Mechanical Engineering Technical Elective Program

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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 at: meadvising.appointments.umn.edu. Advising meetings take place in ME 1120.) You must have your program approved and signed by an advisor (see Requirement #7).

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. All courses used as Technical Electives must be taken on an “A-F” grading scale.

4. 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, but not all, 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.

5. 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 # 6 (below).

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

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

Special Cases

1. The combination of the three co-operative work training classes (ME 3041 + ME 4043W + ME 4044) may be used to fulfill 8 technical elective credits, subject to the credit limits described in Requirement 4. Students who complete the first two co-operative work training classes (ME 3041 + ME 4043W) may use these classes to fulfill 6 technical elective credits, subject to the credit limits described in Requirement 4. ME 3041 alone may not be used for technical elective credit if it is not followed up by ME 4043W.

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

3. Internships may not be used for technical elective credit.

4. ME 3990 (Curricular Practical Training) may not be used as a Technical Elective.

5. Only Honors students are allowed to use 8XXX classes as technical electives. An Honors student must obtain the permission

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3The petition form is available at: [http://policy.umn.edu/forms/otr/otr172.pdf](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.

4Most students who complete ME 3041 + ME 4043W but not ME 4044 take three 3 or 4 credit technical electives to complete their technical elective program.
of the instructor to register for an 8XXX class.

6. Some, but not all, Global Seminar classes may be used as a technical elective, subject to the credit limits described in Requirement 5. The seminar must include sufficient technical content to qualify as an upper division engineering class\(^5\). You can request permission to use a Global Seminar as a technical elective by e-mailing the Director of Undergraduate Studies\(^6\). Please request permission prior to enrolling for the seminar, since not all of them are allowed.

7. 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.

8. If a student intends to use the Advanced Engineering Problems class (ME 4090) as a Technical Elective, then the following requirements must be met:

(a) The project must be advised by a regular faculty member of the Mechanical Engineering Department.

(b) The student must register for 2-4 credits of ME 4090. (This implies 6-12 hours of effort per week on the project for the 15 weeks of the semester.)

(c) The student must submit a one-page proposal of what they intend to do for their project no later than the second week of the semester in which they enroll for the course. 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 adviser. Approval is indicated by obtaining the adviser’s signature.

(d) The student must write a final report for their project. The final report must be approved by the student’s course adviser. A printed copy of the final report must be filed in ME 1120.

(e) ME 4090 technical elective credits are subject to the credit limits described in Requirement 5.

9. 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.

\(^5\)Upper division classes are classes that you take following admission to a CSE major.

\(^6\)ME 3080 is allowed without permission, subject to the credit limits described in Requirement 4.
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

(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 5465 Energy – Resources, Technology and Society
ME 5666 Modern Thermodynamics

Pre-Approved Classes Outside of CSE

PHSL 3061 Principles of Physiology
PUBH 6174 Control of Workplace Exposure

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