Bachelor of Science in Mechanical Engineering (BSME) Degree

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

Program Learning Outcomes (Student Outcomes) for the BSME Degree

Upon completing the BSME 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 BSME Degree

Within 3 to 5 years of graduation, Bachelor of Science in Mechanical Engineering (BSME) degree alumni from Rice will be exceptional engineers who are:

1. Successful and on track to become leaders in the global workforce; and/or
2. Students in top-rated post-graduate programs.

Requirements for the BSME Degree

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

- A minimum of 33 courses (87 credit hours) to satisfy major requirements.
- A minimum of 127 credit hours to satisfy degree requirements.
- A minimum of 18 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) in Mechanical Engineering (associated with the BSME degree), students must additionally identify and declare one of four areas of specialization, either in:
  - Computational Engineering (p. 2): covers methods and tools for computational analysis in engineering applications, fluids and solids, to help with design and performance in such applications; or
  - Mechanics/Dynamics (p. 3): provides a background in the fundamentals of solid interactions and control systems, and is highly relevant in areas such as robotics, solid mechanics, and tissue mechanics; or
  - Thermal Fluids (p. 3): integrates topics from thermodynamics, fluids, and heat transfer to study renewable and conventional energy systems, aerospace/aeronautics, and surface interactions; or
  - Breadth in Mechanical Engineering (p. 3): encompasses concepts from across the areas of specialization to prepare students for working in cross-cutting fields.

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).

The BSME degree prepares students for the professional practice of engineering. The degree program’s goals and objectives are available on the departmental website. Lists of representative undergraduate courses and the usual order in which they are taken are available from the department.

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 Mechanical Engineering | 87 |
| | Total Credit Hours Required for the BSME Degree | 127 |

Degree Requirements

| Core Requirements |
|---|---|---|
| Code | Title | Credit Hours |
| CHEM 121 | GENERAL CHEMISTRY I | 3 |
| or CHEM 111 | AP/OTh CREDIT IN GENERAL CHEMISTRY I | |
| CHEM 123 | GENERAL CHEMISTRY LABORATORY I | 1 |
| or CHEM 113 | AP/OTh CREDIT IN GENERAL CHEMISTRY LAB I | |
| MATH 101 | SINGLE VARIABLE CALCULUS I | 3 |
| or MATH 105 | AP/OTh CREDIT IN CALCULUS I | |
Breadth in Mechanical Engineering

Thermal Fluids
Mechanics/Dynamics
Computational Engineering

Footnotes and Additional Information

1. PHYS 111 may be substituted for PHYS 101 and PHYS 103. The Mechanical Engineering department has determined that credit awarded for PHYS 141 \textit{CONCEPTS IN PHYSICS} I is not eligible for meeting the requirements of the MECH major.
2. PHYS 112 may be substituted for PHYS 102 and PHYS 104. The Mechanical Engineering department has determined that credit awarded for PHYS 142 \textit{CONCEPTS IN PHYSICS} II is not eligible for meeting the requirements of the MECH major.
3. During their senior year, mechanical engineering students in the BSME program complete these courses in design application while completing a major design project.
4. DSCI 305 may not be used to fulfill the Limited Elective requirement.
5. Students must complete a total of 3 technical electives (9 credit hours) in one area of specialization: Computational Engineering, Mechanics/Dynamics, Thermal Fluids, or Breadth in Mechanical Engineering.

Areas of Specialization

Students must complete the requirements as listed for one of the following areas of specialization for the BSME degree program. A minimum of 3 courses (minimum of 9 credit hours) must be taken in the area of specialization.

Area of Specialization: Computational Engineering

To fulfill the BSME degree requirements, students pursuing the Computational Engineering area of specialization must complete:

- 1 course (3 credit hours) from the area of specialization Core Requirement
- 2 courses (6 credit hours) from the area of specialization Elective Requirements

Elective Requirements

Select 2 courses from the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>MECH 417</td>
<td>FINITE ELEMENT ANALYSIS</td>
<td>3</td>
</tr>
<tr>
<td>CEVE 417</td>
<td>FINITE ELEMENT ANALYSIS</td>
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</tr>
<tr>
<td>or MECH 454</td>
<td>COMPUTATIONAL FLUID MECHANICS</td>
<td></td>
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<td>BIOE 454</td>
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University Graduation Requirements (https://ga.rice.edu/undergraduate-students/academic-policies-procedures/graduation-requirements/)

Total Credit Hours 127
Bachelor of Science in Mechanical Engineering (BSME) Degree

MECH 427 / CEVE 427  PHYSICS GUIDED MACHINE LEARNING & DATA DRIVEN MODELING FEM
MECH 454 / BIOE 454 / CEVE 454  COMPUTATIONAL FLUID MECHANICS
MECH 547  ADVANCED COMPUTATIONAL MECHANICS
MECH 555  NUMERICAL METHODS FOR ENGINEERS
MECH 567 / CEVE 567  COMPUTATIONAL FLUID-STRUCTURE INTERACTION
MECH 679 / CEVE 679  APPLIED MONTE CARLO ANALYSIS

Total Credit Hours 9

Footnotes and Additional Information

1 MECH 417 or MECH 454 may fulfill the area of specialization Elective Requirements if they are not selected as the area of specialization Core Requirement.

Area of Specialization: Mechanics/Dynamics
To fulfill the BSME degree requirements, students pursuing the Mechanics/Dynamics area of specialization must complete:

• 1 course (3 credit hours) from the area of specialization Core Requirement
• 2 courses (6 credit hours) from the area of specialization Elective Requirements

Code  Title  Credit Hours
Core Requirement
MECH 412  VIBRATIONS 3
Elective Requirements
Select 2 courses from the following: 6
MECH 400 / CEVE 400  ADVANCED MECHANICS OF MATERIALS
MECH 411  DYNAMICS AND CONTROL OF MECHANICAL SYSTEMS
MECH 416  ADVANCED MACHINE DESIGN AND MECHANICAL SYSTEMS
MECH 417 / CEVE 417  FINITE ELEMENT ANALYSIS
MECH 427 / CEVE 427  PHYSICS GUIDED MACHINE LEARNING & DATA DRIVEN MODELING FEM
MECH 430  TRIBOMECHADYNAMICS
MECH 435 / ELEC 435  INTRODUCTION TO ENERGY-EFFICIENT MECHATRONICS
MECH 450 / COMP 450 / ELEC 450  ALGORITHMIC ROBOTICS
MECH 488  DESIGN OF MECHATRONIC SYSTEMS
MECH 497  NEUROMUSCULOSKELETAL MODELING AND SIMULATION
MECH 498 / COMP 498 / ELEC 498  INTRODUCTION TO ROBOTICS
MECH 596  INTRODUCTION TO FLIGHT MECHANICS

Total Credit Hours 9

Area of Specialization: Thermal Fluids
To fulfill the BSME degree requirements, students pursuing the Thermal Fluids area of specialization must complete:

• 1 course (3 credit hours) from the area of specialization Core Requirement
• 2 courses (6 credit hours) from the area of specialization Elective Requirements

Code  Title  Credit Hours
Core Requirement
MECH 454 / BIOE 454 / CEVE 454  COMPUTATIONAL FLUID MECHANICS 3
or MECH 472  THERMAL SYSTEMS DESIGN
Elective Requirements
Select 2 courses from the following: 6
MECH 417 / CEVE 417  FINITE ELEMENT ANALYSIS
MECH 454 / BIOE 454 / CEVE 454  COMPUTATIONAL FLUID MECHANICS
MECH 472  THERMAL SYSTEMS DESIGN
MECH 482  CONVECTIVE HEAT TRANSFER
MECH 484  MICROSCOPIC THERMODYNAMICS AND TRANSPORT
MECH 555  COMPUTATIONAL FLUID-STRUCTURE INTERACTION
MECH 560  TRIBOLOGY: THE STUDY OF FRICTION, LUBRICATION, AND WEAR
MECH 575  INTRODUCTION TO HYDRODYNAMIC STABILITY
MECH 590  AEROSPACE PROPULSION
MECH 591  GAS DYNAMICS
MECH 594  INTRODUCTION TO AERONAUTICS

Total Credit Hours 9

Footnotes and Additional Information

1 MECH 454 or MECH 472 may fulfill the area of specialization Elective Requirements if they are not selected as the area of specialization Core Requirement.

Area of Specialization: Breadth in Mechanical Engineering
To fulfill the BSME degree requirements, students pursuing the Breadth in Mechanical Engineering area of specialization must complete:

• 3 courses (9 credit hours) from the area of specialization Elective Requirements

Code  Title  Credit Hours
Elective Requirements
Select 3 courses from the following: 9
MECH 412  VIBRATIONS
MECH 417 / CEVE 417  FINITE ELEMENT ANALYSIS
MECH 497  NEUROMUSCULOSKELETAL MODELING AND SIMULATION
MECH 498 / COMP 498 / ELEC 498  INTRODUCTION TO ROBOTICS
MECH 596  INTRODUCTION TO FLIGHT MECHANICS

Total Credit Hours 9
Bachelor of Science in Mechanical Engineering (BSME) Degree

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<td>MECH 472</td>
<td>THERMAL SYSTEMS DESIGN</td>
</tr>
</tbody>
</table>

Total Credit Hours 9

Policies for the BSME Degree

Program Restrictions and Exclusions

Students pursuing the BSME Degree should be aware of the following program restriction:

- As noted in Majors, Minors, and 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 Mechanical Engineering (BSME) Degree may not additionally pursue the BA Degree with a Major in Mechanical 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/). 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/) 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 BSME 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 Mechanical Engineering website: https://mech.rice.edu/

Opportunities for the BSME 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/) (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/). Some departments have department-specific Honors awards or designations.

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

In certain situations and with some terminal master’s degree programs, Rice students have an option to pursue a master’s degree by adding an additional fifth year to their four years of undergraduate studies.

Advanced Rice undergraduate students in good academic standing typically apply to the master’s 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 student’s undergraduate major advisor and the master’s degree program director.

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

- must complete the requirements for a 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 there could be 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 opportunity, including specific information on the registration process can be found here (https://ga.rice.edu/undergraduate-students/academic-opportunities/undergraduate-graduate-concurrent-enrollment/).

Rice undergraduate students completing studies in science and engineering may have the option to pursue the Master of Mechanical Engineering (MME) degree. For additional information, students should contact their undergraduate major advisor and the MME program director.

Additional Information

For additional information, please see the Mechanical Engineering website: https://mech.rice.edu/