Bachelor of Science in Mechanical Engineering

Mechanical Engineering (BSME)

Xiaoyu Zhang, Chief Departmental Advisor

The mechanical engineering program is among the most basic of all engineering programs, with a curriculum that embraces the major areas of power, design, and fluid or solid mechanics. Seniors may select a number of elective classes, approved by their advisor, providing a focus on specialties such as:

1. Power/energy conversion
2. Mechanical systems/design
3. Aerospace engineering
4. Other

The program is designed to prepare its graduates for professional practice in many facets of engineering, such as research, development, design, planning, testing, management, and consulting. The graduate is prepared to undertake challenging and creative engineering work in almost any industry, government agency, research organization, or consulting firm. The program also provides an excellent preparation for graduate school and the Fundamentals of Engineering (FE) Exam.

An undergraduate student handbook providing rules and a detailed semester-by-semester plan for the program is available on the department's website. Courses are routinely scheduled in the late afternoon and evening to accommodate students with current employment.

Outcomes

The Mechanical and Aerospace Engineering Department has adopted, after deliberations by its constituents, 7 outcomes for the BSME program. These outcomes are listed below. The students who qualify for graduation will:

1. Proficiency in mathematics, calculus-based physics, and engineering science, and an ability to apply knowledge in these areas to identify, formulate, and solve mechanical engineering problems.
2. An ability to design an engineering system, component, or process to meet specified needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
3. An ability to present ideas and technical material to diverse audiences visually, verbally, and in writing.
4. An ability to recognize professional and ethical responsibilities and professional practice issues and to acquire the broad education necessary to make informed judgments, which must consider the impact of engineering solutions in a global, economic, environmental, and societal context.
5. An ability to function effectively as a member or a leader of a team that establishes goals, plans tasks, meets deadlines, and creates a collaborative and inclusive environment.
6. An ability to design and conduct experiments and to critically analyze and interpret data in various mechanical engineering areas.
7. An ability to recognize the ongoing need to acquire and apply new knowledge as needed.

Mechanical Engineering Objectives

The program’s educational objectives describe the career and professional accomplishmens that the program is preparing graduates to attain within a few years after graduation. The educational objectives of the mechanical engineering program, established with participation of all constituencies, are consistent with the mission of Old Dominion University and the Department of Mechanical and Aerospace Engineering.

The objectives of the mechanical engineering undergraduate program at Old Dominion University are that our graduates should accomplish the following:

1. To establish themselves as successful professionals in the general areas of thermal/fluid systems, mechanical systems and design, and materials and manufacturing in industry and government settings by demonstrating their ability to:
   a. Conduct themselves consistently in a responsible, professional and ethical manner.
   b. Participate in continuing education, research and development, and in other lifelong creative efforts in science and technology.
   c. Lead others in support of activities that promote service to, and economic development of, the community, the region, state and nation.
2. To successfully pursue and complete graduate programs in mechanical engineering, aerospace engineering or a related field if they so desire.

Accreditation

The Bachelor of Science in Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET. (http://www.abet.org)

Requirements

Lower-Division General Education

Written Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#written) 6
Oral Communication (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#oral) 3
Mathematics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#math) 3
Language and Culture (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#language) 0-6
Information Literacy and Research (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#information) 3
Human Behavior (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#behavior) 3
Human Creativity (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#creativity) 3
Interpreting the Past (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#interpret) 3
Literature (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#literature) 3
Philosophy and Ethics (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#philosophy) 3
The Nature of Science (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#nature) 8
Impact of Technology (http://catalog.odu.edu/undergraduate/requirements-undergraduate-degrees/#impact) 3

General Education requirements in information literacy and research and impact of technology are met through the major. For additional information consult the department undergraduate handbook.

Upper-Division General Education

- Option A. Approved Minor, 12-24 credit hours; also second degree or second major
- Option B. Interdisciplinary Minor; 12 credit hours, (3 credit hours may be in the major area of study)
- Option C. An approved certification program such as teaching licensure (hours vary)
Requirements for Graduation

Requirements for graduation include the following:

- Minimum of 120 credit hours.
- Minimum of 30 credit hours overall and 12 credit hours of upper-level courses in the major program from Old Dominion University.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward the major.
- Minimum overall cumulative grade point average of C (2.00) in all courses taken toward a minor.
- Completion of ENGL 110C, ENGL 211C or ENGL 231C, and the writing intensive (W) course in the major with a grade of C or better. The W course must be taken at Old Dominion University.
- Completion of Senior Assessment.

Meant to provide guidance, the Degree Program Guide is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

Mechanical Engineering Grade Requirements

Mechanical engineering majors must earn a grade of C or better in the following courses in order to continue to progress through the program:

- ENGL 110C: English Composition (3 credit hours)
- MATH 211: Calculus I (4 credit hours)
- ENGL 211C: Writing, Rhetoric, and Research (3 credit hours)
- MATH 212: Calculus II (4 credit hours)
- CHEM 121N: Foundations of Chemistry I Lecture (3 credit hours)
- PHYS 231N: University Physics I (4 credit hours)
- MAE 201: Materials Science (3 credit hours)
- MAE 204: Engineering Mechanics I - Statics (3 credit hours)
- MAE 205: Dynamics (3 credit hours)
- MAE 220: Engineering Mechanics II - Solid Mechanics (3 credit hours)
- MAE 303: Mechanics of Fluids (3 credit hours)
- MAE 311: Thermodynamics I (3 credit hours)
- MAE 332: Mechanical Engineering Design I (3 credit hours)
- MAE 434W: Project Design and Management I (3 credit hours)

General Education

- Complete lower-division requirements (35-41 credit hours)
- Complete upper-division requirements (minimum of 6 credit hours)

Mechanical Engineering Major

- Complete mechanical engineering major requirements as shown in the degree program guide (87 credit hours)

Total Credit Hours: 128-134

Additional Requirements and Information

Continuance Regulations

It is the policy of the Department of Mechanical and Aerospace Engineering to deny a student eligibility to enroll in program courses after it becomes evident that he or she is either unable or unwilling to maintain reasonable standards of academic achievement. Required courses are all those specifically listed above. Major GPA is calculated based on courses with an MAE prefix.

1. Warning. A student will be placed on departmental academic warning if his or her major grade point average falls below 2.0 after six or more hours have been attempted in the major. Students on academic warning are expected to consult with their departmental advisors and to take immediate steps to improve their major GPA.

2. A student will be placed on departmental academic probation whenever his or her major grade point average falls below 2.00 for two consecutive semesters of enrollment. Students on academic probation are expected to improve their major GPA to 2.0 or above in no more than one additional regular semester (Fall or Spring). University rules for grade forgiveness will apply.

3. A student is subject to termination from the program if his or her major GPA remains below 2.0 after the additional regular semester on probation.

4. Students are expected to achieve the required grade (i.e. pass or C) in all required classes in no more than three completed attempts. Failure to do so renders the student subject to immediate termination from the program.

Appeals of termination from the program are in order if extenuating circumstances warrant. Appeals are to be made in writing to the chair of the department. Once the appeal is submitted, it is considered by the faculty of the department.

Degree Program Guide

The Degree Program Guide is a suggested curriculum to complete this degree program in four years. It is just one of several plans that will work and is presented only as broad guidance to students. Each student is strongly encouraged to develop a customized plan in consultation with their academic advisor. Additional information can also be found in Degree Works.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>MATH 211</td>
<td>Calculus I (grade of C or better)</td>
<td>4</td>
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<tr>
<td>CHEM 121N</td>
<td>Foundations of Chemistry I Lecture (grade of C or better)</td>
<td>3</td>
</tr>
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<td>University Physics I (grade of C or better)</td>
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<tr>
<td>MAE 201</td>
<td>Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>MAE 204</td>
<td>Engineering Mechanics I - Statics</td>
<td>3</td>
</tr>
<tr>
<td>MAE 205</td>
<td>Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>MAE 220</td>
<td>Engineering Mechanics II - Solid Mechanics</td>
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<tr>
<td>MAE 332</td>
<td>Mechanical Engineering Design I</td>
<td>3</td>
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<tr>
<td>MAE 434W</td>
<td>Project Design and Management I</td>
<td>3</td>
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Credit Hours: 16

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<tr>
<td>MATH 212</td>
<td>Calculus II (grade of C or better)</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 231N</td>
<td>University Physics I (grade of C or better)</td>
<td>4</td>
</tr>
<tr>
<td>MET 230</td>
<td>Engineering Graphics and Computer Solid Modeling</td>
<td>3</td>
</tr>
<tr>
<td>MAE 111</td>
<td>Mechanical and Aerospace Engineering Information Literacy and Research</td>
<td>2</td>
</tr>
<tr>
<td>ENGN 150</td>
<td>Computer Programming for Engineering Problem Solving</td>
<td>4</td>
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</table>

Credit Hours: 17

Sophomore

Fall

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<tbody>
<tr>
<td>PHYS 232N</td>
<td>University Physics II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 312</td>
<td>Calculus III (285)</td>
<td>4</td>
</tr>
<tr>
<td>MAE 204</td>
<td>Engineering Mechanics I - Statics (grade of C or better)</td>
<td>3</td>
</tr>
</tbody>
</table>
MAE 201  Materials Science (grade of C or better required)  3
MAE 203  Mechanical Engineering Laboratory I - Materials Science  1
ENGL 211C or ENGL 231C  Writing, Rhetoric, and Research (grade of C or better required) or Writing, Rhetoric, and Research: Special Topics  3

Credit Hours  18

Spring
MAE 205  Dynamics (grade of C or better required)  3
MAE 220  Engineering Mechanics II - Solid Mechanics (grade of C or better required)  3
MAE 225  Mechanical Engineering Laboratory II - Solid Mechanics  1
MATH 307  Ordinary Differential Equations (280)  3
Interpreting the Past Way of Knowing  3
STAT 330  An Introduction to Probability and Statistics  3

Credit Hours  16

Junior
Fall
MAE 303  Mechanics of Fluids (grade of C or better required)  3
MAE 305  Mechanical Engineering Laboratory III - Thermo/Fluids  1
MAE 311  Thermodynamics I (grade of C or better required)  3
MAE 340  Computational Methods in Mechanical Engineering  3

Credit Hours  16

Spring
MAE 312  Thermodynamics II  3
MAE 332  Mechanical Engineering Design I (grade of C or better required)  3
MAE 315  Heat and Mass Transfer  3
MAE 336  Electromechanical Systems  3
Philosophy and Ethics Way of Knowing  3
Human Behavior Way of Knowing  3

Credit Hours  18

Senior
Fall
MAE 433  Mechanical Engineering Design II  3
MAE 434W  Project Design and Management I (grade of C or better required)  3
MAE 436  Dynamic Systems and Control  3
MAE Option Course  3

Credit Hours  15

Fall
MAE 435  Project Design and Management II  3
MAE Option Course  3
Upper-Division General Education course  3

Credit Hours  12

Total Credit Hours  128

* Does not include the University's General Education language and culture requirement. Additional hours may be required.
** ENMA 480 is preferred.

Senior Electives
In the senior year, students should select their three elective courses to support a chosen specialty area. Examples include:

1. Power/energy: three courses from MAE 411, MAE 412, MAE 413, MAE 414, MAE 417, MAE 438, MAE 440
2. Mechanical systems design: three courses from MAE 404, MAE 422, MAE 431, MAE 438, MAE 440, MAE 441
3. Aerospace: three courses from MAE 403, MAE 406, MAE 417, MAE 420 (or MAE 440), MAE 438, MAE 460
4. Alternative combinations may be selected with advisor approval.

Linked Bachelor's/Master's Degree Programs
These are designed to allow qualified students to secure a space in a master's program available in the Frank Batten College of Engineering and Technology while they are still pursuing their undergraduate degrees. An eligible student can choose a master's program in the same discipline as his/her bachelor's program or in a complementary discipline. Subject to the approval of the undergraduate and graduate program directors, a student enrolled in a linked program can count up to six credit hours of course work towards both the undergraduate and the graduate degrees. Full-time students may be able to complete the requirements for the bachelor's degree in four years and the master's degree in one additional year. Students in linked programs must earn a minimum of 150 credit hours (120 discrete credit hours for the undergraduate degree and 30 discrete credit hours for the graduate degree).

Students who are matriculated in an undergraduate major in the Frank Batten College of Engineering and Technology with a GPA of at least 3.00 overall and 3.00 in the major are eligible to apply for admission to a linked bachelor's/master's program. Transfer students who desire to be admitted to a linked program at the time they join an undergraduate major at Old Dominion University are eligible to apply if their overall GPA at their previous institution is 3.25 or higher. Prerequisite courses may be required for engineering technology majors to pursue a master's degree in engineering.

Continuance in a linked bachelor's/master's program requires maintenance of a GPA of 3.00 or higher overall and in the major.

Bachelor-to-PhD Programs
For a select number of exceptionally well-qualified students, the college has established a linked doctoral program that enables students to be admitted directly into the PhD program upon completion of the baccalaureate degree. A select number of exceptionally well-qualified students can be admitted to the Bachelor/PhD program in their junior year while they are pursuing one of the undergraduate programs at Old Dominion University. This program encourages admitted students to work closely with faculty members and pursue a research experience. Just as in the linked Bachelor/MS program, six credit hours of graduate course work may again be counted towards the undergraduate degree and doctoral course work mentioned above for
the Bachelor/PhD program. For linked bachelor's to doctoral programs, students must earn a minimum of 198 credit hours (120 discrete credit hours for the undergraduate degree and 78 discrete credit hours for the graduate degree). Students in these programs must maintain a GPA of 3.50 or better throughout their bachelor's and doctoral studies.

The student may opt to obtain the master's degree along the way to the doctorate. To obtain the master's degree, the student must utilize the six graduate credits obtained as part of their undergraduate program, use 18 credits of the graduate course work that is part of the PhD, and also write a master's thesis.