

Design Contest

ME72 Engineering Design Laboratory

Fall Term, 1999

Overview

The 15th annual Caltech Engineering Design Competition will be held on Thursday December 2nd, 1999 starting at 2:00 pm in Beckman Auditorium. Spectators are welcome. Admission is free.

Engineering is primarily the process of creating new *things* to solve problems. This course, and contest, is one attempt to provide students with a real-world opportunity to learn about the design of new *things*, and the solution of open-ended, ill-defined problems.

At the beginning of the term the students are given a design task, a “bag of junk”, and 10 weeks to design and fabricate a device. The task is a competitive one, and is different each year. Each participant (working as part of a team of two) must design, prototype, fabricate, assemble, test, debug, and tune a device to compete against pairs of classmates’ devices. Only the materials provided in the “bag of junk” are permitted. A typical year’s “junk” includes: masonite, plexiglass, aluminum, a few ball bearings, a length of shafting, some brass bearings, a few pulleys and rollers, and other miscellaneous surplus “junk” that can be found in sufficient quantity. Before the annual Schlumberger contribution (beginning in 1987), the power source supplied to the students was rubber bands. Since that time we have been able to provide two (or more) electric motors each. Donations from our industrial sponsors have enabled us to provide each student with high quality “junk”. The display case in the middle of the first floor of the Thomas building includes several of the students’ devices from the previous contest, the trophy, and a display of the contents of the “bag of junk”.

Seven years ago, the students designed and built devices to collect more small plastic pellets than their opponent’s device. Five years ago the students’ devices collected golf-balls from a trough. Four years ago the devices delivered a pre-loaded collection of ping-pong balls to a drain. Three years ago the devices had to gather and sink golf balls into a central drain. Two years ago the devices moved hockey-pucks, golf-balls, and hose-washers out of their side of the table, across an 8-inch high ridge. Last year the devices, in teams of two, gathered ping-pong balls from a central bar and moved them in a soccer-like game into goals at each end of the table. This year’s contest is entirely different, and requires students, again working in teams of two, to design and build individual devices that compete together.

There is an attempt each year to provide a real-world engineering atmosphere. There is a limited amount of time. The hardware resources are limited. Team members must negotiate over size, weight, and task constraints. There are many competing requirements, and overall strategy is a crucial initial decision. Every effort is made to make the contest scrupulously fair; all students have exactly the same raw materials and time, and access to tools and machine tools. The only variability is the student’s learning, talent and expertise. Many lessons come out of the class, including: management and planning of time in the design cycle; decision-making in an uncertain environment; the benefits of prototyping and testing; the benefits of modular easy-to-repair designs; the interaction between design and manufacture; an experience with open-ended problem solving; and working in design teams.

The tournament begins at 2:00 pm and lasts about an hour and a half.