

Mechanical Engineering Elective Program

Approved October 9, 2018

(Applies to students starting their Freshman year after June 2018
or students entering the Mechanical Engineering Program after January 1, 2020)

Background

All students in the mechanical engineering program are required to take a set of “core” classes to ensure that they have a solid grounding in the fundamentals of mechanical engineering¹. However, as you approach graduation, you are encouraged to take courses that address your special interests. These are the “elective” classes.

Three elective classes are required for graduation. Two are termed “technical electives”: specialized engineering classes that go beyond the core². The third is a “specialization elective”, which may be taken from any department³.

The intent of including elective classes as part of your graduation requirements is to enable you to customize your program to best match your personal career goals. For example, say you would like to work in the field of biomedical devices. In that case, you might choose two ME 5XXX classes that are useful toward that goal as Technical Electives plus a class from the Biomedical Engineering or Physiology department as your specialization elective.

We recommend that you take the classes that will best prepare you to obtain the job that you

most want when you graduate. If you are instead planning to attend graduate school, choose classes that will best prepare you to work on your ideal graduate research topic. The Mechanical Engineering faculty advising team is available to make suggestions to best meet your needs.

Procedure

1. Develop your elective program in consultation with a mechanical engineering advisor. (Appointments are scheduled at: <http://meadvising.appointments.umn.edu>.) You must have your elective program approved and signed by an advisor (see Requirement #1).
2. Technical electives are taken after completing most or all of the 3XXX level core classes, as they build on the foundation of knowledge acquired in those classes. As with any class, you must complete all prerequisites before taking an elective class.
3. Due to their specialized nature, technical elective classes are typically offered only once a year, or once every two years. As a result, plan ahead to enable you to take the technical elective classes that you most want.
4. Your electives will be entered into your APAS report after you submit an Elective Program Form, signed by an advisor, to the Student Advising Office (ME 1120).

¹The core classes are ME 2011, AEM 3031, EE 3005/6, IE 3521, ME 3221, ME 3222, ME 3281, ME 3331, ME 3332, ME 3333, ME 4031W, ME 4053 and ME 4054W.

²Note that technical elective classes are typically not more difficult than the core classes; rather, they are more specialized.

³A specialization elective is precisely defined in Requirement 4 on page 2.

5. Discuss your intended elective choices with your advisor in advance of taking them to ensure that no surprises arise when seeking your advisor's approval of your program.

Requirements

1. Your Elective Program must be approved by a Mechanical Engineering Advisor. You must submit your signed Elective Program Form to the Student Advising Office (ME 1120) no later than two weeks prior to the first day of your final semester.
2. You must take a minimum of 8 semester credits of technical electives and a minimum of 3 semester credits of specialization electives. Most students will take a total of 12 credits of electives.

3. A technical elective is any 4XXX or 5XXX class taken from the University of Minnesota Mechanical Engineering Department that is not a core class⁴ nor a senior lab⁵.

Students may request, by petition⁶, to use 4XXX or 5XXX classes from other departments in the College of Science and Engineering (CSE) as technical electives. Such classes must have technical depth comparable to technical elective classes in mechanical engineering to be considered. The petition must be submitted to ME 1120 no later than two weeks prior to the beginning of the semester that the student intends to take the class. The petition should state all courses that the student intends to use as technical electives.

4. A specialization elective is any 3 or 4 credit class offered at the University of Minnesota

⁴The core classes are listed in Footnote 1.

⁵See Requirement 6 for conditions for which senior labs may be counted as Technical Electives.

⁶The petition form is available at:

<http://policy.umn.edu/forms/otr/otr172.pdf>

You can submit your petition at the Student Advising Office, ME 1120.

at the 3XXX level or above which (1) complements your career goals in mechanical engineering in some way, (2) is substantive⁷, (3) has content which is not overly redundant with any of your other classes, and (4) is not being used to fulfill a liberal education core or theme requirement.

A current list of classes that are accepted as specialization electives is available from your APAS report.

Alternatively, you may request to use a class outside of this list, including classes outside of CSE, as a specialization elective if it meets the four constraints listed above. If you would like to make such a request, you must provide a brief explanation of how your specialization elective choice will enhance your career in mechanical engineering. A box is included on the Elective Program Form where you can provide that explanation. You must have your Elective Program Form signed by a mechanical engineering faculty advisor to approve your request. Please have your request for a non-listed specialization elective approved by a mechanical engineering advisor prior to starting the class; otherwise, you have no guarantee that the non-listed class will be accepted as your specialization elective.

5. All courses used as electives must be taken on an "A-F" grading scale.
6. You must take one Senior Lab outside of the Elective Program. You are allowed to take additional Senior Labs as technical electives.

Special Cases

1. Students may take a third technical elective class to fulfill the specialization elective requirement.

⁷A good measure of substance is whether the class has a prerequisite.

2. The elective program of students who complete all three co-operative work training classes will consist of ME 3041, ME 4043W, ME 4044, plus one 4 credit technical elective class from the University of Minnesota Mechanical Engineering Department⁸.
3. The elective program of students who complete two co-operative work training classes will consist of ME 3041, ME 4043W, one 4 credit technical elective class from the University of Minnesota Mechanical Engineering Department, and one specialization elective⁸.
4. ME 3041 alone may not be used for elective credit if not followed up by ME 4043W. ME 4043W may not be used in combination with ME 4090 to fulfill the technical elective requirements.
5. Internships with companies may not be used for elective credit.
6. The Honors Thesis classes, ME 4081H and ME 4082H, may be used as either specialization electives or technical electives. ME 4081H and ME 4082H may not be used in combination with ME 4090 nor ME 4043W to fulfill the technical elective requirements.
7. The ME 4090 "Advanced Engineering Problems" class may be used as a technical elective if it meets the following requirements:
 - (a) The project must be advised by a regular faculty member of the Mechanical Engineering Department.
 - (b) The student must register for 3-4 credits of ME 4090. (This implies 9-12 hours of effort per week on the project for the 15 week semester.)
 - (c) No later than the second week of the semester in which they enroll for the course, the student must submit a one-page proposal of what they intend to do for their project. The proposal must be printed and delivered to ME 1120 (the Mechanical Engineering Student Advising Office). The proposal must be written by the student but approved by their course advisor. Approval is indicated by the advisor's signature.
 - (d) The student must write a final report for their project. The final report must be approved by the student's course advisor. A printed copy of the final report must be filed in ME 1120.
 - (e) The total elective package proposed by the student, which includes ME 4090, must be approved by an ME faculty advisor (see Requirement 1).
8. Global seminar classes of 3 or more credits may be used as specialization electives, even if they do not require a prerequisite. Global seminars do not qualify as Technical Electives.
9. ME 3990 (Curricular Practical Training) may not be used as an elective.
10. Only Honors students are allowed to use 8XXX classes as electives. An Honors student must obtain the permission of the instructor to register for an 8XXX class.
11. Students who study abroad for one semester or one academic year may be allowed to utilize some classes taken abroad as electives. Potential elective classes from international institutions must be approved by the Director of Undergraduate Studies. These students must take at least one technical elective class⁹ from the University of Minnesota Mechanical Engineering Department.

⁸ME 4053 is a prerequisite to ME 4054W. However, if completing ME 4053 prior to ME 4054W would lead to delay of graduation for a student who completes both ME 3041 and ME 4043W, they may request to take ME 4053 concurrently with ME 4054W by petition (see Footnote 6).

⁹ME 4090 may not be used as a Technical Elective for students for which Special Case #11 applies.

Suggestions for Technical Elective Classes by Subject Area

Environmental

- ME 5101 Vapor Cycle Systems
- ME 5103 Thermal Environmental Engineering
- ME 5113 Aerosol/Particle Engineering
- ME 5133 Aerosol Measurement Laboratory
- ME 5312 Solar Thermal Technologies

Design & Manufacturing

- ME 5221 Computer Assisted Product
Realization
- ME 5223 Materials in Design
- ME 5228 Introduction to Finite Element
Modeling, Analysis, and Design
- ME 5229 Finite Element Method for
Computational Mechanics:
Transient/Dynamic
Applications
- ME 5241 Computer-Aided Engineering
- ME 5243 Advanced Mechanism Design
- ME 5247 Stress Analysis, Sensing and
Transducers
- ME 5248¹⁰ Vibration Engineering
- ME 5281 Analog & Digital Control
- ME 5286 Robotics

Thermal Sciences

(Power & Propulsion, Thermodynamics,
Heat Transfer, Fluid Mechanics)

- ME 5101 Vapor Cycle Systems
- ME 5312 Solar Thermal Technologies
- ME 5332 Intermediate Fluid Mechanics
- ME 5341 Case Studies in Thermal
Engineering and Design
- ME 5344 Thermodynamics of Fluid Flow
with Applications
- ME 5351 Computational Heat Transfer
- ME 5446 Introduction to Combustion
- ME 5461 Internal Combustion Engines
- ME 5462 Gas Turbines
- ME 5666 Modern Thermodynamics

¹⁰May be used as either a senior lab or a technical elective but not both.