
How to sponsor a **SUCCESSFUL CAPSTONE DESIGN PROJECT**

FOR INFORMATION OR TO DISCUSS
YOUR PROJECT IDEA, PLEASE CONTACT:

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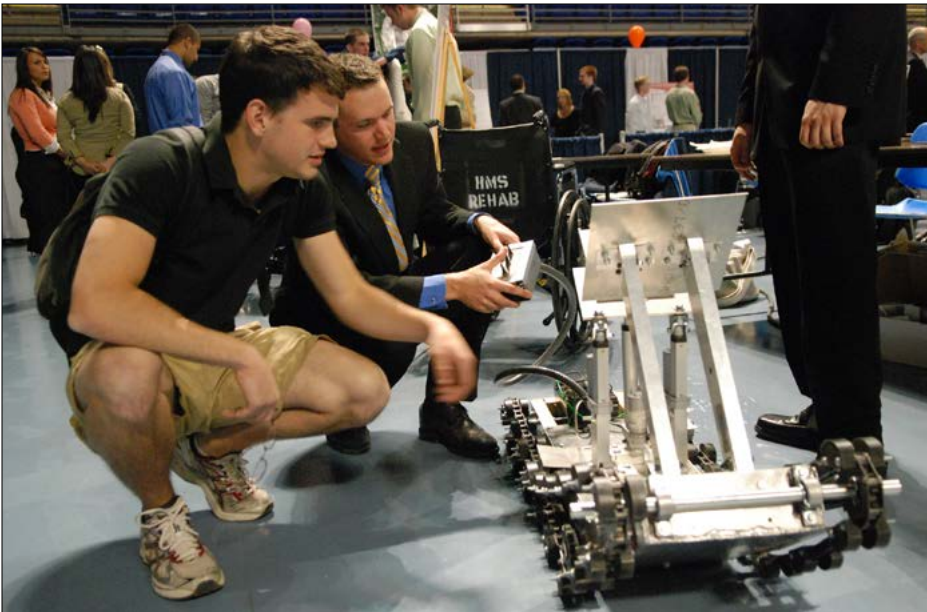
Check out our website for summaries of completed
projects and to submit a project electronically:

www.lf.psu.edu



PennState
College of Engineering

LEARNING FACTORY



OVERVIEW

The Learning Factory involves students from twelve different programs in the College of Engineering and the College of Earth & Mineral Sciences at Penn State:

- Biomedical Engineering
- Chemical Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Energy Engineering
- Engineering Design
- Engineering Science & Mechanics
- Industrial & Manufacturing Engineering
- Materials Science & Engineering
- Mechanical Engineering
- Nuclear Engineering

Together, the departments collaborate to offer an industry project course. This course is typically taken in the senior year and is the culmination, or “capstone,” of the students’ academic careers. The course requires students to demonstrate the ability to apply their rigorous training in engineering science, design, and project management by executing a real-world project defined by a client. Through the Learning Factory, students complete about 200 projects per year.

PROJECT EXPECTATIONS AND DELIVERABLES

Each project will typically involve a team of 4-6 students over a 15-week semester. Considering that the students will also be taking other courses at the same time, this equates to approximately 400 student hours of effort devoted to the project. Results from student teams are highly dependent on the nature of the project, the innate team capabilities, the amount of client interaction and support, and many other variables. No guarantees can be made, other than the students will give it their best effort. Often, a project provides direct and immediate benefits to the sponsor. Another common outcome is a good concept, but further work is required (either by a follow-on project, or by the sponsor’s in-house staff) to bring the project to fruition.

Benefits to Industry Sponsors

Collaboration on a project with Penn State students and faculty has several direct and indirect benefits to the industry sponsor:



Fresh ideas, out-of-the-box solutions to real problems



Low cost, low risk investigation of “back-burner” ideas



Identifying talent for employment



Corporate exposure on campus



Project management experience for your junior staff engineers



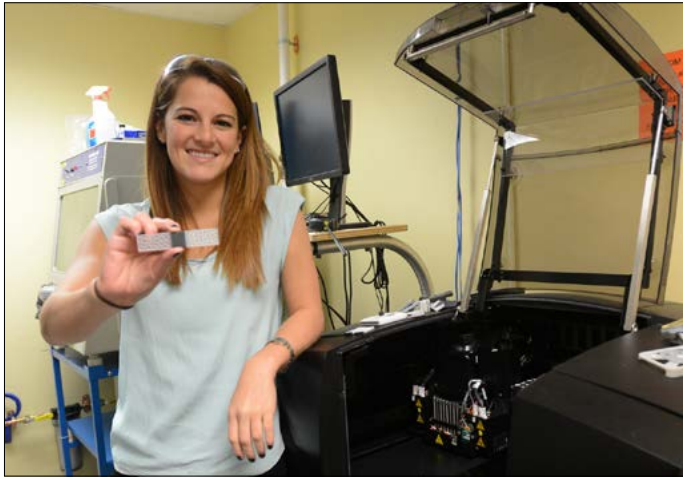
Improving engineering education at Penn State



Networking with other companies and Penn State faculty

Deliverables to the sponsor may include some or all of the following:

1. Reports, feasibility studies, design analyses
2. Solid models and engineering drawings
3. Prototype hardware
4. Software and data
5. Manufacturing or service delivery process plans
6. Presentations, videos, demonstrations



AVAILABLE RESOURCES

Project teams may draw on the expertise of faculty instructors and state-of-the-art resources from across the College of Engineering, including the Bernard M. Gordon Learning Factory facility. The Learning Factory provides complete facilities for prototyping:

- **3D Printing:** Stratasys Objet, UPrint, Dimension 1200 SST, Maker Bots
- **Computer-Aided Design and Analysis Tools** such as SolidWorks, project management and simulation software for various applications
- **Metalcutting:** 3 axis Bridgeport CNC machining center, OMAX Waterjet cutter, milling machines, lathes, drill press, saws, grinder, bead blaster, sheet metal-working
- **Welding:** MIG, TIG, gas

Other college facilities can be made available as needed, including: metal-casting foundry, materials testing, vibration and acoustic test facilities, engine testing, and composite material processing.

Sponsor Requirements

A successful industry-based student design project requires that the sponsoring organization assign a motivated individual to oversee and interact with the students throughout the project duration. The most critical factors to a successful project are communication, and a minimum commitment of 1-2 hours/week as well as attendance at two on-campus events. The sponsor is expected to do the following:

- ✓ Attend the Project Kickoff meeting of all project sponsors and eligible students during the second week of the semester.
- ✓ Provide more detailed information than the initial one-page summary.
- ✓ Facilitate visits by the students to the sponsor's location. The first visit should occur as early as possible.
- ✓ Interact regularly (weekly or more frequently) with the students at the sponsor's site, at University Park, by e-mail, telecommunication, and/or video conferencing.
- ✓ Review reports and provide feedback from the industry point of view (e.g., progress reports, project proposal, design analysis, final report).
- ✓ Evaluate the students' performance mid-way and at the end of the semester which is part of their final grade.
- ✓ During the last week of the semester, attend the on-campus Design Showcase where all the student design projects are on display.
- ✓ Demand constant professionalism and a high level of performance from the students.



Project Submission

Careful consideration and early collaboration between the sponsor and Penn State faculty are crucial to the development and execution of a successful student project. All that is needed to begin the process is a one-page project description, which details the contact information, objectives, motivation, and deliverables for the project. This is entered and submitted electronically by the sponsor at www.lf.psu.edu.

To guarantee consideration, the form should be submitted by the deadline posted on the website. The project descriptions from all the sponsors are assembled available online, from which the students select their preferred projects. The catalog for the current semester is at <http://apps.mne.psu.edu/lf/ProjectSummary.cfm>. Since project selection is voluntary, care should be taken in composing the project description to make it attractive and interesting.



SELECTION OF STUDENT TEAMS

Starting fall 2016, the Project Kick-Off will be different than past years. Teams will be determined the first week of classes. The Project Kick-Off event will be held the second week of classes and will serve as a first technical meeting for teams and sponsors. Teams will already be determined before the Kickoff Event. Teams of 4-6 students will be selected based on three factors: the students' project preferences, the majors that are requested by the sponsor, and the students' class schedules. We make every effort to honor the sponsor's requests for particular majors, but we cannot guarantee it.

The new process will include a sponsor meeting with the Director of the Learning Factory to review the semester, a sponsor dinner which will include faculty who will be advising the projects, followed by the opportunity for sponsors to have a first technical meeting with the team of students already assigned to their project.

We strongly recommend that sponsors attend the kickoff event. If it is not possible for you or a representative to attend then you must arrange a first technical meeting with your team during the second week of classes. This may be appropriate if a site visit is critical to the success of your project.

PROJECT MANAGEMENT

Students are typically in their senior year and are enrolled in a capstone design course. Penn State faculty supervise the student teams and the industrial sponsors serve as mentors to the team. A typical schedule for a 15-week semester project is shown below. Note that this is only a general guideline and may change due to specific project requirements.

15-WEEK SEMESTER SCHEDULE

WEEK 1	WEEK 2	WEEK 3	WEEK 4	WEEK 5
- Project Kickoff and Selection	- Team Formation and Contact Sponsor	- Visit Sponsor		- Project Proposal to Sponsor
WEEK 6	WEEK 7	WEEK 8	WEEK 9	WEEK 10
- Proposal Presentation to Sponsor				- Design Review
WEEK 11	WEEK 12	WEEK 13	WEEK 14	WEEK 15
	- Prototype Completion		- Final Report and Poster Completion	- Final Project Presentation

DESIGN SHOWCASE
at Penn State

FINANCIAL COMMITMENT

The project donation will be \$3,500 per project effective January 2016. The cost for a second team working on the same project is \$2,000. Data shows that having two groups work on the same project is highly desirable. This inspires competition between the teams, allows multiple solutions to be explored, and more than doubles the output, for a minimal additional investment of money and time. Since this is a tax deductible, charitable contribution to the University, no guarantees can be made of project outcomes. All that can be promised is best effort. Each team is given a working budget of \$1,000. The budget covers basic project expenses such as supplies and prototyping materials, phone calls, presentation materials, and car travel to the sponsor's location. The remainder of the fee is used to cover the operating costs of the Learning Factory and the participating departments. The sponsor is expected to supply whatever physical resources are needed and are not already available at the University. Should additional resources or equipment be needed to complete the project, students are expected to justify them by written proposal to the sponsor.

INTELLECTUAL PROPERTY AND CONFIDENTIALITY

Intellectual Property Ownership: For an additional administrative fee, sponsors may also request ownership rights to all intellectual property that is developed by the students during the course of the project. Projects in this category require students to assign their intellectual property rights to the sponsor (see <http://www.lf.psu.edu/sponsors/IPandConfidentiality.aspx>). All materials, reports, and documents produced by students must be available for their personal use. It should be noted that requiring the IP agreement could discourage students from selecting the project.

Confidentiality: For an additional administrative fee, sponsors may request that the student team sign a confidentiality agreement. With regard to company-provided information (data, drawings, design details, etc.) required to execute the project, students and University personnel agree to abide by the terms and conditions of the non-disclosure agreement entered into between Sponsor and University as evidenced by signature on a "Non-Disclosure Agreement Form" (see <http://www.lf.psu.edu/sponsors/IPandConfidentiality.aspx>).

Note: The NDA is void after two years. Prior to public disclosure

of information including reports and display poster, students agree to provide sponsor a copy of any proposed documents for sponsor's review and comment. Upon request of sponsor, students agree to remove all information identified as sponsor's confidential information. All project results are made available to the sponsor. All materials, reports, and documents produced by students must be available for their personal use.



DESIGN SHOWCASE

During the final week of the semester, students display their finished work at the Design Showcase. This event is the major exposition of student projects for the College of Engineering. Typically, more than 100 projects are displayed, ranging from freshman year through graduate course projects, and including the Learning Factory capstone projects. Awards for best projects are given, sponsored by Lockheed Martin. Winners are judged by representatives from industry. The Design Showcase is also an excellent opportunity to recruit new talent and to network with other companies.

TIPS FOR SPONSORS

Getting the most from your student team

VISITS

It is important for students to visit their sponsor as early as possible to get a clear understanding of the project and to meet your employees. The visits should be scheduled as soon in the semester as possible (preferably within the first two weeks), so the project can get off to a good start. While they are there, give them a tour and let them meet as many of the relevant engineers, technicians, and machinists as possible. A second visit later in the semester (perhaps for a mid-term design review) is highly encouraged.

REGULAR COMMUNICATION

Keep their feet to the fire. Direct, regular communication is essential. Bi-weekly conference calls in addition to the weekly fax or e-mail progress reports are recommended. Student teams and sponsors are encouraged to communicate by e-mail. Please provide prompt acknowledgment and feedback after receiving the weekly progress report.

DEMAND PROFESSIONALISM

With your help, we are trying to teach these students what it is like to be a practicing engineer. Demand the same excellence and professional behavior that you would expect from your own employees. If they do not perform to your expectations, notify them and/or their instructor immediately.

COMMITMENT

Clearly identify one contact person who has a good understanding of the project, is willing to spend time with the students, and who is available throughout the semester. Attendance at the Project Kickoff lunch and at the end-of-semester Showcase is essential. The contact person should be committed to the project and take an active role in providing feedback to the students. He or she should be willing to spend time answering student questions and providing feedback. This should take no more than one or two hours per week, on average.

CLEAR, STABLE DELIVERABLES

The sponsor must be clear on the objectives and deliverables for the project. These deliverables should be discussed, refined, and agreed upon in the first few weeks of the semester.

PROVIDE ADDITIONAL INFORMATION

The sponsor should provide more detailed information about the project than the initial one-page summary. The sponsor should keep in mind that the students don't have easy access to the same information the company employees do (e.g. part drawings, dimensions, company specific information) and be willing to expedite transfer of that information to the students.

