ME 72(b): Engineering Design Laboratory
Overview of Course Schedule and Course Mechanics

Instructors:

- **Class Instructor:** Joel Burdick, Thomas 319, 395-4139, jwb@robotics.caltech.edu
- **Class Instructor:** Noel du Toit, Thomas 310, ndutoit@caltech.edu
- **Shop Instructor:** John Van Deusen, Spaulding 024 (Sub-basement M.E. Shop), 395-4120, jvand@caltech.edu,
- **T.A.:** Marc McDuff, mcduff@caltech.edu
- **T.A.:** Nam Nguyen, nnguyen@caltech.edu
- **T.A.:** Melissa Tanner, melissa@caltech.edu

Course Web Site: [http://robotics.caltech.edu/~me72/](http://robotics.caltech.edu/~me72/)

Goals of ME 72(b):

The obvious goal for this quarter is to complete your preparations for the ME 72 contest, which is scheduled to start at 1:00 p.m. on Tuesday, March 9, 2010. Now that you have chosen a design concept and have started the prototyping phase, the main focus of this quarter is to complete your analysis, and then build, test, and refine your concepts in preparation for a successful demonstration on competition day.

Class Format of ME 72(b):

The primary learning this quarter will take place during the process of building and fielding your contest entry. The limited number of class sessions will be devoted to:

1. a brief review of basic propeller engineering;
2. some basic CAD/CAM and CNC training;
3. possibly some hands-on demonstration of vacuum molding;
4. in-class scoring demonstration;
5. in-class mock competition;
6. an in-class presentation by each contest team;
Class Deliverables and Grading:

The major events this quarter (with associated grading components) are described below. Note that 90% of your grade will be derived from the main “deliverables,” while 10% will come from your notebook. Separate handouts will provide more details on the exact nature of the deliverables and the grading scheme for each deliverable. As always, the latter due dates may be adjusted to cope with the realities of our progress.

1. Critical Design Review (CDR)

   - **Date:** *Thursday, Jan. 14, 2010.*
   - **Description:** Like the Preliminary Design Review, each team will meet individually with the class instructors. The purpose of the CDR is to present the final design and the final set of design analyses.
   - **Grade:** 10% of your overall ME 72(b) deliverables grade.
   - **Grading Contributions:** We will assess the thoroughness of your design and your analysis.

2. CNC Part

   - **Date:** *TBD.*
   - **Description:** After learning about CAD/CAM and CNC, your team will manufacture a simple part using CNC fabrication in the shop.
   - **Grade:** 5% of your overall ME 72(b) deliverables grade.
   - **Grading Contributions:** We will assess the thoroughness of your design and your analysis.

2. Scoring Subsystem Test:

   - **Date:** *1:00 p.m., Tuesday, Jan. 26, 2010.*
   - **Description:** On this date each team must demonstrate the scoring capabilities of at least one of their vehicles. The contest regulation ping pong balls, ball dispensers, and contest arena will be available during this test. One of your vehicles must demonstrate its ability to gather ping-pong balls and deliver them to a scoring bin. A three minute time limit will not be enforced. You will also not have to compete against another vehicle. Note that some of the roles that would be played by other team vehicles can be carried out by “hand.” E.g., consider a design/strategy where one ground vehicle trips the dispenser switch while a second vehicle waits under the dispenser to catch the falling balls. During this test, a human can trip the switch, and you need only demonstrate your ability to maneuver your vehicle under the ball dispenser and collect the balls (as well as deposit them in a scoring bin).
3. Complete System Trial:

- **Date:** 1:00 p.m., Thursday, Feb. 11, 2010.
- **Description:** On this date each team will demonstrate it’s ability to carry out an entire heat of the competition–exit the starting zone, collect balls, score, and reach the end zone. This trial will not involve competition between teams.
- **Grade:** 20% of your overall ME 72(b) deliverables grade.
- **Grading Contributions:** We will assess your team’s ability to fluidly transition between all of the different contest behaviors, as well as your system’s ability to balance all of the competing demands on your vehicle(s).

4. Class Presentation:

- **Date:** 1:00-2:30 p.m., Tuesday/Thursday, Feb. 16/18, 2010.
- **Description:** During the scheduled class hours of Feb. 17 and 19, each team will make a 10 minute slide presentation on the status of their contest entry, including the lessons learned from the first trials, and plans to further refine and improve the team’s prototype. The number of slides will be limited to six. The class instructors, T.A.s, and other students will provide feedback on your plans.
- **Grade:** 5% of your overall ME 72(b) deliverables grade.
- **Grading Contributions:** Do you understand the positive and negative aspects of your device’s current embodiment? Do you have reasonable plans and a schedule to carry out further testing and refinement? Have you thought about how will you distribute the remaining work to be done across your team members?

5. Mock Contest:

- **Date:** 1:00-2:30 p.m., Thursday Feb. 25, 2010.
- **Description:** We will carry out a mock contest on this date, where each team will be expected to compete twice against another team. The contest guidelines on system set-up and recovery will be loosely enforced. As this mock contest occurs two-weeks before the actual contest, it’s main goal is to test the readiness of your system, and to help each team assess what modifications are needed to prepare their system for operation in the actual contest.
• **Grade**: 15% of your overall ME 72(b) deliverables grade.

• **Grading Contributions**: Is your prototype robust enough to withstand the expected rigors of the actual contest? Have you paid attention to all of the details that will help you have a competitive entry? Have you improved your system’s performance compared to the first system trial? Does your device work smoothly within the contest environment?

6. **Actual Contest**:

• **Date**: 1:00 p.m., Tuesday, March 9, 2010.

• **Grade**: 30% of your overall ME 72(b) deliverables grade.

• **Grading Contributions**: What is the quality of the final design concept that was entered into the competition? What was the quality of the actual contest device? Was the device easy to set up and deploy? Did it perform well with respect to your predictions? Did it perform well in an absolute sense?

7. **Design Notebook**:

• **Date(s)**: The notebook must be turned in by 5:00 p.m. on the last day of finals.

• **Grade**: 10% of your overall ME 72(b) grade.

• **Grading Contributions**: Did you keep an effective documentation of your project’s progress?

Like ME 72(a), the grade assigned to the team on each team-based deliverable is the grade received by all team members.

*Course collaboration policy.* We will continue the collaboration policy of the first quarter. That is, we encourage students to discuss the competition and the intermediate milestones with other students and with the class instructors and T.A.s. However, the deliverables described above should come from individual and team efforts.