

# **Engineering 4M06**

## **Multidisciplinary Projects**

### **Course Outline 2012 -13**

#### **Calendar Description**

ENGINEER 4M06 MULTIDISCIPLINARY PROJECTS Capstone Course in which students work in multidisciplinary teams to develop an integrated design or solve a problem for an organization (company or not-for-profit organization). Two Labs (3 hours each); both terms  
Prerequisites: Registration in final year of an Engineering program, a CA of at least 8.0, and permission of Department and Instructor.

Antirequisites: CHEM ENG 4W04, CIV ENG 4C04, 4R04, 4X06, ELEC ENG 4I06, 4BI6, ENG MGT 5B03, ENG PHYS 4A06, MATLS 4Z06, MECHATRON 4TB6, MECH ENG 4M06, SFWR ENG 4G06, 4GP6. Not open to students in any Engineering Physics programs.

Notes:

1. This course runs from September to April, but advanced preparation is required.
2. Enrollment is limited to 50 students (10 teams of 5 students) by the procedure described below.
3. Students in Engineering and Management will take this course instead of ENG MGT 5B03 and the capstone course in their department.
4. Students are advised to register in their department capstone course (and ENG MGT 5B03) and then switch registration if they are admitted to this course.

#### **Learning Outcomes**

The objective of this course is to give students experience in open-ended projects that are industrially-based and multi-disciplinary. The projects will be selected to apply design solutions for complex, open-ended engineering problems and to design systems, prototypes, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, economic, environmental, cultural and societal considerations.

The specific learning outcomes include:

- a) The ability to assemble a multidisciplinary team and market the team to potential clients.
- b) The ability to develop a formal proposal and secure an engineering project. The project should:
  - Be selected from a number of possible projects on the basis of team skills and the potential for a value-adding outcome,
  - Include relevant engineering, business and sustainability aspects,
  - Be of a degree of difficulty to challenge the team at the final year level,
- c) The ability to work productively as a consulting team to deliver a project outcome that adds value to the client.
- d) The ability to work with an open-ended project that may be in an unfamiliar field.
- e) The ability to cope effectively with changing circumstances, issues and difficulties that may arise before, during and after the project.

f) Demonstration of professional skills in all aspects of the course. In addition to writing skills, speaking and presentation skills, the team should demonstrate initiative, time management, and analytical ability.

## Briefing Sessions

An evening briefing session will be held in March before the course starts to explain the course organization, and also provide an opportunity for students to network to form teams. Another briefing session will be held in September, and others may be scheduled as required.

## Team Formation & Registration (February to early July)

Potential teams of 4 to 5 students will make a team skills statement and request provisional registration from the instructor. The team skills statement outlines the collective skills of the team and the general types of projects that they will solicit.

Submit the request to [eng4M06@mcmaster.ca](mailto:eng4M06@mcmaster.ca) as a Word document with:

Team Skills Statement

Team Members in a Table with these headings:

Last Name, First Name, McMaster Email, Student Number, Department/Program

Enrollment is limited, so submit your request as soon as possible.

The Instructor will evaluate the request based on:

1. Multi-Disciplinary composition of group (at least 2 Engineering departments)
2. At least 1 Engineering and Management student
3. CA of at least 8.0 for all members
4. Marketability of the team skills and likelihood of finding suitable client organizations.
4. Ensure a reasonable balance between the teams across the Faculty (no more than 10 teams).

If the instructor grants provisional registration, the group must by the end of June:

1. Solicit potential client organizations (companies or not-for-profit organizations, such as hospitals) for 2 or 3 potentially suitable projects.
2. Solicit a faculty member from one of the departments of the students with knowledge of the technical area of the potential projects to act as Advisor.
3. The Advisor, in collaboration with the Instructor and Engineering and Management Coordinator, will assist the group to modify as required and select the best project from the potential ones.
4. Prepare a brief Project Statement that outlines the background to the work, objectives and methodology so that the Instructional Team can evaluate its suitability for a project. Submit this to [eng4m06@mcmaster.ca](mailto:eng4m06@mcmaster.ca) by the end of June. Failure to do so will result in loss of registration.

In early July:

1. The Instructional Team for the course (Instructor, Engineering and Management Coordinator, and advisors from all departments with students in the groups) will determine if the project is suitable for the course based on the Project Statement.
2. Departments have the right to refuse registration in the course if the project is not deemed suitable for a final year capstone experience in the discipline.
3. Students will be notified if their project is accepted; if so, they will be permitted to register in this course on SOLAR. If not, they will take their department capstone course (and ENG MGT 5B03).

## Types of Projects

As noted in the Learning Outcomes section, there is wide scope for the selection of the type of project. They could involve solving specific problems or designing or re-designing processes, components, or products, or even evaluating new engineering business ventures. The projects could be design calculations, but it is possible that some require physical design or laboratory measurements, such building of prototypes, testing of equipment or materials or other types of measurement and analysis.

Often the design and laboratory work will incur some costs. Each team will prepare a Budget in their project proposal. Often the client will provide some cash and in-kind support. The Ontario Centres of Excellence, (OCE) through their Connections Program, provides support to universities to carry out such collaborative projects. Therefore, the portion not covered by the client, can be requested from OCE, up to \$3000 per project.

The Final Report will provide the details of the outcome of the project. It is expected that this will involve multi-disciplinary engineering, and will provide value to the client organization. The Final Report must discuss the financial implications of their project. This could take different forms depending on the project; capital and operating costs, value-in-use analysis, or cost-benefit analysis of proposed changes. The Final Report must also specifically address social and environmental aspects of the project.

## Commercial Sensitivity, Intellectual Property Rights and Due Diligence

It is important to recognize that companies work in a competitive environment. Projects that are commercially sensitive may not be suitable for a Eng 4M06 student team. If a company asks about confidentiality or intellectual property rights, note their questions and say that you will seek advice. Do **NOT** sign any agreements without your instructor's permission. Alert your instructor promptly, providing details, and a copy of any proposed agreement, in an email with a copy to [eng4m06@mcmaster.ca](mailto:eng4m06@mcmaster.ca).

Occasionally a project will be offered that has the potential to expose the team or McMaster to some commercial or legal risks. All projects will be monitored by the instructor in regard to potential risks, and some changes might be required. This is a normal part of project work and students will be encouraged to understand the sources of risk and the methods of dealing with the risk.

## Course Deliverables

<b>Deliverable</b>	<b>E-submit</b>	<b>Paper copy</b>
Team skills statement (Shortly after February briefing session)	<b>Y</b>	<b>N</b>
Project Statements (Due June 29)	<b>Y</b>	<b>N</b>
Progress review notes (Every 7 to 10 days, starting in September)	<b>Y</b>	<b>N</b>
Oral Proposal (to be scheduled evenings of week of September 24)	<b>Y</b>	<b>N</b>
Written Project Proposal (September 28)	<b>Y</b>	<b>Y</b>
Oral Progress Report (to be scheduled evenings of the week of January 14)	<b>Y</b>	<b>N</b>
Written Progress Report (due January 20)	<b>Y</b>	<b>Y</b>
Final Oral Report (to be scheduled in the evenings of the last week of classes in April)	<b>Y</b>	<b>N</b>
Final Written Report (due last day of classes in April)	<b>Y</b>	<b>Y spiral bound</b>

## Course Evaluation

Oral Proposal	10%
Written Proposal	10%
Oral Progress Report	10%
Written Progress Report	10%
Progress Review Notes	10%
Oral Final Report	20%
Written Final Report	<u>30%</u>
<b>TOTAL</b>	<b>100%</b>

## Scheduling & Attendance

Because of the multidisciplinary registration of students, briefing sessions and reporting sessions will be scheduled in the evenings.

Students are required to attend:

- the briefing session in September
- other briefing sessions as notified,
- team meetings as arranged by the team,
- company meetings as arranged by the team,
- adviser meetings as arranged by the team,
- all presentation sessions at which their team is scheduled to present.

## Course Communication

Communication from the instructor is primarily by email ([eng4m06@mcmaster.ca](mailto:eng4m06@mcmaster.ca)). Please follow the ground rules to facilitate efficient and reliable communication.

- Teams are asked to nominate the team contact person and then to use email to communicate with the instructor.
- Always use the subject line “4m06 + team# + topic”
- Only McMaster email accounts will be used.
- Please respond promptly when asked.
- It is your responsibility to check your email regularly and maintain sufficient space on your account to avoid emails not being delivered.

## Safety

The safety of the individual team members is of paramount importance. Teams conducting laboratory, plant or machine shop work will appoint a safety officer who will focus the team's attention on safety. The team safety officer will collect contact information of the team members and the company representatives (if there is work at the company facilities). The course instructor will collate the information and distribute as appropriate. The field trip due diligence check list should also be completed. When working at McMaster, students must adhere to McMaster procedures for safe practice in labs. Consult the appropriate lab supervisor, or the course instructor for guidance. When visiting a company site, each member of the team must understand and comply with all appropriate company procedures and participate in training as required by the company safety representative. If required, students may sign a waiver of responsibility for the company, provided the company has a recognized safety system. Consult the nominated company contact and the course instructor for guidance. When traveling to and from the company site, students should take care with road safety particularly during bad weather. Each student has the right and responsibility to withdraw from travel if they regard conditions as potentially unsafe at the time. The above summary has been approved as an appropriate implementation of the [McMaster Field Trip and Electives Planning \(FTEP\) Policy](#). The waiver in the [FTEP Policy](#) is to be used for this course only in exceptional circumstances.

## Discrimination

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem, that cannot be resolved by discussion among the persons involved, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Office or the Human Rights Consultant, as soon as possible.

## Academic Integrity

It is each student's responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the University Academic Integrity Policy. Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, *e.g.* the submission of work that is not one's own or for which other credit has been obtained.
2. Improper collaboration in group work.
3. Copying or using unauthorized aids in tests and examinations.

The criteria for acceptable collaboration in group work should be discussed with your instructor at the time of assignment of work. In this course we may use software and other security checks designed to reveal plagiarism. Students will be notified when they are required to submit their work electronically and in hard copy so that it can be checked for academic dishonesty.

## Changes to Course Outline

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes.