University of Victoria

THE UNIVERSITY OF VICTORIA
DEPARTMENT OF MECHANICAL ENGINEERING

Course Outline

MECH 400 – ENGINEERING DESIGN

2014-2015 Summer Term

LECTURERS

Afzal Suleman, Ph.D., PEng
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TEACHING ASSISTANTS

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TIMETABLE

- Lectures/Invited Seminars – Tuesdays 12:30 – 14:30 @ ECS 125
- Group Meetings/Laboratory – Tuesdays 14:30-16:30 @ ELW B228

Calendar Description: MECH400 is a multidisciplinary design project course where students work in multidisciplinary teams to develop an open ended and integrated design problem. Complete design of a product or a system; specification of function, analysis, selection of materials, strength calculations, preparation of working/engineering drawings, cost analysis and tenders, preparation of final report and symposium presentation of final design. Weekly seminar series featuring topics related to design, safety, marketing and management.

The projects may originate from faculty members, students, companies, or other external sources. They may have a diverse nature (theoretical investigations, practical designs, measurements, etc.) and serve diverse needs (research, undergraduate laboratory experiments, open house demonstrations, feasibility studies of interest to local companies, etc.). For multi-disciplinary projects originated external to the Department, a faculty supervisor from the MECH Department will be appointed.

Learning Outcomes

The objective of this course is to give students experience in open-ended projects that are industry-based and multidisciplinary. 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:

1. The ability to assemble a multidisciplinary team and market the project/idea to potential clients.
2. The ability to develop a formal proposal and secure an engineering project. The project should:
    a. Be selected from a number of possible projects on the basis of team skills and the potential for a value-added outcome,
    b. Include relevant engineering, business and sustainability aspects,
    c. Be of a degree of difficulty to challenge the team at the final year level.
3. The ability to work productively as a consulting team to deliver a project outcome that adds value to the client.
4. The ability to work with an open-ended project that may be in an unfamiliar field.
5. The ability to cope effectively with changing circumstances, issues and difficulties that may arise before, during and after the project.
6. 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.

Group Meetings

Regular meetings will be held during the group meeting/laboratory time (Tuesdays 14:30-16:30H @ ELW B228).

Team Formation and Skills Statement

Potential teams of 5-6 students will make a team skills statement. The team skills statement outlines the collective skills of the team and the general types of projects that they will solicit. The groups must

provide the following by Tuesday May 12th (**2 Pages**):

1. **Team Skills Statement:** Team Members in a table format with these headings: Last Name, First Name, UVic Email, Student Number, Department/Program (**1-page** Memorandum attached)
2. Prepare a brief **Project Statement (1-page)** that outlines the background to the work, objectives and methodology so that the Instructional Team can evaluate its suitability for a project.
3. Solicit potential client organizations (companies or not-for-profit organizations) for 2 or 3 potentially suitable projects.
4. Solicit a faculty member with knowledge of the technical area of the potential projects to act as Project Advisor.
5. The Instructional Team will assist the group to modify as required and select the best project from the potential ones. The Instructional Team for the course will determine if the project is suitable for the course based on the Project Statement.

Project Selection

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.

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.

The team should be formed as a small company having a name, a suitable logo, and a motto. Students may select a project originating from an industrial or external organization. Teams formed with students from other Departments are encouraged but only students registered in the MECH400 course will be evaluated by the MECH Department. Please notify the Coordinator of your project selection by completing the Project Selection form. If you intend to propose your own project, please provide the Coordinator with the appropriate description of the project, the resources needed, and the name of the potential Faculty Supervisor that you have approached beforehand who agrees to supervise your project. Since some projects might require specialized parts, it is very important that you finalize a complete project proposal and get it approved by the Coordinator prior to the deadline of Project Selection.

Only the projects at an advanced stage of development with proper ENGINEERING DRAWINGS will be accepted to proceed to the prototyping stage in the Machine Shop. All other projects will be required to complete a proof of concept using the 3D printing facilities in the Department. Machine Shop 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 Mechanical Engineering Department provides support to carry out such collaborative projects. Therefore, for the portion not covered by the client, the

Department can provide support for materials up to $150 per 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 MECH400 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 Suleman@uvic.ca.

Occasionally a project will be offered that has the potential to expose the team or UVic 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

	Due Date	E-submit	Paper Copy	Evaluation (%)
Team skills/Project statement	**12-May**	**Y**		**5**
Written Project Full Proposal	**19-May**	**Y**		**15**
Written/Oral Progress Report	**16-June**	**Y**		**30**
Written/Oral Final Report/ Prototype Demo	**31-July**		**Y**	**50**

Scheduling and Attendance

Students are required to attend:

- team meetings as arranged by the team/TA;
- company/faculty sponsor meetings as arranged by the team;
- advisor 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 (CourseSpace). 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 "**MECH400**"
- Only UVic email accounts will be used.
- 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 UVic, students must adhere to UVic 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.

CONTENT AND SCHEDULE

	DATE	TOPIC	LOCATION	DELIVERABLE
MAY				
1	05 Tuesday	**Introduction/Course Outline Presentation**	ECS 125	
	05 Tuesday	Group Meetings	ELW B228	
2	12 Tuesday	**Invited Lecture: A Primer on the Ultimaker 3D Printers – Joshua Coutts**	ECS 125	**Team Skills/Project Statement**
	12 Tuesday	**Invited Lecture: How to Get it Right the First Time - Ray Brougham, Prototype Equipment Design**	ELW B228	
3	19 Tuesday	Invited Lecture	ECS 125	**Proposal**
	19 Tuesday	Group Meetings	ELW B228	
4	26 Tuesday	Invited Lecture	ECS 125	
	26 Tuesday	Group Meetings	ELW B228	
JUNE				
5	02 Tuesday	Invited Lecture	ECS 125	
	02 Tuesday	Group Meetings	ELW B228	
6	09 Tuesday	**Invited Lecture: Design/Engineering Drawings for Manufacture - R Katz**	ECS 125	
	09 Tuesday	Group Meetings	ELW B228	
7	16 Tuesday	**Symposium – Progress Review Presentations**	ECS 125	**Mid Term Review Report**
	16 Tuesday		ELW B228	
8	23 Tuesday	Invited Lecture	ECS 125	**Decision on Manufacturing**
	23 Tuesday	Group Meetings	ELW B228	
9	30 Tuesday	Invited Lecture	ECS 125	
	30 Tuesday	Group Meetings	ELW B228	
JULY				
10	07 Tuesday	Invited Lecture	ECS 125	
	07 Tuesday	Group Meetings	ELW B228	
11	14 Tuesday	Invited Lecture	ECS 125	
	14 Tuesday	Group Meetings	ELW B228	
12	21 Tuesday	Invited Lecture	ECS 125	
	21 Tuesday	Group Meetings	ELW B228	
13	28 Tuesday	**Symposium – Final Project Presentations**	ECS 125	**Final Report**
	28 Tuesday		ELW B228	

M E M O R A N D U M

Department of Mechanical Engineering

DATE _____

TO: **Students registered in MECH400**

FROM: Afzal Suleman, Course Instructor/Coordinator for MECH400 Design Projects
May – August 2015

CONTACT INFO: Email: Suleman@uvic.ca; Tel. 250-721-6039

SUBJECT: Project and Team Selection

Please submit this form to Afzal Suleman (Suleman@uvic.ca) by **May 12, 2015, 17:00H**

Project Title: _____

Faculty Supervisor:_____

External Advisor (if any): _____
(Include Email and/or phone number)

The Team (5-6 students):

Family name	First name	Email	Student No.