE WATER PURIFICATION FOR THE DEVELOPING WORLD	
CEVE 401	CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE	
CEVE 420	ENVIRONMENTAL REMEDIATION RESTORATION	
CEVE 426	SMART MATERIALS FOR THE ENVIRONMENT	
CEVE 434	FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT	
CEVE 444	ENVIRONMENTAL MICROBIOLOGY AND MICROBIAL ECOLOGY	
Or any approved (Area I - Water Quality) course from CEVE course offerings		
<i>Select 2 courses from the Area II - Air, Energy, Climate, and Sustainability Area of Specialization</i>		6
<i>Select 2 courses from the Area III - Environmental Infrastructure, Disasters, and Risk Area of Specialization</i>		6
<i>Select 2 courses from the Area IV - Environmental Management Area of Specialization</i>		6
Total Credit Hours		30

Area of Specialization: Area II - Air, Energy, Climate, and Sustainability

All students must select a minimum of 2 courses (6 credit hours) from Area II. Students pursuing the Area II - Air, Energy, Climate, and Sustainability area of specialization must complete:

- 4 courses (12 credit hours) from Area II - Air, Energy, Climate, and Sustainability
- 2 courses (6 credit hours) from Area I - Water Quality
- 2 courses (6 credit hours) from Area III - Environmental Infrastructure, Disasters, and Risk
- 2 courses (6 credit hours) from Area IV - Environmental Management

Please Note: Of the 10 required courses (30 credit hours) for the area of specialization, a minimum of 7 courses (21 credit hours) must be taken from departmental (CEVE) course offerings.

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i> 12		
CEVE 302	SUSTAINABLE DESIGN	
CEVE 307	ENERGY AND THE ENVIRONMENT	
EEPS 433	CLIMATE DYNAMICS	
EEPS 437	EARTH'S NATURAL RESOURCES FOR THE ENERGY TRANSITION	
EEPS 438	THE SCIENCE OF NATURE-BASED CARBON SEQUESTRATION	
EEPS 471	EARTH SYSTEMS MODELING I: PHILOSOPHY AND FUNDAMENTALS	

EEPS 472	EARTH SYSTEMS MODELING: NUMERICAL TECHNIQUES AND APPLICATIONS	
Or any approved (Area II - Air, Energy, Climate, and Sustainability) course from CEVE course offerings		
<i>Select 2 courses from the Area I - Water Quality Area of Specialization</i>		6
<i>Select 2 courses from the Area III - Environmental Infrastructure, Disasters, and Risk Area of Specialization</i>		6
<i>Select 2 courses from the Area IV - Environmental Management Area of Specialization</i>		6
Total Credit Hours		30

Area of Specialization: Area III - Environmental Infrastructure, Disasters, and Risk

All students must select a minimum of 2 courses (6 credit hours) from Area III. Students pursuing the Area III - Environmental Infrastructure, Disasters, and Risk area of specialization must complete:

- 4 courses (12 credit hours) from Area III - Environmental Infrastructure, Disasters, and Risk
- 2 courses (6 credit hours) from Area I - Water Quality
- 2 courses (6 credit hours) from Area II - Air, Energy, Climate, and Sustainability
- 2 courses (6 credit hours) from Area IV - Environmental Management

Please Note: Of the 10 required courses (30 credit hours) for the area of specialization, a minimum of 7 courses (21 credit hours) must be taken from departmental (CEVE) course offerings.

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i> 12		
CEVE 424	TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS	
CEVE 425	SUSTAINABLE INFRASTRUCTURE MATERIALS	
CEVE 443		
CEVE 452	URBAN TRANSPORTATION SYSTEMS	
CEVE 518	ENVIRONMENTAL HYDROGEOLOGY	
EEPS 432	FLUID FLOW IN FRACTURED ROCKS	
Or any approved (Area III - Environmental Infrastructure, Disasters, and Risk) course from CEVE course offerings		
<i>Select 2 courses from the Area I - Water Quality Area of Specialization</i>		6
<i>Select 2 courses from the Area II - Air, Water, and Climate Area of Specialization</i>		6
<i>Select 2 courses from the Area IV - Environmental Management Area of Specialization</i>		6
Total Credit Hours		30

Area of Specialization: Area IV - Environmental Management

All students must select a minimum of 2 courses (6 credit hours) from Area IV. Students pursuing the Area IV - Environmental Management area of specialization must complete:

- 4 courses (12 credit hours) from Area IV - Environmental Management
- 2 courses (6 credit hours) from Area I - Water Quality

- 2 courses (6 credit hours) from Area II - Air, Energy, Climate, and Sustainability
- 2 courses (6 credit hours) from Area III - Environmental Infrastructure, Disasters, and Risk

Please Note: Of the 10 required courses (30 credit hours) for the area of specialization, a minimum of 7 courses (21 credit hours) must be taken from departmental (CEVE) course offerings.

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i>		
CEVE 301	ENGINEERING ECONOMICS AND PROJECT MANAGEMENT	3
CEVE 313	UNCERTAINTY AND RISK IN URBAN INFRASTRUCTURES	3
CEVE 320	ETHICS AND ENGINEERING LEADERSHIP	3
CEVE 406	INTRODUCTION TO ENVIRONMENTAL LAW	3
CEVE 421	CLIMATE RISK MANAGEMENT	3
EEPS 435	REMOTE SENSING	3
Or any approved (Area IV - Environmental Management) course from CEVE course offerings		
<i>Select 2 courses from the Area I - Water Quality Area of Specialization</i>		6
<i>Select 2 courses from the Area II - Air, Water, and Climate Area of Specialization</i>		6
<i>Select 2 courses from the Area III - Environmental Infrastructure, Disasters, and Risk Area of Specialization</i>		6
Total Credit Hours		30

Suggested Electives for the BSEnvE Degree

Any departmental (CEVE) course offering not taken to fulfill an Area of Specialization requirement can be taken as an elective. Other suggested courses are listed below.

Code	Title	Credit Hours
ANTH 320	CLIMATE CHANGE AND SOCIAL INEQUALITY	3
BIOS 271	ENVIRONMENTAL MANAGEMENT	3
BIOS 374	GLOBAL CHANGE BIOLOGY	3
BIOS 559	SUSTAINABILITY IMPACT ASSESSMENTS	3
CHBE 382	INNOVATION AND SUSTAINABILITY	3
EEPS 434	CLIMATE OF THE COMMON ERA	3
EEPS 436	GIS FOR SCIENTISTS AND ENGINEERS	3
ENST 202 / HUMA 202	CULTURE, ENERGY, AND THE ENVIRONMENT: AN INTRODUCTION TO ENERGY HUMANITIES	3
ENST 210	SUSTAINABLE FUTURES: AN EXPLORATION OF GLOBAL SUSTAINABILITY CHALLENGES AND SOLUTIONS	3
ENST 250	UNDERSTANDING ENERGY: ENERGY LITERACY AND CIVICS	3
ENST 281 / CHBE 281	ENGINEERING SOLUTIONS FOR SUSTAINABLE COMMUNITIES	3
ENST 301	ENVIRONMENTAL JUSTICE	3

ENST 313 / ARCH 313	CASE STUDIES IN SUSTAINABLE DESIGN	3
ENST 315	ENVIRONMENTAL HEALTH	3
ENST 322 / ARCH 322	CASE STUDIES IN SUSTAINABILITY: THE REGENERATIVE REPOSITIONING OF NEW OR EXISTING RICE CAMPUS BLDGS	3
ENST 332 / ANTH 332	THE SOCIAL LIFE OF CLEAN ENERGY	3
ENST 415 / SOCI 415	THE ENVIRONMENTAL MOVEMENT	3
ENST 437 / ECON 437	ENERGY ECONOMICS	3
ENST 480 / ECON 480	ENVIRONMENTAL AND ENERGY ECONOMICS	3
HEAL 375	THE BUILT ENVIRONMENT AND PUBLIC HEALTH	3
STAT 485	ENVIRONMENTAL STATISTICS AND DECISION MAKING	3

Policies for the BSEnvE Degree Program Restrictions and Exclusions

Students pursuing the BSEnvE degree should be aware of the following program restrictions:

- As noted in [Majors, Minors, and Certificates \(https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/\)](https://ga.rice.edu/undergraduate-students/academic-opportunities/majors-minors-certificates/), under *Declaring Majors, Minors and Certificates*, students may not obtain both a BA and a BS in the same major.
- Students pursuing the Bachelor of Science in Environmental Engineering (BSEnvE) Degree may not additionally pursue the Bachelor of Science in Civil Engineering (BSCE) Degree.
- Students pursuing the Bachelor of Science in Environmental Engineering (BSEnvE) Degree may not additionally pursue the BA Degree with a Major in Civil and Environmental Engineering.

Transfer Credit

For Rice University's policy regarding transfer credit, see [Transfer Credit \(https://ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit/\)](https://ga.rice.edu/undergraduate-students/academic-policies-procedures/transfer-credit/). Some departments and programs have additional restrictions on transfer credit. The Office of Academic Advising maintains the university's official list of [transfer credit advisors \(https://oaa.rice.edu/advising-network/transfer-credit-advisors/\)](https://oaa.rice.edu/advising-network/transfer-credit-advisors/) on their website: <https://oaa.rice.edu>. Students are encouraged to meet with their academic program's transfer credit advisor when considering transfer credit possibilities.

Departmental Transfer Credit Guidelines

Students pursuing the BSEnvE degree should be aware of the following departmental transfer credit guidelines:

- Requests for transfer credit will be considered by the program director (and/or the program's official transfer credit advisor) on an individual case-by-case basis.

Additional Information

For additional information, please see the Civil and Environmental Engineering website: <https://cee.rice.edu/>

Opportunities for the BSEnvE Degree

Academic Honors

The university recognizes academic excellence achieved over an undergraduate's academic history at Rice. For information on university honors, please see [Latin Honors \(https://ga.rice.edu/undergraduate-students/honors-distinctions/university/\)](https://ga.rice.edu/undergraduate-students/honors-distinctions/university/) (*summa cum laude*, *magna cum laude*, and *cum laude*) and [Distinction in Research and Creative Work \(https://ga.rice.edu/undergraduate-students/honors-distinctions/university/\)](https://ga.rice.edu/undergraduate-students/honors-distinctions/university/). Some departments have department-specific Honors awards or designations.

Departmental Honor, Award, and Scholarship Opportunities

- **Distinction in Research and Creative Work:** The Department of Civil and Environmental Engineering will recognize graduating seniors for outstanding creative contributions with the award of [Distinction in Research and Creative Work \(https://ga.rice.edu/undergraduate-students/honors-distinctions/university/\)](https://ga.rice.edu/undergraduate-students/honors-distinctions/university/). The Department recognizes this award as being a significant honor. As such, it will be awarded to no more than 20% of a graduating class (rounded up to next whole number). This award shall be given for significant contributions in research, design, and creative projects beyond class assignments (except CEVE 499). Generally, it is expected that the student recipients will have performed research/design for a minimum of two academic segments (one segment = one academic year or one summer) during their undergraduate career (either for credit or pay). It may be given for one outstanding piece of work for consistent meaningful contributions made over the course of an undergraduate career. All majors (BA and BS) are eligible and will be considered for this distinction in the spring prior to their graduation.
- **Rice Global Forum:** Rice Global Forum (RGF) is an engineering and construction industry funded center which is in its second decade of operation. It was founded by Ahmad Durrani, past chair of Civil and Environmental Engineering at Rice. RGF funds and facilitates interaction with the engineering and construction industry, particularly oil and gas related work. RGF funds \$25,000 worth of scholarships every year. In addition, RGF also consistently sponsors and supports Engineers Without Borders (EWB) and has donated to other student clubs as well in addition to holding an engineering design competition every year in February during National Engineers Week.

Rice undergraduate students completing studies in science and engineering may have the option to pursue the Master of Civil and Environmental Engineering (MCEE) degree. For additional information, students should contact their undergraduate major advisor and the (MCEE) chair of the department graduate studies committee.

Student Organizations and Clubs

- **Engineers Without Borders (EWB):** <https://ewb.rice.edu/>
EWB partners with developing communities worldwide to design engineering solutions that will improve their standards of living. It is an important component of the Civil and Environmental Engineering program. BA students with their flexible curriculum are encouraged to participate. This exciting endeavor allows undergraduates to have an experience in a developing country, where they are able to design and build a project to help society. Students have been attracted to the EWB program in large numbers and our local chapter is one of the

most successful in the United States. Some CEVE courses are EWB-related, providing the opportunity to also obtain credit hours.

- **Society of Women Engineers:** <https://swe.rice.edu/>
The Society of Women Engineers aims to empower women to pursue and achieve their full potential in science and engineering related fields. We provide opportunities in professional development, academic and post-graduate planning, community outreach, and social events.

Additional Information

For additional information, please see the Civil and Environmental Engineering website: <https://cee.rice.edu/>