Bachelor of Science Degree in Mechanical Engineering

The Bachelor of Science degree in Mechanical Engineering offers students the opportunity to prepare for careers in traditional, new, and emerging technologies related to the practice of Mechanical Engineering, which is a versatile and broadly-based engineering discipline. Mathematics and basic sciences, such as physics and chemistry, form the foundation of mechanical engineering, which requires an understanding of diverse subject areas, such as solid and fluid mechanics, thermal sciences, mechanical design, structures, material selection, manufacturing processes and systems, mechanical systems and control, and instrumentation.

The five main concentrations within Mechanical Engineering are:

1. General Mechanical Engineering
2. Energy, Thermal and Fluid Systems
3. Manufacturing Engineering and Systems
4. Mechanical Systems and Design
5. Mechanics and Materials

The Mechanical Engineering curriculum provides education and basic engineering training in all specializations through the required coursework. Students may develop a degree of specialization and depth in one of the concentration areas through the selection of technical elective courses. The design experience is integrated throughout the program. Development of open-ended, problem-solving skills is a part of many mechanical engineering courses. Design projects with formal report writing are included in many courses. In addition, a substantial portion of all technical elective courses is devoted to the design of systems and components. A capstone design sequence at the senior level provides an opportunity to apply and integrate the knowledge gained throughout the curriculum to the development of an instructor-approved project.

The laboratory requirements are designed to provide hands-on experience in basic measurement and instrumentation equipment and the application of classroom theory. Students may receive additional hands-on experiences by selecting technical elective courses with laboratory components.

Opportunities exist for students to participate in research and design projects. All students are eligible to participate in undergraduate research, through the independent study courses. Students also have an opportunity to participate in an approved co-op program and may receive up to 3 semester credit hours for their experience.

The educational objectives of the Bachelor of Science degree in the Mechanical Engineering program are to provide graduates with opportunities to:

1. Have engineering careers in industry or government and/or pursue advanced graduate or professional degrees.
2. Apply their engineering skills to their careers.
3. Continue to advance their knowledge, communication and leadership skills by using technology, continuing education, solving problems, and serving in technical or professional societies.
4. Apply their understanding of societal, environmental, and ethical issues to their professional activities.

Graduates of the Bachelor of Science degree in Mechanical Engineering program are expected to demonstrate the following:

- an ability to apply knowledge of mathematics, science, and engineering
- an ability to design and conduct experiments, as well as to analyze and interpret data
- an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- an ability to function on multidisciplinary teams
- an ability to identify, formulate, and solve engineering problems
- an understanding of professional and ethical responsibility
- an ability to communicate effectively
- the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- a recognition of the need for, and an ability to engage in, life-long learning
• a knowledge of contemporary issues
• an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
• an ability to apply principles of engineering, basic science, and mathematics (including multivariate calculus and differential equations) to model, analyze, design, and realize physical systems, components or processes; and work professionally in both thermal and mechanical systems areas.

The minimum number of semester credit hours required for this degree is 128, at least 39 of which must be at the upper-division level. All candidates for this degree must fulfill the Core Curriculum requirements, the General Engineering requirements, and the degree requirements, listed below.

Core Curriculum requirements: Students seeking the Bachelor of Science degree in Mechanical Engineering must fulfill the University Core Curriculum requirements in the same manner as other students. The courses listed in the table below satisfy both major requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for the degree. For a complete listing of courses that satisfy the Core Curriculum requirements, see pages 5–9 of this catalog.

<table>
<thead>
<tr>
<th>Core Curriculum Component Area</th>
<th>Courses that Satisfy Core Curriculum and Degree Requirements</th>
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</thead>
<tbody>
<tr>
<td>Communications</td>
<td>English Rhetoric/Composition (6 semester credit hours)</td>
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<tr>
<td></td>
<td>All students must take the following six hours to meet this core requirement:</td>
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<tr>
<td></td>
<td>WRC 1013 Freshman Composition I</td>
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<td>WRC 1023 Freshman Composition II</td>
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<tr>
<td>Mathematics</td>
<td>Mathematics (3 semester credit hours)</td>
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<td></td>
<td>Any three hours listed under this section in the list of core courses will satisfy this core requirement.</td>
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<tr>
<td></td>
<td>Note: MAT 1214 Calculus I may be used to satisfy the Core Curriculum requirement for mathematics, as well as one of the General Engineering requirements.</td>
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<tr>
<td>Natural Sciences</td>
<td>Science (6 semester credit hours)</td>
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<td></td>
<td>Three hours from Level One and three hours from Level Two will satisfy this core requirement.</td>
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<tr>
<td></td>
<td>Note: CHE 1103 General Chemistry I and PHY 1903 Engineering Physics I may be used to satisfy the Core Curriculum requirements for science, as well as two of the General Engineering requirements.</td>
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<tr>
<td>Humanities &amp; Visual and Performing Arts</td>
<td>Literature (3 semester credit hours)</td>
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<td></td>
<td>Any three hours listed under this section in the list of core courses will satisfy this core requirement.</td>
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<tr>
<td></td>
<td>The Arts (3 semester credit hours)</td>
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<td>Any three hours listed under this section in the list of core courses will satisfy this core requirement.</td>
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<tr>
<td>Social and Behavioral Sciences</td>
<td>United States History and Diversity (6 semester credit hours)</td>
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<td></td>
<td>Any six hours listed under this section in the list of core courses will satisfy this core requirement.</td>
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<tr>
<td></td>
<td>Political Science (6 semester credit hours)</td>
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<tr>
<td></td>
<td>POL 1013 Introduction to American Politics, plus three additional hours listed under this section in the list of core courses will satisfy this core requirement.</td>
</tr>
</tbody>
</table>
Core Curriculum Component Area | Courses that Satisfy Core Curriculum and Degree Requirements
---|---
**Social and Behavioral Science** (3 semester credit hours)  
COR 1203 Freshman Seminar  
**Economics** (3 semester credit hours)  
Any three hours listed under this section in the list of core courses will satisfy this core requirement.

**World Society and Issues** (3 semester credit hours)  
Any three hours listed under this section in the list of core courses will satisfy this core requirement.

### General Engineering Requirements

Students seeking the Bachelor of Science degree in Mechanical Engineering must complete the following 22 semester credit hours:

- CHE 1103 General Chemistry I  
- EGR 2323 Applied Engineering Analysis I  
- MAT 1214 Calculus I  
- MAT 1224 Calculus II  
- PHY 1903, 1911 Engineering Physics I and Laboratory  
- PHY 1923, 1931 Engineering Physics II and Laboratory

### Degree Requirements

Students seeking the Bachelor of Science degree in Mechanical Engineering must complete the following semester credit hours, as well as the Core Curriculum requirements and General Engineering requirements:

A. 61 semester credit hours of required foundation and general mechanical engineering courses:

- EE 2213 Electric Circuits and Electronics  
- EGR 2103 Statics  
- EGR 2513 Dynamics  
- EGR 3323 Applied Engineering Analysis II  
- ME 1302 Mechanical Engineering Practice  
- ME 1402 Mechanical Engineering Practice and Graphics  
- ME 2173 Numerical Methods  
- ME 3113 Measurements and Instrumentation  
- ME 3244 Materials Engineering and Laboratory  
- ME 3263 Manufacturing Engineering  
- ME 3293 Thermodynamics I  
- ME 3543 Dynamic Systems and Control  
- ME 3663 Fluid Mechanics  
- ME 3813 Mechanics of Solids  
- ME 3823 Machine Element Design  
- ME 4293 Thermodynamics II  
- ME 4313 Heat Transfer  
- ME 4543 Mechatronics  
- ME 4733 Mechanical Engineering Laboratory  
- ME 4812 Senior Design I  
- ME 4813 Senior Design II
B. 9 semester credit hours of Mechanical Engineering elective courses. Students are encouraged to choose courses from a specific concentration listed below.

C. 3 semester credit hours of approved mathematics or basic science elective courses. A list of acceptable courses is available in the College of Engineering Undergraduate Advising Center.

**Concentration: Energy, Thermal and Fluid Systems**

- ME 4183 Compressible Flow and Propulsion Systems
- ME 4323 Thermal Systems Design
- ME 4343 Heating, Air Conditioning, and Refrigeration Design
- ME 4593 Alternative Energy Sources
- ME 4613 Power Plant System Design
- ME 4623 Internal Combustion Engines
- ME 4663 Fluid Systems Design

**Concentration: Manufacturing Engineering and Systems**

- ME 4563 Computer Integrated Manufacturing
- ME 4573 Facilities Planning and Design
- ME 4583 Enterprise Process Engineering

**Concentration: Mechanical Systems and Design**

- ME 3323 Mechanical Vibration
- ME 4133 CAD/CAE
- ME 4553 Automotive Vehicle Dynamics
- ME 4673 Mechanical Systems Design
- ME 4723 Reliability and Quality Control in Engineering Design
- ME 4773 Fundamentals of Robotics

**Concentration: Mechanics and Materials**

- ME 4243 Intermediate Materials Engineering
- ME 4603 Finite Element Analysis
- ME 4963 Bioengineering

**Concentration: General Mechanical Engineering**

Courses selected from any of the previous areas
- EGR 4993 Honors Research*
- ME 4953 Special Studies in Mechanical Engineering*
- Graduate Courses in Mechanical Engineering†

*With prior approval, these courses may be used as a technical elective.
†Graduate courses require approval. Forms are available in the College of Engineering Undergraduate Advising Center.