ME 14: Introduction to Mechanical Design

Instructors:

- **Class Instructor:** Joel Burdick, Keck 205, 395-4139, jwb@robotics.caltech.edu
- **Shop Instructor:** John Van Deusen, Spaulding 024 (Sub-basement M.E. Shop), 395-4120, jvand@caltech.edu
- **Graduate T.A.:** Melissa Tanner, Keck 218, melissa@caltech.edu

Course Web Site: *http://robotics.caltech.edu/∼jwb/courses/ME14/ME14.html*

What is Design?

In an engineering context, the word "Design" implies *problem solving*: the application of engineering science and technology to solve real world problems. Design is the underlying process of applied mechanical, civil, electrical, chemical, and computer engineering. Much of what practicing engineers do can be considered as design. Even engineers and scientists whose primary focus is research must often design instruments in the course of their work.

Design is simultaneously a creative, analytical, and cumulative process. While a certain amount of design can be taught in a lecture format, design is often best learned by hands-on experience. While this course will attempt to introduce students to the broader notion of design, it will primarily focus on the design domain traditionally known as "mechanical design."

Intent and Goals of ME 14:

The heuristic goals of this course are to:

- Present an introductory overview of design as a creative process.
- Introduce students to the trade offs which typically arise in the design process by having students perform a range of design activities.
- Introduce students to intermediate level machine shop practice and fabrication methods.
- Introduce a limited subset of the basic mechanical elements– such as pulleys, fasteners, springs, and bearings– which are typically used in machine design.
- Prepare students for a more advanced design experiences in ME 72

Prerequisites for ME 14:

In general, ME 13 can be taken as a co-requisite. However, in years where ME 13 is not offered at the same time as ME 14, then it is a prerequisite.

Format of ME 14:

Because design is a largely experiential subject, the class format will differ somewhat from traditional engineering courses. A large portion of the class lecture time will be devoted to projects, design competitions, and machine shop instruction. In the latter part of the course, students will be expected to spend a significant amount of time in the machine shop constructing their final projects.

Homework, Finals, and Grading:

The course work will consist entirely of machine shop projects, two competitions, a few paper homeworks, and a final project. All students must also keep a "design notebook." There is no midterm or final exam in the traditional sense. The final grade will be computed as:

- 55% Homeworks and competitions.
- 40% Final project.
- 5% Design Notebook.

The final project will involve milestones, drawings, and documents in addition to the actual physical construction of a project. Each of these items will contribute to your overall final project grade. Details on these items will distributed at the beginning of the final project period.

We currently anticipate the 55% of your grade from homeworks and competitions to be broken down as follows:

- *Two Homeworks:* 5% each
- *Group Design Project:* 20%
- *Transmission Contest:* 25%

The Group Design Project and Transmission Contest will be graded by the course instructors and T.A.s. The final project will be graded by the course instructors. Note that some of the projects are done in teams (the Group Design Project involves teams of 4, while the Transmission contest involves groups of 2-3 students). The grade assigned to the team is the grade received by all team members. However, much of your course grade (homeworks and

final project) will potentially come from individual efforts. The final project can be done individually or in teams.

Grading of design projects is often subjective. We will attempt to be as fair as possible and lay out the grading procedure for each project beforehand via a handout that describes the specifics for each project. Students are encouraged to ask questions when the grading procedure is not clear.

Course collaboration policy.

We encourage students to discuss the homeworks and competitions amongst themselves and with the class instructors and T.A.s. The group projects by their nature involve collaboration. On individual projects and homeworks, while discussions with other class participants is encouraged, the work that is ultimately turned in should reflect entirely the effort of the individual.

Shop Materials and Tools

We will provide all of the material that you need for most of the class homeworks and competitions. For the final project, each student is allocated a budget for materials. Students will have to buy materials whose expense falls outside of the basic budget, or materials that are not stocked on the Caltech campus.

Basic hand tools are available for each student to use in the M.E. shop. We encourage students to purchase their own basic set of measurement tools.

References

There is no text for this course, and I will photocopy and distribute course material as necessary.