

MECHANICAL ENGINEERING

College of Engineering and Mines
Department of Mechanical Engineering
907-474-7136
<http://cem.uaf.edu/me/>

BS, BS/MS Degrees

Minimum Requirements for Degree: BS: 130 credits;
BS/MS: 151 credits

The mission of the mechanical engineering department at UAF is to offer the highest quality contemporary education at undergraduate and graduate levels, and to perform research appropriate to the technical needs of the state of Alaska, the nation and the world.

Mechanical engineers conceive, plan, design and direct the manufacturing, distribution and operation of a wide variety of devices, machines and systems for energy conversion, environmental control, materials processing, transportation, materials handling and other purposes. Mechanical engineers are engaged in creative design, applied research, development and management. A degree in mechanical engineering also frequently forms the base for entering law, medical or business school, as well as for graduate work in engineering.

The objectives of the mechanical engineering program are to produce graduates who are able to compete successfully on the world stage at the professional level; deal with the significant local, regional, national and global issues facing humankind; continue to develop as engineers through lifelong learning; and serve as resources of technical knowledge for the state as well as the nation, especially with respect to northern issues. The Engineering Accreditation Commission of ABET has accredited the BS degree program in mechanical engineering since 1980.

Because engineering is based on mathematics, chemistry and physics, students are introduced to the basic principles in these areas during their first two years of study. The third year encompasses courses in the engineering science — extensions to the basic sciences forming the foundation to engineering synthesis and design. The design project course draws on much of the student's previous learning through a simulated industrial design project. Throughout the four-year program, courses in communication, humanities and social sciences are required because mechanical engineers must be able to communicate effectively in written, oral and graphical form.

Students may choose an emphasis in aerospace or petroleum engineering. Because of UAF's unique location, special emphasis is placed on cold regions engineering problems. This fact is highlighted in the technical elective, arctic engineering. Candidates for the BS degree in mechanical engineering are required to take the State of Alaska Fundamentals of Engineering examination in their general field.

Undergraduate students who plan to pursue graduate studies in engineering may also choose an accelerated degree for a master's in mechanical engineering. This program speeds the process and allows qualified mechanical engineering students to complete both a bachelor of science and a master of science degree in five years.

Major — BS Degree

1. Complete the general university requirements. (See page 131. As part of the core curriculum requirements, complete MATH F200X, CHEM F105X and CHEM F106X.)
2. Complete the BS degree requirements. (See page 136. As part of the BS degree requirements, complete MATH F201X, PHYS F211X and PHYS F212X.)
3. Complete the following program (major) requirements:
 - ES F101—Introduction to Engineering.....3
 - ES F201—Computer Techniques.....3
 - ES F209—Statics.....3
 - ES F210—Dynamics.....3
 - ES F301—Engineering Analysis.....3

ES F307—Elements of Electrical Engineering.....	3
ES F331—Mechanics of Materials.....	3
ES F341—Fluid Mechanics.....	4
ES F346—Basic Thermodynamics.....	3
ESM F450W—Economic Analysis and Operations.....	3
MATH F202X—Calculus III.....	4
MATH F302—Differential Equations.....	3
ME F302—Dynamics of Machinery.....	4
ME F308—Measurement and Instrumentation.....	3
ME F313—Mechanical Engineering Thermodynamics.....	3
ME F321—Industrial Processes.....	3
ME F334—Elements of Material Science/Engineering.....	3
ME F403—Machine Design.....	3
ME F408—Mechanical Vibrations.....	3
ME F415W—Thermal Systems Laboratory.....	3
ME F441—Heat and Mass Transfer.....	3
ME F486—Senior Design.....	1
ME F487W,O—Design Project.....	3
ME electives**.....	6
Technical electives***.....	3

4. Minimum credits required130

* Students must earn a C- grade or better in each of the program (major) requirements, with exception of ES F101.

** Mechanical engineering course at F400-level or above.

*** Engineering course at F400-level or above.

Note: Students electing to complete an emphasis in aerospace engineering must complete the sequence of aerospace courses (ME F450, F451, F452 and F453) as part of their program requirements and complete a senior design project that is related to aerospace engineering.

Note: Students electing to complete an emphasis in petroleum engineering must complete the sequence of petroleum-related courses (ME F409; ME F416; PETE F407; PETE F426) as part of their program requirements and complete a senior design project that is related to petroleum engineering.

Note: Students must plan their elective courses in consultation with their mechanical engineering faculty advisor, and obtain the advisor's approval for all elective courses.

Major — BS/MS Degree

1. Complete the following admission requirements:
 - a. ME major (junior preferred) or senior standing.
 - b. GPA 3.25 or above (based on minimum of 24 credits in ME major requirements). Students must maintain a cumulative GPA of 3.0 to remain in the program.
 - c. Submit three letters of reference.
 - d. Submit GRE (general) scores.
 - e. Submit a study goal statement.
 - f. Submit a UAF graduate application for admission.
2. Complete the general university requirements (page 131).
3. Complete the BS degree requirements. (See page 136. As part of the BS degree requirements, complete: MATH F201X, PHYS F211X and PHYS F212X.)
4. Complete the master's degree requirements (page 206).
5. Complete the following BS program (major) requirements:
 - ES F101—Introduction to Engineering.....3
 - ES F201—Computer Techniques.....3
 - ES F209—Statics.....3
 - ES F210—Dynamics.....3
 - ES F301—Engineering Analysis.....3
 - ES F307—Elements of Electrical Engineering.....3
 - ES F331—Mechanics of Materials.....3
 - ES F341—Fluid Mechanics.....4
 - ES F346—Basic Thermodynamics.....3
 - ESM F450W—Economic Analysis and Operations.....3
 - MATH F202X—Calculus.....4
 - MATH F302—Differential Equations.....3
 - ME F302—Dynamics of Machinery.....4

ME F308—Measurement and Instrumentation	3
ME F313—Mechanical Engineering Thermodynamics.....	3
ME F321—Industrial Processes.....	3
ME F334—Elements of Materials Science/Engineering	3
ME F403—Machine Design	3
ME F408—Mechanical Vibrations	3
ME F415W—Thermal Systems Laboratory.....	3
ME F441—Heat and Mass Transfer	3
ME F486—Senior Design.....	1
ME F487W/O— Design Project	3
6. Complete the following MS program (major) requirements:	
ME F608—Advanced Dynamics	3
ME F631—Advanced Mechanics of Materials.....	3
ME F634—Advanced Materials Engineering.....	3
ME F641—Advanced Fluid Mechanics	3
ME F642—Advanced Heat Transfer.....	3
7. Complete the thesis or non-thesis requirements:	
Thesis	
ME F699—Thesis	6
Electives	9
(Electives approved by student’s advisory committee with at least 3 credits at the graduate level)	
Non-Thesis	
ME F698—Project	3
Electives	12
(Electives approved by student’s advisory committee with at least 6 credits at the graduate level)	
8. Minimum credits required for both degrees.....	151

Note: This degree program must be completed in seven years or the student will be disqualified from the program. If a student is disqualified for exceeding the seven year limit, a mechanical engineering BS degree will be awarded if: 1) course work is completed in 10 years, and 2) the student meets all ME BS requirements.

Baccalaureate Core Requirements

Communication 9 Credits

- ENGL F111X—Introduction to Academic Writing.....(3)
ENGL F190H may be substituted.

Complete one of the following:

- ENGL F211X—Academic Writing about Literature.....(3)
- ENGL F213X—Academic Writing about the Social and Natural Sciences.....(3)

Complete one of the following:

- COMM F131X—Fundamentals of Oral Communication: Group Context.....(3)
- COMM F141X—Fundamentals of Oral Communication: Public Context.....(3)

9

Perspectives on the Human Condition 18 Credits

Complete all of the following four courses:

- ANTH F100X/SOC F100X—Individual, Society and Culture.....(3)
- ECON F100X or PS F100X—Political Economy.....(3)
- HIST F100X—Modern World History.....(3)
- ENGL/FL F200X—World Literature.....(3)

12

Complete one of the following three courses:

- ART/MUS/THR F200X—Aesthetic Appreciation: Interrelationship of Art, Drama and Music.....(3)
- HUM F201X—Unity in the Arts.....(3)
- ANS F202X—Aesthetic Appreciation of Alaskan Native Performance.....(3)

3

Complete one of the following six courses:

- BA F323X—Business Ethics.....(3)
- COMM F300X—Communicating Ethics.....(3)
- JUST F300X—Ethics and Justice.....(3)
- NRM F303X—Environmental Ethics and Actions.....(3)
- PS F300X—Ethics and Society.....(3)
- PHIL F322X—Ethics.....(3)

3

Or complete 12 credits from the above courses plus one of the following:

- Two semester-length courses in a single Alaska Native language or other non-English language
- Three semester-length courses (9 credits) in American Sign Language taken at the university level.

6 – 9

Mathematics 3 Credits

Complete one of the following:

- MATH F103X—Concepts and Contemporary Applications of Mathematics.....(3)
 - MATH F107X—Functions for Calculus*.....(4)
 - MATH F161X—Algebra for Business and Economics**.....(3)
 - STAT F200X—Elementary Probability and Statistics.....(3)
- * No credit may be earned for more than one of MATH F107X or F161X.

Or complete one of the following*:

- MATH F200X—Calculus I**.....(4)
- MATH F201X—Calculus II.....(4)
- MATH F202X—Calculus III.....(4)
- MATH F262X—Calculus for Business and Economics.....(4)
- MATH F272X—Calculus for Life Sciences.....(4)

* Or any math course having one of these as a prerequisite

** No credit may be earned for more than one of Math F200X, F262X or F272.

3 – 4

Natural Sciences 8 Credits

Complete any two (4-credit) courses.

- ATM F101X—Weather and Climate of Alaska.....(4)
- BIOL F100X—Human Biology.....(4)
- BIOL F101X—Biology of Sex.....(4)
- BIOL F103X—Biology and Society.....(4)
- BIOL F104X—Natural History.....(4)
- BIOL F115X—Fundamentals of Biology I.....(4)
- BIOL F116X—Fundamentals of Biology II.....(4)
- BIOL F120X—Introduction to Human Nutrition.....(4)
- BIOL F213X—Human Anatomy and Physiology I.....(4)
- BIOL F214X—Human Anatomy and Physiology II.....(4)
- CHEM F100X—Chemistry in Complex Systems.....(4)
- CHEM F103X—Basic General Chemistry.....(4)
- CHEM F104X—Beginnings in Biochemistry.....(4)
- CHEM F105X—General Chemistry.....(4)
- CHEM F106X—General Chemistry.....(4)
- GEOG F111X—Earth and Environment: Elements of Physical Geography.....(4)
- GEOS F100X—Introduction to Earth Science.....(4)
- GEOS F101X—The Dynamic Earth.....(4)
- GEOS F106X—Life and the Age of Dinosaurs.....(4)
- GEOS F112X—History of Earth and Life.....(4)
- GEOS F120X—Glaciers, Earthquakes and Volcanoes.....(4)
- GEOS F125X—Humans, Earth and Environment.....(4)
- MSL F111X—The Oceans.....(4)
- PHYS F102X—Energy and Society.....(4)
- PHYS F103X—College Physics.....(4)
- PHYS F104X—College Physics.....(4)
- PHYS F115X—Physical Science I.....(4)
- PHYS F175X—Astronomy.....(4)
- PHYS F211X—General Physics.....(4)
- PHYS F212X—General Physics.....(4)
- PHYS F213X—Elementary Modern Physics.....(4)

8

Library and Information Research 0 – 1 Credit

- Successful completion of library skills competency test or LS F100X or LS F101X prior to junior standing

0 – 1

Upper-Division Writing and Oral Communication

Complete the following at the upper-division level:

- Two writing intensive courses designated (W) and one oral communication intensive course designated (O), or two oral communication intensive courses designated (O/2) (see degree and/or major requirements)

Total credits required 38 – 39

All degrees (e.g. B.A., B.S., etc.) require additional courses.

Refer to specific degree and program requirements.

Students must earn a C- grade or better in each course used toward the baccalaureate core.