Western University
Department of Mechanical & Materials Engineering

MME 4499 - Mechanical Engineering Design Project

COURSE OUTLINE – 2015-2016

CALENDAR DESCRIPTION:

Students will develop and practice engineering design skills by working on a team-based project. Students will experience all phases of the design process, including: problem definition, generation and evaluation of concepts, engineering analysis and testing, and preparation of design documentation. Project management and communications skills will also be emphasized.

COURSE INFORMATION:

Course coordinator	Prof. R. Tutunea-Fatan (rtutunea@eng.uwo.ca)
Course instructors (project advisors)	Prof. L. Ferreira (louis.ferreira@uwo.ca) Prof. P. Kurowski (pkurowski@eng.uwo.ca) Prof. R. Tutunea-Fatan (rtutunea@eng.uwo.ca)
Lectures	Wed., 1:30 – 2:20 pm, SH-3345
Tutorials (team meeting/advising)	Thu., 4:30 – 7:20 pm, UCC 37

PREREQUISITES:

Completion of third year of the Mechanical Engineering Program.

Unless you have either the prerequisites for this course or written special permission from your Dean to enroll in it, you will be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

ANTIREQUISITES:

CBE 4497, CEE 4441, ECE 4416, ES 4499, SE 4450

ACCREDITATION UNITS:

Complementary Studies = 25%, Engineering Design = 75%

TOPICS:

Students work in teams on a major design project. Suitable design projects may be defined by students, faculty, or industry sponsors. In addition, all students are required to attend the scheduled course lectures.

LEARNING OUTCOMES:

The primary objective of this course is to provide students with a structured engineering design experience to build on the knowledge that they have accumulated during the prior years of the undergraduate program. Engineering design is a complex and creative human activity that integrates elements of basic sciences, mathematics, engineering sciences, as well as other skills in developing components and systems to meet specific needs. Furthermore, engineering design is an iterative, open-ended process whose result is subjected to a number of project-specific constraints that are formulated to address economic, health, safety, environmental, social, or other pertinent interdisciplinary factors.

To address the considerations above, the course is intended to provide students with an opportunity to learn and practice the design methodology and associated soft skills by seeking an engineering solution to a real-life problem. At the end of the course, students will be able to:

- Systematically generate an engineering solution that satisfies the constraints imposed by the design beneficiary
- Apply and justify the steps involved in the engineering design process by demonstrating critical thinking about the design and design decisions:

  - Define the scope and the objectives of the design problem
  - Collect, analyze and evaluate relevant design solutions that were previously developed to address similar and/or related problems
  - Investigate and evaluate candidate design concepts from functional, structural, safety, environmental, manufacturing, and economic perspectives
  - Apply previously acquired engineering knowledge to identify the optimal candidate solution to the open-ended design problem
  - Generate complete embodiments of the selected design solution through the application of the relevant engineering standards, codes and design practices
  - Validate the selected design through virtual prototypes, including mathematical models and computer-aided engineering (CAE) tools
  - Assess the functional and economic feasibility of a physical prototype
  - Validate the final design solution by means of a functional physical prototype
- Prepare professional-quality design documentation to include sketches, detail and assembly drawings, bills of materials, schematics, etc.
- Apply communication skills to effectively communicate engineering ideas verbally and in writing
- Manage and apply the principles of effective team interaction: organization, management, and motivation
- Apply design-related skills to include project management as well as the assessment of environmental, legal, ethical and social implications of the developed design solution

CONTACT HOURS: 1 lecture hour, 4 laboratory/tutorial hours, 1.0 course.

TEXT: No textbook will be assigned.

REFERENCES: Dependent upon choice of project. Use of engineering books and design codes and standards is highly recommended.

Detailed information is available on the OWL course website.

COMPUTING: CAD, analysis and computer simulation software will be used as appropriate to the project.

UNITS: SI units are encouraged. However, the use of English units is permitted, if justified and approved by the project advisor.

EXAMINATIONS AND QUIZZES: Students will be required to present reports orally and in writing at various times during the year. *At the latitude of the project advisor, extensively prolonged unsatisfactory assessment and/or project progress may result in immediate project termination and course failure.*

EVALUATION: Course milestones will be carried out according to the following *tentative* schedule:

Milestone	Type	Weight	Due date
Team formation and project selection	T		Oct. 2, 2015
Project proposal	T	5%	Oct. 9, 2015
Interim project report I: state-of-the-art review, concept generation, design selection, complete design embodiment	T	20%	Nov. 2, 2015
Interim project report II: design analysis and virtual prototyping	T	10%	Nov. 27, 2015
Interim design presentation	T	10%	Dec. 4, 2015
Interim project report III: design documentation, and physical prototype feasibility	T	15%	Jan. 22, 2016
Interim project report IV: physical prototyping, testing and validation	T	15%	Mar. 18, 2016
Final design presentation	T	10%	Mar. 25, 2016
Final project report	T	10%	Apr. 6, 2016
Reflections and lessons learned	I	5%	Apr. 6, 2016
Peer evaluation (optional)	I		Apr. 6, 2016

Please note that:

- The deliverables in the table above are assigned either to teams (T) or to individuals (I).
- While the default assumption for team submissions is that all team members have contributed equally and hence they should receive identical marks for team deliverables, the project advisor can *discretionarily* adjust the marks depending on individual contributions brought to the team effort.
- Teams will be formed around approved project topics to be determined early in the course. A dedicated OWL enrolment feature will be used for team signup. The opening of the team signup feature will be announced through OWL.
- Capstone design teams can be formed by a minimum of 3 and a maximum of 4 members. No exceptions from this rule will be allowed!
- Project topics could be proposed by: i) project advisors; ii) external to the course faculty members; iii) students enrolled in the course; iv) third party/industry partners. Since certain conditions are to be met by a particular design problem in order to become an approved project topic in the course, those interested to propose projects falling under the last two categories are encouraged to contact

the course coordinator as early as possible.

- Tutorial time should be interpreted as the time set aside to meet with the faculty advisor as well as to hold weekly team meetings. This means that *tutorials are mandatory* unless agreed otherwise with the project advisor. Permissions to not attend the tutorial are to be granted by the project advisor solely and they are only valid for a particular week. If the tutorial room will prove to be inadequate to host all team/advisor meetings concurrently, alternate meeting locations can be identified at the latitude of project advisors.
- Professional-level deliverables are expected in the course, regardless of their format (*e.g.* written or oral). Please keep this *always* in mind while preparing your submissions and make sure to allocate enough time for this step. Please keep in mind that while a number of misconceptions allocate more weight to the content to the detriment of the form, the latter is often preventing the reader to appreciate the real value of the former.

ENGLISH: In accordance with Senate and Faculty Policy, students may be penalized up to 10% of the marks on all assignments, tests and examinations for improper use of English. Additionally, poorly written work, with the exception of final examinations, may be returned without grading. If resubmission of the work is permitted, it may be graded with marks deducted for poor English and/or late submission.

ATTENDANCE: Any student who, in the opinion of the instructor, is absent too frequently from class or laboratory periods in any course, will be reported to the Dean (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Dean, the student will be debarred from taking the regular examination in the course.

CHEATING: University policy states that cheating, including plagiarism, is a scholastic offense. The commission of a scholastic offence is attended by academic penalties which might include expulsion from the program. If you are caught cheating, there will be no second warning. (see Scholastic Offence Policy in the Western Academic Calendar)

SSD: Please contact the course instructor if you require material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Students that are in emotional/mental distress should refer to Mental Health@Western, **http://www.uwo.ca/uwocom/mentalhealth/**, for a complete list of options about how to obtain help.

NOTE: The above topics and outline are subject to adjustments and changes as needed. Students who have failed an Engineering course (i.e., <50%) must repeat all components of the course. No special permissions will be granted enabling a student to retain laboratory, assignment or test marks from previous years. Previously completed assignments and laboratories cannot be resubmitted for grading by the student in subsequent years.