Capstone Design Factory

Overview
Currently the Accreditation Board for Engineering and Technology (ABET) requires all graduates to undertake a “capstone” design project which requires students to apply their knowledge and experience toward real-world projects in a team-oriented environment. In the Civil and Construction Engineering (CCE) curriculum, the Capstone Design Program is implemented in a two-course sequence. The first course covers the project definition, planning, scheduling, and control techniques. The second course deals with project design, analysis, and implementation. These courses result in a Capstone Design Project where the students produce a working design, written report, and oral presentation.

Industry Involvement
The CCE Department has established a Capstone Design Factory that will be a University-Industry partnership in which industry participates in the students’ education to help produce highly-qualified civil and construction engineers. This will be accomplished through the integration of design, construction, and business realities in an active learning environment. These real-world problems will meet state-of-the-art modeling, analysis, and design tools in a modern facility that give the students an experience that directly prepares them for careers in civil and construction engineering, with general problem-solving abilities.

Industry involvement is an essential component of the Capstone Design Factory. In fact, this program is in response to the industry demand for graduates who are well trained in engineering fundamentals, as well as professional skills to effectively compete in today's market place, such as teamwork, project management, cross functional networking, communications and design. The development of our facilities and curricula would be overseen and guided by our Industry Advisory Board (IAB). The IAB members come from a variety of industries and are willing to contribute their time, money, and provide guidance, mentorship, and student job opportunities to make this program a success.

Sponsor Benefits
Industry partners directly benefit from this partnership by

- Availability of well-prepared graduates who understand the design and construction process
- Opportunities to evaluate potential employees through internships, collaborative projects and classroom interactions
- Direct assistance in design problems through sponsorship of senior design projects
- Professional development of industry personnel through teaching and curriculum development
- Technology transfer through Industrial-Academic exchanges--industry engineers in the classroom, and faculty internships in industry
- Opportunity to influence and improve the education of civil and construction engineers well into the century

Additional direct benefits to the industry partners from the Capstone Design Factory include:

- Fresh ideas, 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 junior staff engineers
- Contributing to engineering education at Western Michigan University
- The mental stimulation of interacting with bright, energetic, creative young minds
- Networking with other companies and Western Michigan University faculty
Sponsor Expectations
A successful Capstone Design Project requires the sponsor to be actively involved by assigning a motivated individual to interact with the student throughout the duration of the project. First, this requires the sponsor to fill out the Capstone Design Factory Project Submission Form with as much detail as possible. Then the individual projects will be reviewed by faculty. Next, the teams will choose a project and meet with the sponsor to discuss details of the project. Finally, the sponsor and students will hold routine progress meeting (approximately one to two hours per week) to discuss the current status of the project and give guidance.

During the remainder of the semester and the following semester, students will develop a final proposal for the project and begin regular meetings with sponsors to develop deliverables. Teams will continue to work on the projects until the Senior Capstone Design Factory Projects.

Capstone Design Projects: Parameters and Constraints
Requirements vary from project to project but in general contain the following:

CONSTRUCTION ENGINEERING
- The proposed projects should have more than 200 activities. Upcoming or recently completed industrial, commercial, and highway projects are examples of projects.
- Students should be able obtain the plans and specifications of the projects
- The following is a suggested list of tasks which the students need to complete during their capstone design experience:
  - Work Breakdown Structure (WBS)
  - CPM Network Plot/Reports
  - Detailed Estimate (Labor, Equipment, Material, Overhead, Contingency, Profit)
  - Construction Methods, Detail and Design
  - Project Management System (Data collection, Safety Plan, Reports)
- Technical report
- Oral presentation

CIVIL ENGINEERING
- The proposed projects should incorporate at least two focus areas of study (Construction, Environmental, Geotechnical, Transportation, and Structure)
- The following is a suggested list of tasks which the students are expected to complete during their capstone design experience:
  - Planning and site development
  - Modeling and analysis
  - Design and detail different components
  - Environmental and Transportation issues related to the proposed project
  - Technical report
  - Oral presentation
Capstone Design Factory Project Submission Form

Sponsor Information:
Company/Agency Name: __________________________________________________________
Address: __________________________ City: _______ State: _______ Zip: ______
Contact Person: ________________________________________________________________
Phone: ______________________  E-mail Address: __________________________________

Project Title: ________________________________

Project Description (please attach additional pages if necessary):
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Project Details (location, existing information, etc.):
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Proposed Project and Constraints (traffic, environmental concerns, construction methods, etc.):
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________

Project Deliverables (Site plan, drawings, quantities, estimation, schedule, etc.):
__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________