

**Western University
Faculty of Engineering
Mechatronic Systems Engineering Program**

**MSE 4499—Mechatronic Design Project
Course Outline 2017–18**

Description: In this course, students will work in small teams to tackle a comprehensive engineering design project, building upon the overall undergraduate course material offered through the Mechatronics Systems Engineering program. Throughout the course, students will be expected to complete milestones related to the design process, including: problem definition, generation and evaluation of concepts, engineering analysis and testing, and preparation of design documentation. Each team will be supervised by a faculty advisor with whom they will meet regularly. An interdisciplinary committee will evaluate project deliverables such as design reviews, progress reports, presentations and a final engineering report.

Coordinator: Dr. Abbas Samani, P.Eng.
MSB 402, 519-661-2111 ext. 82723, asamani@uwo.ca
Consultation hours: By appointment.

Academic Calendar Copy: The aim of the course is to develop and practice the interdisciplinary skills required to solve open-ended engineering design problems from a mechatronics perspective. 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. A faculty advisor will supervise project teams and an interdisciplinary committee comprised of Mechatronics program faculty members will assess project outcomes.

Contact Hours: 6 laboratory/project, 1.0 course.

Antirequisites: CBE 4497, the former MME 4419, CEE 4441, GPE 4497, SE 4450, MME 4499, ECE 4415, ECE 4416, ES 4499.

Prerequisites: Completion of third year of the Mechatronic Systems Engineering program.

Unless you have either the requisites 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.

CEAB Academic Units: Complementary Studies 25%, Engineering Design 75%.

Required Software: Students are expected to know how to use computer software necessary to carry out their design project efficiently. This includes CAD and analysis software, programming environments, version control, etc.

Required Textbook: None assigned. General instructions and guidelines related to the course are available on OWL.

Recommended References: A number of textbooks related to the engineering design process, from the perspective of both general and mechatronics engineering, may be useful as references:

Clive L. Dym and Patrick Little, *Engineering Design: A Project-Based Introduction*, 3rd edition, New York: John Wiley & Sons, 2009.

Kevin Otto and Kristin Wood, *Product Design: Techniques in Reverse Engineering and New Product Development*, Upper Saddle River, NJ: Prentice Hall: 2000.

George E. Dieter and Linda C. Schmidt, *Engineering Design*, 5th edition, New York, NY: McGraw-Hill, 2013.

David G. Alciatore and Michael B. Hstand, *Introduction to Mechatronics and Measurement Systems*, 4th edition, New York: McGraw-Hill, 2012.

J. Edward Carryer, R. Matthew Ohline and Thomas W. Kenny, *Introduction to Mechatronic Design*, Upper Saddle River, NJ: Prentice Hall, 2011.

Klaus Pohl, *Requirements Engineering: Fundamentals, Principles and Techniques*, London: Springer-Verlag, 2010.

Pankaj Jalote, *A Concise Introduction to Software Engineering*, London: Springer-Verlag, 2008.

General Learning Objectives (CEAB Graduate Attributes):

Knowledge Base	D	Use of Engineering Tools	A	Impact on Society and the Environment	D
Problem Analysis	A	Individual and Team Work	D	Ethics and Equity	
Investigation	I	Communication Skills	D	Economics and Project Management	D
Design	A	Professionalism	D	Life-Long Learning	D

Notation: *x* represents the content level code as defined by the CEAB. blank = not applicable; I = introduced (introductory); D = developed (intermediate) and A = applied (advanced).

Specific Learning Objectives:

By the end of the course, students should understand and be able to apply sound engineering design principles and methodology to the solution of an open-ended design problem. Students should also have good oral and written communication skills, and should be able to function effectively in a design team. In particular, by the end of the course, students should be able to:

1. Properly identify and define an engineering design problem
2. Conduct background research on relevant existing and emerging technology
3. Generate multiple possible solutions using knowledge from different engineering disciplines
4. Effectively evaluate alternatives and select the best one
5. Apply engineering knowledge and tools from different disciplines to perform appropriate analysis
6. Validate engineering designs using mathematical modeling, simulation and prototype testing
7. Perform cost analysis and generate project budgets
8. Identify and apply relevant engineering standards, codes and practices
9. Schedule and manage a large design project
10. Recognize and address environmental, legal, ethical and social implications of an engineering design project

11. Produce professional-quality design documentation, including working drawings, detail drawings, bills of materials, schematics, etc.
12. Effectively communicate engineering ideas in written and oral forms
13. Use appropriate computer tools to support all phases of the design process

Project Topic:

The project topic may be selected from a listing of projects suggested by faculty advisors or may be suggested by a student team. The topic must be related to some aspect of Mechatronic Systems Engineering, contain a significant amount of engineering design experience and be approved by the course coordinator.

Evaluation: Over the course of the year, students will be required to deliver/meet a number of milestones. These will be evaluated on an individual and team basis as follows:

Course Component	Team Grade	Individual Grade	Due Date *
Project Selection			Sep. 19, 2017
Project Proposal	5%		Oct. 6, 2017
Personal Contribution Report **		2.5%	Oct. 24, 2017
Design Review 1	5%		Oct. 30, 2017
Phase 1 Report	10%		Nov. 14, 2017
Oral Design Presentation	7.5%		Nov. 27, 2017
Personal Contribution Report **		2.5%	Dec. 5, 2017
Design Review 2	5%		Jan. 15, 2018
Phase 2 Report	10%		Feb. 16, 2018
Personal Contribution Report **		2.5%	Mar. 6, 2018
Detailed Design Documentation	15%		Mar. 13, 2018
Design Showcase	10%		April 2, 2018
Final Report	20%		Apr. 10, 2018
Reflections and Lessons Learned		5%	Apr. 11, 2018

* Deadlines are approximate and maybe slightly adjusted due to unforeseen circumstances.

** Report to be signed by all team members or team lead member, otherwise it will not be graded.

Team grades may be adjusted by up to 15% for each student based on self and peer evaluation. In order to pass the course, the final report grade must be at least 60%. In addition, ***component grades below 60% may result in immediate project termination and failure of the course.***

Late Submission Policy: Late submission of any report or deliverable will incur a penalty of 10% per day of the component mark. Any deliverables submitted more than 5 days late will not be accepted.

Use of 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 the final examination 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: Attendance is mandatory for scheduled activities, including the design reviews, presentations and the final showcase. Students are required to meet regularly with their faculty advisor as scheduled.

Absence Due to Illness or Other Circumstances: Students should immediately consult with the instructor or program Director if they have any problems that could affect their performance in the course. Where appropriate, the problems should be documented (see the attached “Instructions for Students Unable to Write Tests or Examinations or Submit Assignments as Scheduled”). The student should seek advice from the instructor or program Director regarding how best to deal with the problem. Failure to notify the instructor or program Director immediately (or as soon as possible thereafter) will have a negative effect on any appeal.

For more information concerning medical accommodations, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf

For more information concerning accommodations for religious holidays, see the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

Cheating and Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. University policy states that cheating, including plagiarism, is a scholastic offence. 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.

All required papers may be subject to submission for textual similarity review to commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted will be included as source documents on the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between the University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, in the relevant section of the Academic Handbook:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

Policy on Repeating All Components of a Course: Students who are required to repeat an Engineering course 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 by the student for grading in subsequent years.

Internet and Electronic Mail: Students are responsible for regularly checking their Western e-mail and the course web site (<https://owl.uwo.ca/portal/>) and making themselves aware of any information that is posted about the course.

Accessibility: 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 519-661-2111 ext. 82147 for any specific question regarding an accommodation.

Support Services: Office of the Registrar, <http://www.registrar.uwo.ca/>
Student Development Centre, <http://www.sdc.uwo.ca/>
Engineering Undergraduate Services, <http://www.eng.uwo.ca/undergraduate/>
USC Student Support Services, <http://westernusc.ca/services/>

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

INSTRUCTIONS FOR STUDENTS UNABLE TO WRITE TESTS OR EXAMINATIONS OR SUBMIT ASSIGNMENTS AS SCHEDULED

IF, ON MEDICAL OR COMPASSIONATE GROUNDS, YOU ARE UNABLE TO WRITE TERM TESTS OR FINAL EXAMINATIONS OR COMPLETE COURSE WORK BY THE DUE DATE, YOU SHOULD FOLLOW THE INSTRUCTIONS LISTED BELOW. YOU SHOULD UNDERSTAND THAT ACADEMIC RELIEF WILL NOT BE GRANTED AUTOMATICALLY ON REQUEST. YOU MUST DEMONSTRATE TO YOUR DEPARTMENT (OR THE UNDERGRADUATE SERVICES OFFICE) THAT THERE ARE COMPELLING MEDICAL OR COMPASSIONATE GROUNDS THAT CAN BE DOCUMENTED BEFORE ACADEMIC RELIEF WILL BE CONSIDERED. DIFFERENT REGULATIONS APPLY TO TERM TESTS, FINAL EXAMINATIONS AND LATE ASSIGNMENTS. PLEASE READ THE INSTRUCTIONS CAREFULLY. (SEE THE 2017 UWO ACADEMIC CALENDAR).

A. GENERAL REGULATIONS & PROCEDURES

1. All first year students will report to the Undergraduate Services Office, SEB 2097, for all instances.
2. If you are an upper year student and you are missing a test/assignment/lab or exam that is worth MORE THAN 10% of your final grade, you will report to the Undergraduate Services Office, SEB 2097. Otherwise, you will report to your department office to request relief.
3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.
4. Documentation must be provided as soon as possible. If no one is available in your Department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.
5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. TERM TESTS

1. If you are in first year and you are unable to write a term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.
2. If you are an upper year student and you are unable to write a term test, inform your instructor PRIOR to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office. If the test is worth MORE THAN 10% of your final grade you will report to the Undergraduate Services Office, SEB 2097 to request relief. Otherwise, you will report to your department office to request relief.
3. Be prepared to provide supporting documentation to the Department Chair and/or the Undergraduate Services Office (see next page for information on documentation).
4. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair or the Undergraduate Services Office is required when rescheduling term tests.

C. FINAL EXAMINATIONS

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page for information on documentation) the next day, or as soon as possible (in cases where students are hospitalized). The following circumstances are not considered grounds for missing a final examination or requesting special examinations: common cold, sleeping in, misreading timetable and travel arrangements.
3. In order to receive permission to write a Special Examination, you must obtain the approval of the Chair of the Department **and** the Associate Dean and in order to apply you must sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

N.B. It is the student's responsibility to check the date, time and location of the Special Examination.

D. LATE ASSIGNMENTS

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4.
 - i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
 - ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

E. SHORT ABSENCES

If you miss a class due to a minor illness or other problem, check your course outlines for information regarding attendance requirements and make sure you are not missing a test, laboratory or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. EXTENDED ABSENCES

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or Ms. Karen Murray in the Undergraduate Services Office, if you are in first year.

G. DOCUMENTATION

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. ACADEMIC CONCERNS

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).
2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**
3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2017 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness: <http://westerncalendar.uwo.ca/2017/pg117.html>

Academic Accommodations for Students with Disabilities: <http://westerncalendar.uwo.ca/2017/pg118.html>

Academic Accommodations for Religious or Holy Days: <http://westerncalendar.uwo.ca/2017/pg119.html>

Course Withdrawals: <http://westerncalendar.uwo.ca/2017/pg157.html>

Examinations: <http://westerncalendar.uwo.ca/2017/pg129.html>

Scheduling of Term Assignments: <http://westerncalendar.uwo.ca/2017/pg135.html>

Scholastic Offences: <http://www.westerncalendar.uwo.ca/2017/pg111.html>

Student Medical Certificate: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf

Engineering Academic Regulations: <http://www.westerncalendar.uwo.ca/2017/pg1442.html>

Note: These instructions apply to all students registered in the Faculty of Engineering regardless of whether the courses are offered by the Faculty of Engineering or other faculties in the University.

Drop Deadlines:

First term half course (i.e. "A" or "F"):	November 5, 2017
Full courses and full-year half courses (i.e. "E", "Y" or no suffix):	November 30, 2017
Second term half or second term full course (i.e. "B" or "G"):	March 7, 2017

Contact Information:

Undergraduate Services Office:	SEB 2097	Telephone: (519) 661-2130	E-mail: engugrad@uwo.ca
Dept. of Chemical and Biochemical Engineering & Green Process Engineering:	TEB 477	Telephone: (519) 661-2131	E-mail: cbeugrad@uwo.ca
Dept. of Civil and Environmental Engineering:	SEB 3005	Telephone: (519) 661-2139	E-mail: civil@uwo.ca
Dept. of Electrical and Computer Engineering, Software Engineering & Mechatronics Engineering:	TEB 279	Telephone: (519) 661-3758	E-mail: eceugrad@uwo.ca
Dept. of Mechanical and Materials Engineering:	SEB 3002	Telephone: (519) 661-4122	E-mail: mmeundergraduate@uwo.ca