Guidelines for
Industry Sponsorship of Clarkson University MAE Department
Mechanical Engineering Capstone Student Projects

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1. Context

Clarkson’s engineering departments all offer “Capstone” engineering design project courses to undergraduate engineering students. Mechanical engineering students take ME-445 Integrated Design-1 and ME-446 Integrated Design-2. Each is a one-semester course sequentially forms the Capstone Design experience. The two main objectives are for students to apply their technical knowledge to real-world design situations and to acquaint students with the design processes generally used by US industry and government organizations. (Inventiveness is encouraged however creating patentable products is not a primary objective, noting that much of engineering practice consists of doing things correctly, efficiently and economically.)

Both courses are offered in the spring and fall semesters. Typically, 100 or so students take ME-445 in the fall semester and continue to ME-446 in the spring semester at which time their Capstone design will have been completed. Forty or so new students take ME-445 in the spring and then ME-446 in the following fall.

Design teams consist of two to eight students, with four or five being the norm. Each team works on a different project, though sometimes multiple teams will work on different aspects of the same project. Each team has a faculty mentor who regularly meets with her/his team. Project “completion” can vary. For some projects, students design, build and verify a prototype hardware model. For others they only provide analyses, CAD models, sometimes code and hardware drawings. All project teams write a comprehensive final report and also present their work at a poster session held at Clarkson at the end of each semester.

Concurrently, students study the design process. Topics emphasize system engineering and include design for manufacturing and assembly, design for reliability, WBS project
management, decision-making tools, design for the environment, fostering creativity, verification… etc.

Project ideas come from many sources: recommendations by the faculty, suggestions by the students, interdepartmental projects recommended by other Clarkson Departments, and recommendations and sponsorship by industry. A few weeks after they begin ME-445 students are presented with a list of potential projects.

2. Guidelines
   a) Industry, non-profit organizations and government organizations should recommend projects of interest.
   b) The above may be done as one-on-one communication with Clarkson faculty, which can be facilitated by the chair of the department.
   c) Projects should span two semesters. Students would begin doing project-specific work a month or so after the start of ME-445.
   d) Industry (et al) must provide a project mentor. He/she should have periodic (weekly preferred) “meetings” with the student team, either in-person or via telecon, videoconference, webinar or other means.
   e) From time-to-time MAE faculty may join these meetings as non-participants (unless called upon).
   f) Industry project mentors are strongly encouraged to meet in-person with their student teams at least once during ME-445 semester and again during ME-446.
   g) They should also keep the Clarkson ME-445/6 course instructor informed by email as to the progress of the team.
   h) Industry project mentors should define what constitutes “completion” of the project.
   i) Industry project mentors should recommend a grade for each student to the course instructor.

3. Management of Expectations
   a) The work should be within the technical capacity of Junior and Senior undergraduate engineering students.
   b) A typical project team is usually made up of students with a range of technical knowledge as well as a range of hands-on experience with fabrication, integration and verification and others with little or none.
c) Time can be a constraint. The sum amount of time a student has to work on an ME445/6 project throughout a semester is limited, accounting for her/his other courses and some cases Clarkson sports, ROTC and other activities. A maximum allowance of work time is 7-8 hours/week.

d) Finally, Industry Project mentors should keep in mind that the main purpose of design projects is to be an educational experience for the students, not to produce ‘value’ for the industry.

4. **Financial**

   a) Unless otherwise defined within their own organization (e.g. NASA) industry and government are expected to pay Clarkson a non-refundable $2,500 at the beginning of a project.

   b) At the conclusion of the project, i.e. at the end of ME-446, they are requested to pay an additional $2,500 provided they are satisfied with the student’s effort on the project.

   c) The above may be fully or partially in the form of “in-kind” payment. For example, the organization might provide materials or components (e.g. motors) or perform fabrication or testing that otherwise Clarkson would have to pay for.

   d) Financial considerations for student projects done for non-profit organizations (e.g. American Red Cross) will be handled on a case-by-case basis.