

Industry Sponsorship of Senior Capstone Design Projects in Electrical and Computer Engineering Michigan State University

(Deadline to Notify MSU of Interest in Participating: August 1 for Fall Projects; Dec. 3 for Spring Projects)

Overview

Seniors majoring in Electrical Engineering or in Computer Engineering at MSU are required to participate in a 1-semester Senior Capstone Design Project, as a member of a (usually 4-person) team. (Sometimes, teams also include students from Mechanical Engineering or Computer Science, if required by the topic and possible to arrange in advance.) Each team's activities are supervised by an MSU faculty member ("facilitator"). In order to improve the quality of the design experience in reflecting the types of industrial problems students will encounter after graduation, these teams are industrially sponsored. That is, a sponsor specifies the project to be done, and acts as the team's customer. We want the projects to work to the mutual benefit of the sponsors and the student teams. In order to help to integrate and consolidate what the students have learned during their study to this point, we seek projects that involve both **hardware and software** skills, and, to the extent practical, both analog and digital electronics. Many projects involve use of microcontrollers, A/D and D/A, DSP chips, and/or communications chips. For this capstone, projects involving *only* software development on PC or Unix systems are not appropriate, but projects combining software and associated hardware development are fine. At the end of the semester, all teams present and display their work, and a team of judges from industry presents the Prism Venture Partners Prizes, which include cash awards to students on three winning teams.

How It Works

Sponsors provide, prior to the beginning of the semester in which the project will be done, a brief (typically less than one page) description of the project. They also submit a 1-page form with the project title and the name and contact information for the person at the company who will serve as the engineering liaison for the project. The students will have contact with that person primarily at three times: 1) at the beginning of the semester, to clarify the specification of the project, learn about the context for the work, etc. (often including a visit to the sponsor's facility, if within a reasonable driving distance from MSU), 2) during about the 4-6th week of the semester, to validate the student team's initial design concepts with the company, to be sure it meets the intent, receive any suggestions, etc., and 3) at the end of the semester, when the company liaison is asked to attend the students' final oral presentation/poster presentation/demonstration (alternative arrangements can be made if sponsor location is far from MSU). If the sponsor wishes to work with the team on a more frequent basis, they may arrange it with the students.

Students have available to them laboratory space and the supplies and assistance of the departmental electronics shop. Machine shop access is available if needed.

Benefits to the Sponsors

Companies sponsoring projects will receive the final written report of the student team. Note that this project is the work of the students, not the professional output of the faculty facilitator, whose primary role is to assure that the students are making timely progress on the project and to help them find out how to get access to the necessary resources. The company is also invited to see the oral report/demonstration of the project at the end of the semester, on campus, in a program called Design Day, sponsored by the College of Engineering. If desired, sponsor may receive the physical prototype built by their team. They will be given a copy of the students' deliverables for the course on a CD-ROM, including the final report, poster (in PowerPoint, 24"x30"), team web site, and other documentation of the team's activities.

One of the chief benefits to sponsors, of course, is the exposure of these soon-to-graduate engineering students to the company and the sorts of problems it works on. Students learn about the company, and the company liaison gets to see the students in action, which can be helpful when recruiting/hiring decisions must be made.

Intellectual Property Issues

If requested by the sponsor, students and faculty facilitators can be asked by company to sign a non-disclosure form (available through the university). In addition, the university makes no claim on the intellectual property developed by the students, and does not expect the team's faculty facilitator to generate intellectual property. If arranged in advance through the university, sponsor may ask students picked for a project to assign to the company any intellectual property rights they might have to what they develop, using a "standard" form provided by the university (you may get the forms from Prof. Goodman or on the course web site, www.egr.msu.edu/classes/ece480/goodman/forms/). Requests for assignment of student rights or for non-disclosure agreements must be made before the beginning of the semester, so that students can be told that signing such a form is a condition for choosing a team imposing those requirements. (For legal reasons, the university must offer the students the *opportunity* to work on some project that does not require them to sign over any rights, but most students are not reluctant to sign such forms regarding an industry-sponsored project, if the project requires it.)

In order for the students to satisfy the course objectives, certain information about each project must be disclosed. If disclosure of a general description of the project to be worked on would endanger sponsor's eventual IP rights, sponsor should file patents before providing the project description, as it will be publicly disclosed at the beginning of the semester. (Note that provisional patents can have students' names added later if appropriate.) If the student team has assigned IP rights to the sponsor via the MSU form labeled "Student Assignment and Agreement Concerning Class Project Intellectual Property Rights" and creates intellectual property that the sponsor wishes to protect, sponsor must file for at least provisional patents before November 15 (for fall semester projects) or April 1 (for spring semester projects), in order that students may publicly describe and illustrate their work in the advance program publicizing Design Day and present the results of their work at Design Day, orally, on their poster and web site, and in writing. Certain types of information can be kept confidential during Design Day (for example, schematics and computer code), and contained only in confidential appendices

to the final report, not made available to the public via web posting, etc. Such material would be made available only to sponsor and to MSU employees covered by an MSU Confidential Disclosure Agreement. However, students must be free to describe their work in general terms and display the prototype they have produced, and/or pictures of that prototype, in public sessions at the College of Engineering's Design Day, which means that provisional patents (and particularly foreign patents) must be filed before the publicity material for Design Day is distributed (approximately April 1 for spring, November 1 for fall) if the students' presentations would threaten their validity.

Cost to Sponsors

The standard fee for company sponsorship of a student team is \$3,500. Ordinarily, the cost of any components/supplies, etc., used for the project, any student travel to/from sponsor site, and presentation materials, etc., is included in that amount. The sponsorship also helps to pay for upgrade/maintenance of the lab, licenses for software available to the students, facilities and refreshments for participants and the audience during the industrial judging of the projects, and time of the electronics shop technicians to assist the teams. Special financial arrangements can be made in the unusual event that a particularly expensive component or software license not otherwise available must be used for the project to be carried out. Payment may be made at the time of submission of the project proposal, by check or credit card, or during the semester of sponsorship, if timelines make advance payment difficult.

DEADLINES FOR SPRING SEMESTER and FALL SEMESTER, 2009:

- 1) Commitment to sponsor a project: August 1, 2009 or December 1, 2009 (by email to goodman@egr.msu.edu or by return of project form, with/without check or purchase order)
- 2) Providing 1-paragraph synopsis of problem: August 10, 2009 or December 10, 2009 (students will be given this paragraph at the beginning of the semester to use in deciding their preferences among projects)
- 3) Providing specifications for project (starting point for team): August 15, 2009 or Dec. 28, 2009

.(Contact Erik Goodman, (517)355-6453, goodman@egr.msu.edu, or fax (517)353-1980 with any questions.)