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, http://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 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. 1): Air and water quality, transport theory, modeling, and energy, or Area II - Hydrology and Water Resources (p. 2): Watershed and aquifer management, flood prediction, data analysis, GIS, and hydrologic modeling, or Area III - Structural Engineering and Mechanics (p. 3): Structural analysis, mechanics, design, dynamics, and matrix method, or Area IV - Urban Infrastructure, Reliability, and Management (p. 4): 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

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total Credit Hours Required for the Major in Civil Engineering</td>
<td>94-95</td>
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<tr>
<td></td>
<td>Total Credit Hours Required for the BSCE Degree</td>
<td>133-134</td>
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Degree Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td></td>
<td>General Math and Science Requirements 1</td>
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<tr>
<td>CAAM 210</td>
<td>INTRODUCTION TO ENGINEERING COMPUTATION</td>
<td>3</td>
</tr>
<tr>
<td>CAAM 335</td>
<td>MATRIX ANALYSIS 1</td>
<td>3</td>
</tr>
<tr>
<td>or MATH 354 / HONORS LINEAR ALGEBRA</td>
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<td>MATH 355</td>
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<tr>
<td>CHEM 121</td>
<td>GENERAL CHEMISTRY I</td>
<td>4</td>
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<tr>
<td>&amp; CHEM 123</td>
<td>and GENERAL CHEMISTRY LABORATORY I</td>
<td></td>
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<tr>
<td>CHEM 122</td>
<td>GENERAL CHEMISTRY II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 124</td>
<td>and GENERAL CHEMISTRY LABORATORY II</td>
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<tr>
<td>ESCI 115</td>
<td>INTRODUCTION TO THE EARTH 2</td>
<td>3-4</td>
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</table>
Bachelor of Science in Civil Engineering (BSCE) Degree

Footnotes and Additional Information

- Include 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

Elective Requirements

Select electives to fulfill the remaining BSCE degree requirements (see below for suggested elective courses).

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)

Total Credit Hours

133-134

Select 4 courses from the following:

- CEVE 302 / ENGI 302: SUSTAINABLE DESIGN
- CEVE 308: INTRODUCTION TO AIR POLLUTION CONTROL
- CEVE 404: ATMOSPHERIC PARTICULATE MATTER
- CEVE 406 / ENST 406: INTRODUCTION TO ENVIRONMENTAL LAW
- CEVE 411: ATMOSPHERIC PROCESSES
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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
Select 2 courses (6 credit hours) from the Area III - Structural Engineering and Mechanics Area of Specialization
Select 2 courses (6 credit hours) from the Area IV - Urban Infrastructure, Reliability and Management Area of Specialization

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

Select 4 courses from the following:

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 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
Select 2 courses (6 credit hours) from the Area II - Hydrology and Water Resources Area of Specialization
Select 2 courses (6 credit hours) from the Area IV - Urban Infrastructure, Reliability and Management Area of Specialization

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

Select 4 courses from the following:

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 II - Hydrology and Water Resources Area of Specialization
Select 2 courses (6 credit hours) from the Area III - Structural Engineering and Mechanics Area of Specialization
Select 2 courses (6 credit hours) from the Area IV - Urban Infrastructure, Reliability and Management Area of Specialization

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

Select 4 courses from the following:

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
CEVE 452 URBAN TRANSPORTATION SYSTEMS

Total Credit Hours 30
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 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

Suggested Electives for the BSCE Degree

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

**Professional Engineering Master’s 5th Year Degree Option for Rice Undergraduates**

Rice undergraduate students have the option to earn the Master of Civil and Environmental Engineering (MCEE) degree by adding an additional year after completing their bachelor’s degree. Advanced Rice undergraduate students in good academic standing may apply to the graduate program during their junior or senior year. Upon acceptance, depending on course load, financial aid status, and other variables, they may complete part of the course requirements for the MCEE program during their senior year. A plan of study based on their particular focus area will need to be approved by the chair of the department graduate studies committee.

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

- must complete the requirements for their bachelor’s degree and the MCEE degree independently of each other (i.e. no course may be counted toward the fulfillment of both degrees).