Mechanical Engineering 4054/55 Design Projects

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First things first: This document only briefly covers what you need to know. Visit the ME4054 web site at for complete details on the course. Students are responsible for reading all the material on the web site, particularly the "Assignments" and "Course Information" material. You will need the information posted there to complete the first homework assignment. Add ME4054 to your browser bookmarks! Also, be aware that information on the course web site is subject to change, so check back every now and then.

Course Objective

The objective of 4054 is to provide you with an opportunity to use your skills as an engineer in the synthesis of a new product, device or process. Unlike most of the courses you have taken, the design problem you will work on is open-ended and without a unique, "correct" solution. We will teach (and hope that you learn) a methodology of design which you can use to tackle any project that entails synthesis. It is this methodology that we are most concerned with in the course and it is the use of this methodology that distinguishes the professional designer. The class is exciting in that it allows you to apply your creativity to a greater degree than a textbook-style class. We will show you how to amplify your creativity with the resources of your team members and previous course work. Furthermore, we will show you how to ensure that the product you develop is something that your customer really wants. However, success in this course depends entirely on the ability of you and your team members to complete and document a successful design.

Prerequisites

Students registered for ME 4054 and who are graduating under the quarter system must have completed courses 3201, 3203, 3205, 3303, and 5342. Those who are graduating under the semester system must have completed courses 2011, 3031, 3221, 3223, 3321, 3322, AEM 2021, and AEM 3031. Students registered for ME 4055 must have completed ME 4054.

ME 4054 is a 4 credit course and meets the CLE requisite of a Writing Intensive course.

Textbook

This text provides excellent guidelines for managing the design of any product or process. The lecture material is nicely paralleled in the text. You may find it useful to consult the text for further information and examples as you apply the lecture material to your project. The text is available in the bookstore under the ME4054 course number.

Schedule

Tuesdays and Thursdays, 1:25 - 5:30 PM. Lectures are in Room 18 ME. Team meetings are in rooms to be assigned at the start of the course. The on-line class schedule has all the details. Mark on your personal calendar the dates for (1) the first team meeting, (2) the Oral Presentation Workshop, (3) Project site visits, (4) Mid-Project Design Reviews (note that these may run into the evening), (5) the Design Show, (6) the due date of the Final Report, and (7) any other deadlines or due dates marked on the schedule. Let the instructor and your team advisor know immediately if you have any conflicts.

Two team meetings per week are required during the scheduled course times of 1:25 to 5:30 PM on Tuesdays and Thursdays. Please do not schedule work or other conflicts at these times; you will usually need the entire time for your meetings and related work. Meetings will start immediately after lecture, or at 1:25 if there is no lecture.

Course Structure

The class meets as a whole according to the published schedule. The bulk of the work, however, is concerned with the individual design projects which are tackled by your design team under the supervision of your project advisor. The role of the advisor is to advise, not to lead. He or she attends one of the two weekly team meetings, reads your weekly progress memos, listens to a formal project status at the Mid-Project Design Review, attends the Design Show, and reads and evaluates your final report.

The objectives, deliverables and pace of your design project are largely up to your team (in consultation with your advisor); however, there are common assignments which must be delivered on specific due dates for all the teams. See the "Assignments" section of the web to learn about required progress memos, design note books, site visits and other individual and team expectations for the course.

Lectures

The lectures cover a variety of topics important to implementing an effective and efficient design process. You are expected to apply the lecture material to your projects. For example, you are expected to develop a product design specification (Determining Customer Needs lecture), a concept selection chart (Ideation and Concept Screening lecture), a Gantt chart (Project
Management lecture), design cost information (Cost Estimation lecture), and prototypes appropriate to your project.

These materials are appropriate to all projects in some degree, regardless of whether your project topic falls within the realm of design and controls, biomechanics, environmental engineering, thermal design or industrial engineering. Your final report will document how you applied the lecture concepts to the specifics of your project. The product design specification, results of concept generation and concept selection chart will also be presented in the mid-semester reviews. All of the lecture concepts should be addressed to obtain the full learning benefit from this course.

Project Teams

A handout posted on the web and distributed at the first class describes the design projects offered this semester. You will express your project preferences on a request sheet which is submitted at the end of the first class meeting. Project teams will be announced on the class website before the second class meeting. Teams are typically four to six students plus one advisor. Advisors come from the U or from industry.

Writing

Designers and design teams must communicate, and the most effective lasting form of communication is writing. Because of this, you and your team will be doing a substantial amount of writing during the semester. Because ME 4054 has been certified as a University Writing Intensive Course, your writing will be evaluated and will contribute to your final grade. Some writing will be informal, for example, what appears in your design notebook and progress memos. Some will be formal, for example, the mission statement and product specifications. The most substantial formal writing assignment is the final design report for which you will be required to submit early drafts of sections for feedback and revision.

Whether formal, informal, draft or final, please pay attention to your writing. Most importantly, think of the audience and purpose each time your fingers reach for the keyboard.

E-mail

Important information about the course will be transmitted by e-mail or through the course website. By virtue of the fact that you are a registered U of M student, you have an e-mail account. Please be sure that your e-mail is up and running from day one of this course. If you have troubles with your e-mail, contact the e-mail help line at 626-4276. You are responsible for checking your e-mail at least once a day. We will be sending all official course emails to your @umn.edu email address, the one that appears on the University course registration lists.
Through One-Stop, you can have email forwarded to another address, but that's entirely up to you.

Evaluation

Your final grade will depend on both individual and design team performance. This means your grade depends not only on how well you do as an individual designer, but also on how well your team members do.

Your team will get a letter grade based on the project results and the team deliverables. This grade will be C, B-, B, B+, A-, or A.

Your personal grade will be the same as the team grade or up to one full grade above or below the team grade depending upon your individual contribution to the project and your individual deliverables. For example, if your team receives a B+, your grade could be anywhere between a C+ and an A. For another example, if your team receives a C for the project grade, there is no way you will get anything above a B for your own grade no matter how good your individual performance was. So what you should conclude from the grading policy is that it's to your benefit to make sure you have a high performing team.

Truly abysmal individual performance (essentially if you do nothing at all) will rate a C, D or F, no matter what the team grade.

The criteria for individual and team assessment are:

* Advisor assessment of effort and contribution based upon team meetings, progress memos, outside work (individual)

* Advisor assessment of design notebook (individual)

* Peer assessment of your performance by other members of your team (individual)

* Mid-Project Design Review presentation (team)

* Design Show jury evaluation (team)

* Advisor and course coordinator assessment of final report (content and style) (team)

* Advisor assessment of team deliverables (team)

* Advisor assessment of overall design (team)

* Course coordinator assessment of overall design (team)
There will be a formal assessment of your work approximately mid-way through the project. Your advisor will give you a tentative grade based on your contribution to the team, your design notebook, your progress memos, anonymous peer evaluations from other members of your team and the progress of the whole team.

We expect that Mechanical Engineering seniors enrolled in this course will receive a B. Exceptional work will be rewarded with an A while below average performance will rate a C. Substandard work will receive a D and if you don't show up or don't do anything at all you will get an F.

Time Commitment

This is a 4-credit course so the expected time commitment is 12 hours per week (including group meetings) or 180 hours for the 15 week semester. You are required to attend the lectures and your group meetings. Beyond that, this course does not have an imposed structure. How you spend the remaining, individual design hours will depend upon your project. Be cautious about letting time slip away early in the quarter because the design show seems far away. You are advised to police your time to make sure you are dedicating yourself at an appropriate level for each of the 15 weeks.

Students With Disabilities

Students with disabilities are welcome in this course. If you have a disability and want to discuss possibilities for accommodations, please contact the faculty member in charge before classes begin, or any time thereafter. Also, you may wish to contact the U's Disability Services (tel: 624-4037) for additional assistance.

Feedback

We appreciate and welcome your comments and suggestions for improving this class. Please send your ideas at any time by e-mail to any of the course teaching staff.