

BACHELOR OF SCIENCE IN CIVIL ENGINEERING (BSCE) DEGREE

The program leading to the BSCE degree is accredited by the Engineering Accreditation Commission (EAC) of ABET, <https://www.abet.org>.

Program Learning Outcomes (Student Outcomes) for the BSCE Degree

Upon completing the BSCE 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 BSCE Degree

Within 3 to 5 years of graduation, graduates with a Bachelor of Science in Civil Engineering (BSCE) degree are expected to attain the following program educational objectives:

1. Demonstrate strong 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 BSCE Degree

For general university requirements, see Graduation Requirements (ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements). Students pursuing the BSCE degree must complete a minimum of 133 credit hours to complete the degree to include the following:

- A minimum of 35 courses (94-95 credit hours depending on course selection) to satisfy major requirements.

- A minimum of 133-134 credit hours (depending on course selection) to satisfy degree requirements.
- A minimum of 19 courses (54 credit hours) taken at the 300-level or above.
- The requirements for one area of specialization (see below for areas of specialization). The BSCE degree offers four areas of specialization:
 - Area I - Environmental Engineering (p.): Air and water quality, transport theory, modeling, and energy, **or**
 - Area II - Hydrology and Water Resources (p.): Watershed and aquifer management, flood prediction, data analysis, GIS, and hydrologic modeling, **or**
 - Area III - Structural Engineering and Mechanics (p.): Structural analysis, mechanics, design, dynamics, and matrix method, **or**
 - Area IV - Urban Infrastructure, Reliability, and Management (p.): Transportation systems, complex urban systems, system reliability, soil mechanics, decision theory, engineering economics, and project management.
- A minimum of 16 courses (40-41 credit hours) from the General Math and Science courses.
- A minimum of 9 courses (24 credit hours) from the Core Requirements.

Civil and Environmental Engineering's innovative and challenging BSCE 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>).

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>.) 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 Civil Engineering		94-95
Total Credit Hours Required for the BSCE Degree		133-134

Degree Requirements

Code	Title	Credit Hours
General Math and Science Requirements ¹		
CAAM 210	INTRODUCTION TO ENGINEERING COMPUTATION	3
CAAM 335	MATRIX ANALYSIS ¹	3
	or MATH 354 / HONORS LINEAR ALGEBRA	
	MATH 355	
CHEM 121 & CHEM 123	GENERAL CHEMISTRY I and GENERAL CHEMISTRY LABORATORY I	4
CHEM 122 & CHEM 124	GENERAL CHEMISTRY II and GENERAL CHEMISTRY LABORATORY II	4
ESCI 115	INTRODUCTION TO THE EARTH ²	3-4

or BIOC 201	INTRODUCTORY BIOLOGY	
MATH 101	SINGLE VARIABLE CALCULUS I	3
or MATH 105	AP/OTH CREDIT IN CALCULUS I	
MATH 102	SINGLE VARIABLE CALCULUS II	3
or MATH 106	AP/OTH CREDIT IN CALCULUS II	
MATH 211	ORDINARY DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	3
MATH 212	MULTIVARIABLE CALCULUS	3
PHYS 101 & PHYS 103	MECHANICS (WITH LAB) and MECHANICS DISCUSSION	4
PHYS 102 & PHYS 104	ELECTRICITY & MAGNETISM (WITH LAB) and ELECTRICITY AND MAGNETISM DISCUSSION	4
STAT 310 / ECON 307	PROBABILITY AND STATISTICS ³	3
Core Requirements⁴		
CEVE 101	FUNDAMENTALS OF CIVIL AND ENVIRONMENTAL ENGINEERING ⁵	3
CEVE 211 / MECH 211	ENGINEERING MECHANICS ⁵	3
CEVE 310	PRINCIPLES OF ENVIRONMENTAL ENGINEERING ⁵	3
CEVE 311 / MECH 311	MECHANICS OF SOLIDS AND STRUCTURES ⁵	3
CEVE 312	STRENGTH OF MATERIALS LAB ⁵	1
CEVE 363	APPLIED FLUID MECHANICS	3
CEVE 401	CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE LAB	4
or CEVE 470	PRINCIPLES OF SOIL MECHANICS	
CEVE 480	SENIOR DESIGN	3
CEVE 481	INTRODUCTION TO SENIOR DESIGN	1
Area of Specialization		
<i>Select 1 from the following Areas of Specialization (see Areas of Specialization below):</i>		30
Area I - Environmental Engineering		
Area II - Hydrology and Water Resources		
Area III - Structural Engineering and Mechanics		
Area IV - Urban Infrastructure, Reliability and Management		
Elective Requirements		
Select electives to fulfill the remaining BSCE degree requirements (see below for suggested elective courses) ⁶		
Total Credit Hours Required for the Major in Civil Engineering	94-95	
University Graduation Requirements (ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements) [*]	39	
Total Credit Hours	133-134	

Footnotes and Additional Information

* Includes coursework completed as distribution credit, FWIS, LPAP, upper-level, residency (hours taken at Rice), 60 hours outside of the major (if applicable), and any additional academic program requirements. The “hours outside of the major” requirement may include all of the above university requirements.

¹ Or an equivalent approved course

- ² Students may substitute ESCI 115 with any departmental (ESCI) course offering.
- ³ Students may substitute STAT 310 with any departmental (STAT) course offering at the 300-level or above with the exception of STAT 305.
- ⁴ **Please Note:** For students pursuing an area of specialization in Environmental Engineering (Area I) or Hydrology and Water Resources (Area II), CEVE 401 is required, and CEVE 470 is an Urban Infrastructure, Reliability, and Management (Area IV) elective. For students pursuing an area of specialization in Structural Engineering and Mechanics (Area III) or Urban Infrastructure, Reliability, and Management (Area IV), CEVE 470 is required and CEVE 401 is an Environmental Engineering (Area I) elective.
- ⁵ 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, CEVE 311, CEVE 312)
- ⁶ See also the University Graduation Requirements footnote above denoted with an *.

Areas of Specialization

To fulfill the remaining BSCE degree requirements, students must complete a total of 10 courses (30 credit hours) from the four areas of specialization as follows:

- 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.

Area of Specialization: Area I - Environmental Engineering

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

- 4 courses (12 credit hours) from Area I - Environmental Engineering
- 2 courses (6 credit hours) from Area II - Hydrology and Water Resources
- 2 courses (6 credit hours) from Area III - Structural Engineering and Mechanics
- 2 courses (6 credit hours) from Area IV - Urban Infrastructure, Reliability and Management

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i>		
CEVE 302 / ENGI 302	SUSTAINABLE DESIGN	12
CEVE 307 / ENST 307 / ESCI 307	ENERGY AND THE ENVIRONMENT	
CEVE 308	INTRODUCTION TO AIR POLLUTION CONTROL ¹	
CEVE 404	ATMOSPHERIC PARTICULATE MATTER ¹	
CEVE 406 / ENST 406	INTRODUCTION TO ENVIRONMENTAL LAW ¹	
CEVE 411	ATMOSPHERIC PROCESSES	

CEVE 434	FATE AND TRANSPORT OF CONTAMINANTS IN THE ENVIRONMENT	
CEVE 442	WATER REUSE AND RESOURCE RECOVERY	
CEVE 444	ENVIRONMENTAL MICROBIOLOGY AND MICROBIAL ECOLOGY	
Or any approved (Area I - Environmental Engineering) course from CEVE course offerings		
Select 2 courses (6 credit hours) from the Area II - Hydrology and Water Resources Area of Specialization		6
Select 2 courses (6 credit hours) from the Area III - Structural Engineering and Mechanics Area of Specialization		6
Select 2 courses (6 credit hours) from the Area IV - Urban Infrastructure, Reliability and Management Area of Specialization		6
Total Credit Hours		30

Area of Specialization: Area II - Hydrology and Water Resources

All students must select a minimum of 2 courses (6 credit hours) from Area II. Students pursuing the Area II - Hydrology and Water Resources area of specialization must complete:

- 4 courses (12 credit hours) from Area II - Hydrology and Water Resources
- 2 courses (6 credit hours) from Area I - Environmental Engineering
- 2 courses (6 credit hours) from Area III - Structural Engineering and Mechanics
- 2 courses (6 credit hours) from Area IV - Urban Infrastructure, Reliability and Management

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i> 12		
CEVE 314	SUSTAINABLE WATER PURIFICATION FOR THE DEVELOPING WORLD	
CEVE 412	HYDROLOGY AND WATER RESOURCES ENGINEERING	
CEVE 418 / ESCI 418	QUANTITATIVE HYDROGEOLOGY	
CEVE 420	ENVIRONMENTAL REMEDIATION RESTORATION	
CEVE 512	ADVANCED HYDROLOGY AND HYDRAULICS	
CEVE 518	CONTAMINANT HYDROGEOLOGY	
Or any approved (Area II - Hydrology or Water Resources) course from CEVE course offerings		
Select 2 courses (6 credit hours) from the Area I - Environmental Engineering Area of Specialization		6
Select 2 courses (6 credit hours) from the Area III - Structural Engineering and Mechanics Area of Specialization		6
Select 2 courses (6 credit hours) from the Area IV - Urban Infrastructure, Reliability and Management Area of Specialization		6
Total Credit Hours		30

Area of Specialization: Area III - Structural Engineering and Mechanics

All students must select a minimum of 2 courses (6 credit hours) from Area III. Students pursuing the Area III - Structural Engineering and Mechanics area of specialization must complete:

- 4 courses (12 credit hours) from Area III - Structural Engineering and Mechanics
- 2 courses (6 credit hours) from Area I - Environmental Engineering
- 2 courses (6 credit hours) from Area II - Hydrology and Water Resources
- 2 courses (6 credit hours) from Area IV - Urban Infrastructure, Reliability and Management

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i> 12		
CEVE 304	STRUCTURAL ANALYSIS I	
CEVE 400 / MECH 400	ADVANCED MECHANICS OF MATERIALS	
CEVE 405	STEEL DESIGN	
CEVE 407	REINFORCED CONCRETE DESIGN	
CEVE 408	CONCRETE AND STEEL STRUCTURES LABORATORY	
CEVE 427 / MECH 427	COMPUTATIONAL STRUCTURAL MECHANICS AND FEM	
CEVE 476	STRUCTURAL DYNAMIC SYSTEMS ¹	
CEVE 496	SYSTEM IDENTIFICATION OF DYNAMIC SYSTEMS	
Or any approved (Area III Structural Engineering and Mechanics) course from CEVE/MECH course offerings		
Select 2 courses (6 credit hours) from the Area I - Environmental Engineering Area of Specialization		6
Select 2 courses (6 credit hours) from the Area II - Hydrology and Water Resources Area of Specialization		6
Select 2 courses (6 credit hours) from the Area IV - Urban Infrastructure, Reliability and Management Area of Specialization		6
Total Credit Hours		30

Area of Specialization: Area IV - Urban Infrastructure, Reliability and Management

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

- 4 courses (12 credit hours) from Area IV - Urban Infrastructure, Reliability and Management
- 2 courses (6 credit hours) from Area I - Environmental Engineering
- 2 courses (6 credit hours) from Area II - Hydrology and Water Resources
- 2 courses (6 credit hours) from Area III - Structural Engineering and Mechanics

Code	Title	Credit Hours
<i>Select 4 courses from the following:</i> 12		
CEVE 301	ENGINEERING ECONOMICS AND PROJECT MANAGEMENT	
CEVE 313 / STAT 313	UNCERTAINTY AND RISK IN URBAN INFRASTRUCTURES	
CEVE 424	TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS ¹	
CEVE 452	URBAN TRANSPORTATION SYSTEMS	

CEVE 460	BRIDGE ENGINEERING AND EXTREME EVENTS ¹	
CEVE 492	MODELING AND ANALYSIS OF NETWORKED SYSTEMS ¹	
Or any approved (Area IV - Urban Infrastructure, Reliability and Management) course from CEVE/MGMT/ECON/CAAM/STAT course offerings		
Select 2 courses (6 credit hours) from the Area I - Environmental Engineering Area of Specialization		6
Select 2 courses (6 credit hours) from the Area II - Hydrology and Water Resources Area of Specialization		6
Select 2 courses (6 credit hours) from the Area III - Structural Engineering and Mechanics Area of Specialization		6
Total Credit Hours		30

Footnotes and Additional Information

¹ Offered alternative years

Suggested Electives for the BSCE Degree

Code	Title	Credit Hours
CEVE 320 / ENGI 320	ETHICS AND ENGINEERING LEADERSHIP	3
CEVE 417 / MECH 417	FINITE ELEMENT ANALYSIS	3
CEVE 424	TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS	3
CEVE 454 / BIOE 454 / MECH 454	COMPUTATIONAL FLUID MECHANICS	3
CEVE 499	SPECIAL PROBLEMS	1-12
CAAM 336	DIFFERENTIAL EQUATIONS IN SCIENCE AND ENGINEERING	3
CAAM 378	INTRODUCTION TO OPERATIONS RESEARCH AND OPTIMIZATION	3
CAAM 453	NUMERICAL ANALYSIS I	3
CAAM 471	LINEAR AND INTEGER PROGRAMMING	3
CHEM 211 & CHEM 213	ORGANIC CHEMISTRY I and ORGANIC CHEMISTRY DISCUSSION	3
ECON 100	PRINCIPLES OF ECONOMICS	3
ECON 445	MANAGERIAL ECONOMICS	3
MECH 343	MODELING OF DYNAMIC SYSTEMS	4
MECH 412	VIBRATIONS	3
STAT 385	METHODS OF DATA ANALYSIS AND SYSTEM OPTIMIZATION	4

Policies for the BSCE Degree

Transfer Credit

For Rice University's policy regarding transfer credit, see Transfer Credit (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 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 BSCE 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://ceve.rice.edu/>

Opportunities for the BSCE 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 (ga.rice.edu/undergraduate-students/honors-distinctions/university) (*summa cum laude*, *magna cum laude*, and *cum laude*) and Distinction in Research and Creative Work (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*. 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) with a GPA of 3.30 or higher in all courses completed at Rice 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.

Student Organizations and Clubs

- **American Society of Civil Engineers Student (ASCE):** <https://www.asce.org/membership/student/>. ASCE seeks to promote civil and environmental engineering, expose students to real world engineering, and connect students to alumni and professionals. Throughout the year we invite speakers from the industry, visit plants and sites, and organize social events. The

objectives of this Chapter are to encourage the development of a professional consciousness, to afford an opportunity for civil engineering students to become acquainted and to practice working together effectively, to promote a spirit of congeniality among them, and to provide friendly contact with the engineering profession. We also support the Concrete Canoe competition (see below) and the Seismic Design Competition of the Earthquake Engineering Research Institute (EERI).

- **Chi Epsilon:** <https://www.chi-epsilon.org/xewebgeneral2/>. Chi Epsilon is dedicated to maintaining and promoting the status of civil engineering as an ideal profession. Chi Epsilon was organized to recognize the characteristics of the individual civil engineering deemed to be fundamental to the successful pursuit of an engineering career, and to aid in the development of those characteristics in the civil engineering student.
- **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.
- **Concrete Canoe:** <https://concretecanoe.rice.edu/>. Rice Concrete Canoe is a student-run club that creates a functional concrete canoe to race and present at the yearly ASCE sponsored competition. Through the year, members gain engineering experience through the research, planning and constructing of a concrete canoe. By offerings members exposure to the engineering design process, small-group work, software such as Matlab and Adobe Illustrator (and possibly more starting this year), and laser cutters, Concrete Canoe offers a unique experience to students regardless of whether or not they want to become engineers.
- **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.

- must complete the requirements for their bachelor's degree and the master's degree independently of each other (i.e. no course may be counted toward the fulfillment of both degrees).
- should be aware of the financial aid implications, if the conversion of undergraduate coursework to that of graduate level reduces their earned undergraduate credit for any semester below that of full-time status (12 credit hours).
- more information on this *Undergraduate - Graduate Concurrent Enrollment* possibility, including specific information on the registration process can be found here (ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment).

Additional Information

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

Fifth-Year Master's Degree Option for Rice Undergraduate Students

Rice students have an option to pursue the Master of Civil and Environmental Engineering (MCEE) degree by adding an additional fifth year to their four undergraduate years of science and engineering studies.

Advanced Rice undergraduate students in good academic standing may apply to the MCEE degree program during their junior or senior year. Upon acceptance, depending on course load, financial aid status, and other variables, they may then start taking some required courses of the master's degree program. A plan of study will need to be approved by the students's undergraduate advisor and the (MCEE) chair of the department graduate studies committee.

As part of this option and opportunity, Rice undergraduate students: