

Western University
Faculty of Engineering
Electrical and Computer Engineering Program
MSE 4499 – Mechatronic Design Project
Course Outline Fall/Winter 2026

COURSE 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.

ACADEMIC CALENDAR:

https://www.westerncalendar.uwo.ca/Courses.cfm?CourseAcadCalendarID=MAIN_023641_1&SelectedCalendar=Live&ArchiveID=

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.

PRE OR COREQUISITES: MSE 3302A/B, MSE 3380A/B, or MME 3380A/B

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.

ANTIREQUISITES: CBE 4497, the former MME 4419, CEE 4441, GPE 4497, SE 4450, MME 4499, ECE 4415, ECE4416, Engineering Science 4499, IE 4499.

CEAB ACADEMIC UNITS: Engineering Design 100%

INSTRUCTOR INFORMATION:

Instructor:

Office:

Phone:

Email:

CONTACT HOURS:

Timetable information is available at <https://draftmyschedule.uwo.ca/>.

Lectures will not occur every week, be sure to check the OWL Brightspace site for this course for the detailed schedule.

LECTURE:

LAB:

TUTORIAL:

RECOMMENDED/REQUIRED TEXT: No required textbook. General instructions and guidelines related to this course are available on OWL Brightspace.

Western Libraries has several textbooks presenting the formal process of engineering design that students may wish to review – just search “engineering design” in the library catalogue. The following textbooks are particularly applicable to this course:

1. C. L. Dym and P. Little, *Engineering Design: A Project-Based Introduction*, 3rd edition, New York: John Wiley & Sons (2009).
2. K. Oto and K. Wood, *Product Design: Techniques in Reverse Engineering and New Product Development*, Upper Saddle River, NJ: Prentice Hall (2000).
3. G. E. Dieter and L. C. Schmidt, *Engineering Design*, 5th edition, New York, NY: McGraw-Hill (2013).
4. D. G. Alciatore and M. B. Hiestand, *Introduction to Mechatronics and Measurement Systems*, 4th edition, New York: McGraw-Hill (2012).
5. J. E. Carryer, R. M. Ohline and T. W. Kenny, *Introduction to Mechatronic Design*, Upper Saddle River, NJ: Prentice Hall (2011).
6. K. Pohl, *Requirements Engineering: Fundamentals, Principles and Techniques*, London: Springer-Verlag (2010).

In addition to printed texts listed above, there are some good online textbooks available through Western Libraries:

7. G. Pahl, W. Beitz, J. Feldhusen, K.-H. Grote, K. Wallace, and L. Blessing, *Engineering Design: A Systematic Approach*, London: Springer London (2007).
8. G. D. Catalano and K. C. Catalano, *Engineering Design: An Organic Approach to Solving Complex Problems in the Modern World*, San Rafael: Morgan & Claypool Publishers (2020).
9. K. Janschek, *Mechatronic Systems Design*, Berlin: Springer-Verlag (2012).
10. P. Jalote, *A Concise Introduction to Software Engineering*, 2nd edition, Switzerland: Springer Nature (2025).

RECOMMENDED/ REQUIRED SOFTWARE:

Students are expected to know how to use computer software necessary to carry out their design project efficiently. This includes programming environments, CAD and relevant computational modelling software, version control, etc. Students should be familiar with these software tools from their previous studies in the MSE program.

RECOMMENDED RESOURCES/REFERENCES:

Additional electronic resources for selected aspects of engineering design will be posted to OWL Brightspace. These will usually be posted to accompany a class lecture on that topic. It is also expected that each student will undertake a suitable literature search for the individual project undertaken.

GENERAL LEARNING OBJECTIVES (CEAB GRADUATE ATTRIBUTES)

Knowledge Base		Engineering Tools	A	Impact on Society	A
Problem Analysis	A	Individual & Teamwork	A	Ethics and Equity	A
Investigation	A	Communication	A	Economics and Project Mgmt.	A
Design	A	Professionalism	A	Life-Long Learning	A

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).

Rating: I – The instructor will introduce the topic at the level required. It is not necessary for the student to have seen the material before. D – There may be a reminder or review, but the student is expected to have seen and been tested on the material before taking the course. A – It is expected that the student can apply the knowledge without prompting (e. g. no review).

COURSE MATERIALS: Lesson content and guides for completing the project will be available on OWL Brightspace. The material for this course will be taught in the lectures. Several lectures feature guest instructors who will provide in-depth information on selected topics. It is imperative that you attend each scheduled lecture.

UNITS: SI

COURSE TOPICS AND SPECIFIC LEARNING OUTCOMES: Mechatronics, as an engineering discipline, strives to optimally integrate mechanical, electronic and computer systems to create high-quality products and processes. By the end of this course, students should be able to apply sound engineering design principles and methodology in arriving at a solution to an open-ended design problem. Students should be able to demonstrate good oral and written communication skills, and work effectively in a team environment of 4 members.

The following table summarizes the course learning outcomes along with CEAB GAIs where the GAIs in bold indicate ones to be measured and reported annually.

Course Topics and Specific Learning Outcomes	CEAB Graduate Attribute Indicators
1. Problem Analysis An ability to use appropriate knowledge and skills to identify, formulate, analyze and solve complex engineering problems pertaining to capstone project in order to reach substantiated conclusions.	PA1, PA2, PA3
2. Investigation a. Applied level ability to define and plan an investigation pertaining to capstone project successfully (whether experimental or analytical). b. Applied level ability to conduct an investigation pertaining to capstone project successfully. c. Applied level ability to analyse and interpret data generated in the group's capstone project to reach valid conclusions.	I1 I2 I3

3. Design a. Applied level ability to frame a complex, open-ended design problem of capstone project in engineering terms. b. Applied level ability to generate a diverse set of candidate engineering design solutions for capstone project. c. Applied level ability to select candidate engineering design solutions of capstone project for further development. d. Applied level ability to advance an engineering design of capstone project to a defined end state – completion.	D1 D2 D3 D4
4. Use of Engineering Tools a. Applied ability to identify and select appropriate engineering tool(s) and resources for capstone project. b. Applied ability to apply appropriate engineering tool(s) and resources for capstone project. c. Applied ability to create/develop/adapt appropriate engineering tools for capstone project.	ET1 ET2 ET3
5. Individual and Team Work Advanced level ability to work effectively as a member and leader in MSE 4499 student team setting.	ITW1, ITW2, ITW3
6. Communication Skills a. Advanced level ability to follow instructions (listening and reading for comprehension). b. Advanced level ability to communicate orally using appropriate materials, language, non-verbal communication and effective graphical tools. c. Advanced level ability to articulate ideas in writing using appropriate technical language, and effective graphical tools.	CS1 CS2 CS3
7. Professionalism Developed level understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.	P1, P2, P3
8. Impact of Engineering on Society and the Environment a. Advanced ability to analyze the interactions of engineering with economic, social, health, safety, legal and cultural aspects of society pertaining to capstone project. b. Advanced understanding of the concept of sustainable design and development pertaining to capstone project. c. Advanced level understanding of the concept of environmental stewardship pertaining to capstone project.	IESE1 IESE2 IESE3
9. Ethics and Equity a. Advanced level knowledge of professional ethics pertaining to capstone project. b. Advanced level ability to apply Ethical Behaviour pertaining to	EE1 EE2

capstone project.	
c. Advanced level ability to apply the principles of professional accountability pertaining to capstone project.	EE3
d. Advanced level of awareness of the principles of equity pertaining to capstone project.	EE4
10. Economics and project management Advanced level ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations, to perform cost analysis and generate project budgets, and to schedule and manage a large design project.	EPM1, EPM2, EPM3
11. Life-Long Learning a. Advanced level ability to assess limitations in knowledge and skills. b. Advanced level ability to learn independently.	LL1 LL2

Project Topic:

The project topic may be selected from a listing of projects suggested by faculty advisors, industry, or may be suggested by a student team. The project scope should be large enough to enable an approximate even distribution among team members. Project teams can be formed by 4 members. The topic must be clearly defined and it must be related to major aspects of Mechatronic Systems Engineering, including significant elements of electronic and mechanical engineering in addition to some elements of other fields (e.g., control, embedded systems, software engineering etc.), 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.

Name	% Worth	Due Date	CEAB GAs ASSESSED
Team Formation	-		
Team Charter and Project Selection	2		
Report 1: Project Statement, Literature Review, and Design Specifications	10		I1, CS3
Iteration Planning and Individual Check-ins	5		
Concept Design Presentations	10		IESE3, EE4
Report 2: Conceptual Design	15		D3, ET1, CS3
Individual Design Reviews and Retrospective	5		
Report 3: Detailed Design	15		I2, ET2, CS3
Design Showcase Presentations	10		
Report 4: Final Prototyping, Testing, and Design Iterations	15		I3, D4, ET3, CS3

Reflections and Lessons Learned	5		LL1, EE2
Participation and Professionalism (including lecture attendance)	8		EE3

Note that the dates listed above are **tentative** and may be adjusted if needed.

* The design showcase will be scheduled at a time and location suitable for all capstone projects in the mechatronics systems engineering, electrical engineering, software engineering, and mechanical engineering programs to be presented at the same time and in the same venue.

Marks will be assigned on the basis of method of analysis and presentation, correctness of solution, clarity and neatness. Unless stated otherwise, assignments should be submitted electronically through OWL Brightspace. Professional-level deliverables are expected in this course, regardless of format (written or oral). Please keep this in mind while preparing your submissions and make sure to allocate enough time for this step.

All marks for project deliverables are tentative and will be finalized at the end of each term.

Grade Distribution: By default, group assignment grades earned by each team will be uniformly distributed among group members. While highly discouraged, if the contribution of a team member(s) is significantly less than others, grades of team members who contribute less may be adjusted consistently with their low contribution. Each submitted group assignment where work distribution issue is encountered should be accompanied by a grade distribution form appended to this document. In such cases, team grades may be adjusted for each student based on self and peer evaluation. While it is preferred that issues of design team dynamics be resolved within the team, such issues must be reported to the course coordinator immediately if a satisfactory resolution is not achieved within the team shortly after lack of improvement is noticed.

All deliverables are group assignment grades except for performance during the individual design check-in and individual design reviews, as well as the assessed grades in participation and professionalism, and reflections and lessons learned.

Important: Submitted grade distribution forms cannot be applied retroactively.

Minimum Requirements for Completing the Course: 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 a final course grade of 48% or less. Failure to complete all course deliverables will result in a grade no greater than 48%.

Groups may be required to attend meetings with the course instructor or TAs, make presentations, or provide documentation on their progress throughout the term. These may not always be graded assessments, but are still considered a course deliverable.

Students who have previously failed this course must repeat all components of the course. No special permissions will be granted enabling a student to retain evaluation marks from previous years. Previously completed evaluations cannot be resubmitted for grading by the student in subsequent years.

COURSE POLICIES:

Logbook: Students are expected to keep a project logbook that is available for periodic review by their advisor/coordinator, and attend and participate in required course lectures as well as regular meetings with their faculty advisor (which are documented). Grading information and due dates are provided on the course OWL Brightspace site. Written reports are evaluated by the course coordinator, TA with input from the faculty advisor if necessary. Factors considered in the evaluation of the submissions include the level of challenge involved in the project, the manner in which the project is carried out as well as the clarity and accuracy of the reports.

Project Budget: The department provides a budget of \$100 for 3D printing and laser cutting per team, and an additional \$125 per team member for purchasing materials. To use these funds, all materials, supplies, and equipment must be purchased through the electronics shop. Any purchases made without following this procedure will not be reimbursed.

Industry-, Faculty-, or Club-Sponsored Projects: Any project that is sponsored, and in which the sponsor expects to take possession of the physical prototype or any intellectual property generated during the completion of the project, needs to have a signed contract outlining these expectations. The course instructor can help facilitate this process. Sponsors may be expected to provide additional funding or resources to help teams complete their projects.

Parts and Material Return: Unless other arrangements have been made, students may be required to return any large components, equipment or documentation provided by the Department/Faculty during the course of the project to the Electronics Shop as directed. Failure to do so may result in the withholding of a grade in the course.

LATE SUBMISSION POLICY:

Advise the instructor if you are having problems completing the assignment on time prior to the due date of the assignment and be prepared to submit an Academic Consideration Request and provide documentation if requested by the instructor at: <https://www.eng.uwo.ca/undergraduate/academic-consideration-for-absences.html>

If you are granted an extension, establish a new due date with the instructor. The approval of the Chair of your Department is not required if assignments are completed prior to the last day of classes. Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies.

All deliverables, even those granted academic consideration, **must** be completed and submitted. Academic Consideration, if granted, will only provide an extension to complete the assessment without penalty. Under no circumstances will obtaining academic consideration allow an assessment to be dropped, or allow the grade that assessment to be redistributed to other portions of the course.

USE OF GENERATIVE AI POLICY:

Students have the opportunity to make use of generative AI (genAI) as a tool to help complete their projects. Students must keep in mind it is completely unprofessional for engineers to rely entirely on genAI. Any specific

information provided by genAI, including, but not limited to, literature references, calculated values, or source code should be thoroughly checked by the students for correctness and consistency.

Students who use genAI for any part of a report or presentation should include a statement explaining how genAI was used, in much the same way as these reports or presentations should mention the use of Matlab, AutoCAD, or any other computational tool.

If the course instructor or a course TA suspects a student is misusing genAI in their submitted work, they reserve the right to interview that student regarding their submitted work. If the course instructor or TA determines that a misuse of genAI did occur, they reserve the right to penalize the student by up to 100% of the grade for that assessment depending on the severity of the matter. Using genAI without declaration is a minor form of misuse. A more severe misuse of genAI is copying genAI output directly into a report or presentation without personally vetting that the information provided is correct.

The bottom line is that a professional engineer accepts personal responsibility and legal liability for their work, and should never submit work without a thorough understanding of that work.

ATTENDANCE: Attendance is mandatory for all lectures, design reviews, and the design showcase presentation.

GENERAL FACULTY/UNIVERSITY POLICIES:

The Faculty of Engineering and Western University have overarching policies that prescribe how undergraduate courses should run. The course-specific policies described above should be considered *in addition to* those overarching policies, or as course-specific interpretations of them. In the event of contradictions or confusion between course-specific policies above and general Faculty / University policies, please contact your course instructor for clarification.

Western Engineering's undergraduate policies can be found by navigating to:

<https://www.eng.uwo.ca/undergraduate/academic-support-and-accommodations/policies.html>

and then clicking the “*Engineering Undergraduate Policies framework*” link.

Note: The above topics and outline are subject to adjustments and changes as needed.