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. ): 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/degeworks/officialcertifier).) Students and their academic advisors should identify and clearly document the courses to be taken.

Summary

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>Total Credit Hours Required for the Major in Civil Engineering</td>
<td>94-95</td>
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</tr>
<tr>
<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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</thead>
<tbody>
<tr>
<td>CAAM 210</td>
<td>INTRODUCTION TO ENGINEERING COMPUTATION</td>
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<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>
</tr>
<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>
<td></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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<tr>
<td>CEVE 101</td>
<td>FUNDAMENTALS OF CIVIL AND ENVIRONMENTAL ENGINEERING</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 211 / MECH 211</td>
<td>ENGINEERING MECHANICS</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 310</td>
<td>PRINCIPLES OF ENVIRONMENTAL ENGINEERING</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 311 / MECH 311</td>
<td>MECHANICS OF SOLIDS AND STRUCTURES</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 312</td>
<td>STRENGTH OF MATERIALS LAB</td>
<td>1</td>
</tr>
<tr>
<td>CEVE 363</td>
<td>APPLIED FLUID MECHANICS</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 401</td>
<td>CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE LAB</td>
<td>4</td>
</tr>
<tr>
<td>or CEVE 470</td>
<td>PRINCIPLES OF SOIL MECHANICS</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 480</td>
<td>SENIOR DESIGN</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 481</td>
<td>INTRODUCTION TO SENIOR DESIGN</td>
<td>1</td>
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Elective Requirements

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

1. **Core Requirements**

- CEVE 101: FUNDAMENTALS OF CIVIL AND ENVIRONMENTAL ENGINEERING
- CEVE 211 / MECH 211: ENGINEERING MECHANICS
- CEVE 310: PRINCIPLES OF ENVIRONMENTAL ENGINEERING
- CEVE 311 / MECH 311: MECHANICS OF SOLIDS AND STRUCTURES
- CEVE 312: STRENGTH OF MATERIALS LAB
- CEVE 363: APPLIED FLUID MECHANICS
- CEVE 401: CHEMISTRY FOR ENVIRONMENTAL ENGINEERING AND SCIENCE LAB
- or CEVE 470: PRINCIPLES OF SOIL MECHANICS
- CEVE 480: SENIOR DESIGN
- CEVE 481: INTRODUCTION TO SENIOR DESIGN

2. **Area of Specialization**

Select 1 from the following Areas of Specialization (see Areas of Specialization below):

- **Area I - Environmental Engineering**
- **Area II - Hydrology and Water Resources**
- **Area III - Structural Engineering and Mechanics**
- **Area IV - Urban Infrastructure, Reliability and Management**

3. **Elective Requirements**

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

4. **Total Credit Hours Required for the Major in Civil Engineering**

- 94-95

5. **University Graduation Requirements**

- 39

6. **Total Credit Hours Required for the Major in Civil Engineering**

- 133-134

**Footnotes and Additional Information**

1. 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.

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 an 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**
---|---|---
CEVE 302 / ENGI 302 | SUSTAINABLE DESIGN | 12
CEVE 307 / ENST 307 / ESCI 307 | ENERGY AND THE ENVIRONMENT | 12
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 | 1
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

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<tr>
<td>CEVE 304</td>
<td>STRUCTURAL ANALYSIS I</td>
<td>12</td>
</tr>
<tr>
<td>CEVE 400 / MECH 400</td>
<td>ADVANCED MECHANICS OF MATERIALS</td>
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<tr>
<td>CEVE 405</td>
<td>STEEL DESIGN</td>
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<td>CEVE 407</td>
<td>REINFORCED CONCRETE DESIGN</td>
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</tr>
<tr>
<td>CEVE 408</td>
<td>CONCRETE AND STEEL STRUCTURES LABORATORY</td>
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<tr>
<td>CEVE 476</td>
<td>STRUCTURAL DYNAMIC SYSTEMS</td>
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<tr>
<td>CEVE 476</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CEVE 496</td>
<td>SYSTEM IDENTIFICATION OF DYNAMIC SYSTEMS</td>
<td></td>
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</tbody>
</table>

Select 4 courses from the following:

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

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<tbody>
<tr>
<td>CEVE 301</td>
<td>ENGINEERING ECONOMICS AND PROJECT MANAGEMENT</td>
<td>12</td>
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<tr>
<td>CEVE 313 / STAT 313</td>
<td>UNCERTAINTY AND RISK IN URBAN INFRASTRUCTURES</td>
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<tr>
<td>CEVE 424</td>
<td>TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS</td>
<td>1</td>
</tr>
<tr>
<td>CEVE 452</td>
<td>URBAN TRANSPORTATION SYSTEMS</td>
<td></td>
</tr>
</tbody>
</table>

Select 4 courses from the following:

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 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

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<td>CEVE 301</td>
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<td>CEVE 424</td>
<td>TIME-DEPENDENT SYSTEM RELIABILITY METHODS AND APPLICATIONS</td>
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<td>CEVE 452</td>
<td>URBAN TRANSPORTATION SYSTEMS</td>
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</table>

Select 4 courses from the following:

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 III - Structural Engineering and Mechanics Area of Specialization

Total Credit Hours 30
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 (https://oaa.rice.edu/undergraduate-students/honors-distinctions/university) (summa cum laude, magna cum laude, and cum laude) and Distinction in Research and Creative Work (https://oaa.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 opportunities for the BSCE Degree

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

Policies for the BSCE Degree

Transfer Credit

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Suggested Electives for the BSCE Degree

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<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>
</tr>
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<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>
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<td>MECH 343</td>
<td>MODELING OF DYNAMIC SYSTEMS</td>
<td>4</td>
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<td>MECH 412</td>
<td>VIBRATIONS</td>
<td>3</td>
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<tr>
<td>STAT 385</td>
<td>METHODS OF DATA ANALYSIS AND SYSTEM OPTIMIZATION</td>
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<tr>
<td>MECH 343</td>
<td>MODELING OF DYNAMIC SYSTEMS</td>
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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
cement 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 offeringings 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:

- 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).

### Additional Information

For additional information, please see the Civil and Environmental
Engineering website: [https://ceve.rice.edu/](https://ceve.rice.edu/)