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 engineering\(^1\). However, as you approach graduation, you will take additional classes which fit your particular interests and add depth to your mechanical engineering knowledge base. These classes constitute your technical electives: specialized classes that go beyond the core\(^2\).

The intent of the technical elective program is to enable you to customize your program to best match your personal career goals. 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 advising staff is available to make suggestions to best meet your needs.

Procedure

1. Develop your technical elective program in consultation with a mechanical engineering advisor. (Appointments are scheduled in the Student Advising Office, ME 1120.) You must have your program approved and signed by an advisor (see Requirement #6).

2. Technical electives are taken after completing most of the 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 a technical 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 technical electives will be entered into your APAS report after you submit a Technical Elective Program Form, signed by an advisor, to the Student Advising Office (ME 1120).

5. Because of the uncertainty regarding which technical electives will be scheduled in upcoming semesters, many students choose to submit their Technical Elective Program when they are about to register for their final semester. Nevertheless, discuss your intended technical elective choices with your advisor well in advance of this time to ensure that no surprises arise when seeking your advisor’s approval of your program.

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\(^1\)The 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, and ME 4054W.

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

1. A minimum of 15 semester credits of technical electives are required to graduate.

2. You must take a minimum of 8 credits of technical electives from the University of Minnesota's Mechanical Engineering Department

3. The technical electives taken beyond satisfying the minimum of 8 credits in Mechanical Engineering may also be taken in Mechanical Engineering, but they don’t have to be. Most 4XXX or 5XXX classes offered in any department within the College of Science and Engineering (CSE) can be counted as technical electives, as long as the class adds depth to your mechanical engineering program. If in doubt, ask your advisor.

Classes offered outside of CSE and 3XXX classes within CSE must be petitioned and approved by the Director of Undergraduate Studies in order to be used as technical electives. Most classes in this category will not be accepted, so be sure to obtain approval before enrolling in such a class. A candidate class must contain sufficient technical depth to be consistent with an engineering program. Pre-approved classes are listed on page 4.

4. A maximum of 5 credits of “special topics” classes are allowed on a Technical Elective Program. Special topics classes include ME 4043W (Industrial Assignment II), ME 4081H/4082H (Honors Thesis), ME 4090 (Advanced Engineering Problems), ME 5070 (Topics in Mechanical Engineering), equivalent classes in other departments, and global seminars described in Special Case # 5 (below).

5. You must take one Senior Lab outside of the Technical Elective Program. You are allowed to take additional Senior Labs as technical electives.

6. Your Technical Elective Program must be approved by a Mechanical Engineering Advisor.

Special Cases

1. The co-operative work training classes (ME 3041, ME 4043W and ME 4044) may be used as technical electives, subject to the credit limits described in Requirement 4.

2. Internships with companies may not be used for technical elective credit.

3. The Honors Thesis classes, ME 4081H and ME 4082H, may be used as Technical Electives, subject to the credit limits described in Requirement 4.

4. Only Honors students are allowed to use 8XXX classes as technical electives. An Honors student must obtain the permission of the instructor to register for an 8XXX class.

5. Some, but not all, Global Seminar classes may be used as a technical elective, subject to the credit limits described in Requirement 4. The seminar must include sufficient technical content to qualify as an upper division engineering class. You can request permission to use a Global Seminar as a technical elective.

The following applies to students graduating on or before May 2016 who have a strong interest in Industrial Engineering. You have an option to take at least 4 credits from the Mechanical Engineering Department plus at least 12 credits from the Industrial & Systems Engineering (ISyE) Program. Students who choose this option must consult with an ISyE advisor in addition to an ME advisor. The three ISyE technical electives must satisfy at least 3 of the 4 areas listed at: http://www.isye.umn.edu/program/bme-ieoption.shtml.

The petition form is available at: http://policy.umn.edu/forms/otr/otr172.pdf

Please state all classes that you intend to use as Technical Electives on your petition. You can submit your petition at the Student Advising Office, ME 1120.

Upper division classes are classes that you take following admission to a CSE major.
technical elective by e-mailing the Director of Undergraduate Studies. Please request permission prior to enrolling for the seminar, since not all of them are allowed.

6. Students who study abroad for one semester or one academic year may be allowed to utilize some classes taken abroad as technical electives, although 8 credits of technical electives must still be taken from the University of Minnesota’s Mechanical Engineering Department (see Requirement 2). Any such classes must add depth to your mechanical engineering program. Potential technical elective classes from international institutions must be approved by the Director of Undergraduate Studies.

7. Students enrolled in accredited dual degree programs with outside institutions (so called “3/2 programs”) may be allowed to use one or two upper division classes from their second degree program as technical electives in Mechanical Engineering if these classes add depth to your mechanical engineering program. Requests must be approved by the Director of Undergraduate Studies. Such programs must still meet Requirement 2.

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### Suggestions for Technical Elective Classes by Subject Area

**Environmental**
- ME 5101 Vapor Cycle Systems
- ME 5103 Thermal Environmental Engineering
- ME 5105 HVAC System Design
- ME 5113 Aerosol/Particle Engineering
- ME 5116 Cleanroom Technology and Particle Monitoring
- 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 5241 Computer-Aided Engineering
- ME 5243 Advanced Mechanism Design
- ME 5247 Stress Analysis, Sensing and Transducers
- ME 5248 Vibration Engineering
- ME 5281 Analog & Digital Control
- ME 5286 Robotics

**Thermal Sciences**
(Heat Transfer, Fluid Mechanics, Power & Propulsion, Thermodynamics)
- ME 5101 Vapor Cycle Systems
- ME 5312 Solar Thermal Technologies
- ME 5341 Case Studies in Thermal Engineering and Design
- ME 5344 Thermodynamics of Fluid Flow with Applications
- ME 5348 Heat Transfer in Electronic Equipment
- ME 5351 Computational Heat Transfer
- ME 5381 Biological Transport Processes
- ME 5446 Introduction to Combustion
- ME 5461 Internal Combustion Engines
- ME 5462 Gas Turbines
- ME 5465 Energy – Resources, Technology and Society
- ME 5666 Modern Thermodynamics

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Pre-Approved Classes Outside of CSE

PHSL 3061  Principles of Physiology
PUBH 6171  Exposure Assessment for Air Contaminants
PUBH 6174  Control of Workplace Exposure