



LEHIGH
U N I V E R S I T Y

Technical Entrepreneurship Capstone

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Sponsor Handbook

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OVERVIEW

Technical Entrepreneurship (TE) Capstone is a Lehigh University course set in which undergraduate students form interdisciplinary teams to work with companies in product and process development/improvement. Each industry partner receives at least one team of undergraduate students, a Lehigh team advisor, and a Lehigh senior peer mentor. These teams are taught to use the nationally acclaimed Integrated Product Development (IPD) Process of creativity and innovation to address technical problems in a business context. The process includes regular interaction with the company, a solution to the problem that is driven by market, end-user and stakeholder needs, appropriate use of technology, and financial sustainability. The following document will provide an overview of roles, responsibilities, and expectations for the teams, companies and advisors.

ROLES

There are many roles in the IPD process that all must work together in order to educate the students and provide a framework that allows them to focus on real world practical solutions to industry problems. Below is a brief overview of the main roles.

INDUSTRY PARTNERS AND COMPANY PROJECT MENTORS

The role of the industry partner is to bring the problem/project to the team complete with all available company/industry context. The industry partner must have at least one project mentor from within their organization that will be the contact point, the gateway to the company and its resources, and a mentor for project.

The partner company, through the project mentor, should share all relevant information about the project, including the company context, any work done on it to date, and the goals of the project. The project mentor should also provide access to documents, data and background information, as well as introductions to other related company employees and stakeholders. The information shared enables the teams to do their deep dive into the company and the problem.

The project mentor should expect regular communication with the team(s) as well as company visits, weekly summaries, presentations, mockups/prototypes, and a final executive summary for each semester (deliverables further clarified later in this document). There will be opportunities for project mentors to come to Lehigh to interact with students and attend presentations. These opportunities will be communicated throughout the year by both the team and the TE Capstone staff. Additional meetings between the team and project mentor are encouraged.

Throughout the two semesters the project mentor should be a resource and provide ongoing feedback to the team as they report their progress. The IPD process is a specifically prescribed way for students to learn a systematic process of innovation. They are required to follow the course requirements and all the coursework relates directly to their project, so the project mentor's response to their work and ideas is crucial to a successful outcome. Sometimes the project mentor encourages the team(s) to work ahead of the IPD process. This is fine but works

best when the team, along with their advisor, customize the IPD process to fit with the industry partner's process. As long as the students learn and apply the IPD process, it works out well.

STUDENT TEAM

Student teams participating in TE Capstone will be responsible for all aspects of the IPD process. This will include regular weekly communications with the project mentor as well as formal deliverables related to their work. Direct communication between the team and project mentor is necessary in the form of e-mail, phone calls, site visits, and presentations. If a problem develops between the project mentor and the team, the first course of action should be direct, clear communication. If direct communication between the project mentor and the team does not resolve the issue, the advisor and/or the IPD staff will be able to step in to help facilitate a solution.

TE 211 is a 3 credit undergraduate course held in the spring with an enrollment of ~ 200 students who are split into teams of 6-7 members. Most students are in the second semester of their junior year when the projects begin in January. TE 212, held in the fall semester, is a 2 credit undergraduate course and sees the return of approximately 175 students from TE 211. Typically the teams remain constant but the team size drops to 4-6 members.

TE 211 is a 3 credit course so each student is expected to work an average of 9 hours per week in the spring semester. This includes class time, team meetings, independent research/project work, documentation etc. TE 211 in the fall is worth 2 credits so the expectation is 6 hours per student per week. Students are required to submit documentation of individual contribution each week to the team advisor that includes their hours for the week and a summary of their individual contributions.

Engineering students are required to take both TE 211 and TE 212. Product design and supply chain management students are required to take TE 211 and encouraged to take TE 212. TE 211 teams usually consist of a business student or two, three to five engineering students (bio, mechanical, materials science,) and in some cases, a product design student.

ADVISOR

The team advisor's role is to help guide the students through the IPD process and fulfill the academic requirements of the course, including grading and administrative actions. The advisors give the teams weekly feedback on their progress against milestones that have been agreed to between the team and the project mentor, based on the IPD process. The more specific those milestones, the better the experience for everyone. The advisor and the project mentor should communicate regularly if the team seems reticent or if schedules make it difficult to connect. The advisor is available for consult if difficulties arise between student teams and project mentors.

SENIOR PEER MENTOR (SPM)

The senior peer mentors are Lehigh undergraduates who have recently completed the TE Capstone. Their role is to help mentor the students through the first semester of TE by helping the students better understand what is expected of them, how to navigate the challenging program requirements and how to apply the IPD process to their particular project. They work closely with the teams and advisors and sometimes are in contact with the project mentor, especially at the beginning of the project.

FACULTY AND STAFF

The faculty and staff of the TE Capstone are responsible for classroom instruction, academic structure, event organization, obtaining and organizing partner companies, equitable grading practices, student team budgets and purchasing, and generating student teams that appropriately match the needs of the projects.

They are also available to help students, project mentors, SPMs and team advisors with project concerns when needed. See Appendix A for contact information for the TE Capstone staff.

DELIVERABLES

The teams are required to submit deliverables that reflect the teams' project work. These deliverables are designed to keep the team on task and the project mentor up to date with the progress and direction of the work. Additionally, the deliverables are graded and make up a portion of each student's final course grade. For a time frame of these deliverables please see Appendix B. The following are the deliverables you can expect to see, receive and give feedback on.

WEEKLY PROJECT BRIEF

The weekly project brief is a written version of the teams' work each week, written by one team member (authors may rotate.) It should summarize the key points that were covered at the team meeting including project activity & outcomes, progress, setbacks, and need for additional information or resources from the project mentor. The emailed document should include an appendix of relevant supporting or illustrative materials so the project mentor has a complete set of information from which to keep updated on the progress of the team. Research results, data tables, drawings, CAD models, test results, and other relevant documentation should be included as appendices.

Weekly briefs should be provided by the start of the work day on Tuesdays each week.

The weekly brief should be consistently formatted with the track changes feature enabled (if the project mentor so desires) so that the mentor may see, at a glance, where the new material has been included and if their comments from the previous week have been addressed. The team

advisor will be giving the student authors feedback and will grade the briefs but this interaction will not be included in the mentor's version of the document.

ONGOING PROJECT DOCUMENTATION

Each student's course work should be clearly documented in their personal, digital course notebook. This includes a written personal summary of reading assignments, annotated lecture slides, and personal reflections on what they are learning/applying to project.

Each student's project work should be clearly documented in their personal lab or Maker notebook. This notebook is to serve as a documentation system for the individual's work done on the project. Each notebook is structured such that it can serve as legal documentation of the creation of intellectual property. These notebook entries will be available to the industry partner if they wish to pursue any protection of the IP developed by the students. The industry partner, as part of the Lehigh/Partner Agreement, owns any IP that may arise from a TE Project.

Each team must keep a DIGITAL team binder that is a repository for all company literature, research documents, contacts, correspondences, agenda, and minutes that the team needs to be shared among all team members. For intellectual property and nondisclosure issues, the team binder **MUST BE HOSTED ON COURSESITE SO IT IS SECURE** and not open to public scrutiny. The binder should be organized by sections and all documents must have clear authorship and **BE** clearly dated. Best practice dictates that this binder must be managed by one person while providing all team members with the ability to post as well as access the information.

PROJECT SUMMARY

At the end of each semester, the team will summarize the semester's work with a two to four page executive summary that will be placed at the front of the collection of weekly project briefs. The summary should be supported by appropriate appendices and documentation as above.

MIDTERM PRESENTATION

Midterm presentations will be held mid-semester in on campus (location TBD.) Teams will present to other students, visiting faculty, team advisors, project mentors and others from the industry partner company. All teams for a partner company will present in the same room. These presentations may take one of a variety of forms to be determined by the team and advisor as appropriate for the project and the partner company.

Advisors and project mentors will review/grade their own teams, but will encourage the other students in the room to ask the questions during the Q & A portion of the presentation. The project mentor and the team can discuss the project in the debrief session immediately following the presentations. Teams receive a group grade for these presentations.

FINAL PRESENTATION

Final presentations will be given to communicate the teams' work, final ideas, and future recommendations. The presentation is seen as an opportunity for the students to communicate to the industry partner in a professional way, the research, idea/innovation/solution/business case development, and recommendations for next steps. At the presentations in May, students, faculty, staff, and project mentors in the audience can question, respond, and recommend further team work that will help the team when they resume the project in the fall. At the presentations in December when the team is presenting their final solution, prototype, test results, business case/recommendations, the Q & A portion of the presentation is used more for clarification purposes

These presentations are in lieu of a final exam and will take one of a variety of forms as at mid-term; however the timeslot is scheduled during the final exam period by the Lehigh University Registrar. The team receives a group grade for this presentation.

MOCKUPS AND PROTOTYPES

Although each project is different, every team is required to produce mockups, models and prototypes of some aspect of their solution. Some are virtual and others are physical. Toward the second half of the spring semester as teams are formulating ideas based on both their understanding of the problem and stakeholder input, they are encouraged to create mockups of their ideas. Mockups (anything that can be put together quickly to "show" the design or aspects of the solution rather than "tell" about it) allow for stakeholder, customer and end-user feedback, early enough in the process that the feedback can inform next steps in the ideation/design/solution.

During the fall semester, prototypes are required. Teams decide what aspects of the solution need to be modeled and prototyped so the relevant features and specifications can be tested appropriately. The company often provides materials, and helps to manufacture more advanced prototypes when possible. Testing is done on site or on campus, depending on the project.

TIMING

COMPANY VISITS

Company site visits are required within the first couple of weeks of the project unless travel cannot be arranged. These visits usually entail the student team meeting the project mentor at the company, getting a tour of the company facility and an overview of the industry/company/division/department in which the project will be situated.

These visits are crucial in engaging the students in the culture of the company. "Breathing the company air" is absolutely the best way to get the students immersed in the problem they'll be solving. It may also be their first exposure to a professional industry environment which is an important learning objective of the program.

SUMMER BETWEEN TE 211 & TE 212

At the conclusion of the spring semester in May, most projects are put on hold until the students return to Lehigh in late August. Some industry partners offer summer internships to one or more of the students on their TE Capstone team(s). These internships are managed separately from TE/university interactions with the company and there is no relationship between the students and the TE Capstone/university during the period of time in which the student is an employee of the company. Some companies choose to have the student intern(s) work on some aspect of the project over the summer and others focus the work in a different, often related, area. When projects resume at the beginning of the fall semester, the students who worked as interns typically become the natural leaders of the TE Capstone team and are able to bring the company perspective to the project on a daily basis.

RESUMING PROJECT IN AUGUST

When classes resume in late August, TE Capstone holds a “Fall Kickoff” event usually the Wednesday after Labor Day. At that time the students reconnect with the project mentor to verify that the conceptual design and plan to move forward with solution is still appropriate in the company context. Sometimes the company has taken steps over the summer (especially if an intern has been in place) to implement or test the team’s ideas. Either way, the company and the team become realigned at the Fall Kickoff, and the project continues through December.

APPENDIX A: CONTACTS

John B Ochs PhD, Professor ME & Mech, Director TE Program



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An award-winning innovator in curriculum and program development, John Ochs joined Lehigh University's Mechanical Engineering and Mechanics department in 1979 and founded and directed its Computer-Aided Design Labs from 1980 to 1999. From 1985-95 he did extensive industry consulting and was involved in the startup of three companies. Since 1996, he has directed Lehigh's Integrated Product Development (IPD) program. What started as a pilot in 1994 as a capstone experience for mechanical engineering majors is now cross-listed in engineering, business, and arts with more than 300 students from over 20 majors participating each year. The program won the 1996 American Society of Mechanical Engineers' curriculum innovation award and the 1997 Newcomen Society's award for the promotion of America's free-enterprise system.

Jodie Johnson, Assistant Director TE Program



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Jodie Johnson is the Assistant Director for Lehigh University's Technical Entrepreneurship Program, working with the program's students and faculty. Jodie works closely with students and applicants on a daily basis, assisting with applications, course registration, purchasing, curriculum materials, campus visits, and more. Jodie brings more than 25 years of experience at Lehigh University to her position, having worked for Lehigh's Energy Research Center as publications and administration coordinator since 1993. Previous experience included working as an administrative assistant for Northeast Tier Ben Franklin Technology Center. Jodie has experience with small businesses, as the daughter of small business owners and a former co-owner of her own businesses.

Lauren Purdom, TE Outreach Manager



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Lauren Purdom is the point of contact for all company sponsors of Lehigh University's undergraduate Technical Entrepreneurship Capstone (formerly IPD) Program. As a Lehigh graduate, she went through the program as an undergraduate engineer. Lauren then went on to advise multiple capstone teams while pursuing her Master's in Technical Entrepreneurship, also at Lehigh. She now works with the sponsors, advisors, and senior peer mentors of the program. In 2016, Lauren won the YWCA's Tri-County Tribute to Exceptional Women in the S.T.E.M. category for educating and encouraging young women and girls in understanding the science, technology, engineering, and mathematics fields in the workplace and the community.

APPENDIX B: DELIVERABLE TIME FRAME

Deliverable	Due Date
Weekly Communications	Every Monday night by 11:59pm
Midterm Presentation	~ Week 7 in each semester
Final Oral Presentation	First week in May, Second week in Dec
Executive Summary	Week of Final Presentation