MME 4499 - Mechanical Engineering Design Project

COURSE OUTLINE – 2025-2026

CALENDAR DESCRIPTION: Students develop and practice engineering design skills by working on a team-based project. The 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 are emphasized.

COURSE INFORMATION:

Instructors	Email	Office	Phone
Dr. J. Makaran, P.Eng. (Course Coordinator)	jmakaran@uwo.ca	SEB 3095	x 86045
Dr. L. Jiang, P.Eng.	ljiang55@uwo.ca	SEB 3076	x 80422
Dr. G.K. Knopf, P.Eng.	gkknopf@uwo.ca	SEB 3087	x 88452
Dr. M.D. Naish, P.Eng.	mnaish@uwo.ca	ACEB 3470	x 88294
Dr. C. DeGroot, P.Eng.	cdegroo5@uwo.ca	SEB 3096	x 84455
Dr. R. Willing, P.Eng.	rwilling@uwo.ca	TEB 363	x 80295

Office hours are available by appointment. Students must use their Western (@uwo.ca) email addresses when contacting their instructors and use appropriate / agreed upon forms of address when contacting faculty and industry sponsors.

Lectures (in-person)	Refer to timetable
Tutorials (team meeting/advising)	Refer to timetable Note: 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 where teams and faculty advisors agree upon another meeting date and time. It is expected that the faculty teams and advisors meet one time per week as a minimum. Team meetings may be in person or may occur via Zoom or MS-Teams.

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 if 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: Engineering Design = 100%

CONTACT HOURS: 3 lecture hours, 3 tutorial hours (for group and supervisor meetings), full course (1.0 credit)

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 lectures.

LEARNING OUTCOMES:

The Mechanical and Materials Engineering Program has been accredited by Canadian Engineering Accreditation Board (CEAB) of Engineers Canada. Accredited programs provide the academic requirements for licensure as a professional engineer in Canada. Western Engineering has defined indicators of the 12 Graduate Attributes (GAs) that the CEAB expects graduating engineering students to demonstrate. The connections between course learning outcomes and Western Engineering's GA Indicators are identified below.

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:

- 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. (D1)
  - Collect, analyze and evaluate relevant design solutions that were previously developed to address similar and/or related problems. (LL2)
  - Investigate and evaluate candidate design concepts from functional, structural, safety, environmental, manufacturing, and economic perspectives. (D2)
  - Apply previously acquired engineering knowledge to identify the optimal candidate solution to the open-ended design problem. (PA2)
  - Generate complete embodiments of the selected design solution through the application of the relevant engineering standards, codes and design practices. (D3, IES3)
  - Generate a plan to achieve the selected design utilizing the appropriate methods and tools. (IN1)
  - Validate the selected design through virtual prototypes, including mathematical models and computer-aided engineering (CAE) tools. (ET1, ET2)
  - Assess the functional and economic feasibility of the selected design. (D4, EPM1)
- Prepare professional-quality design documentation to include sketches, detail and assembly drawings, bills of materials, schematics, etc. (D1, D2, D3, D4, ET1, ET2)
- Apply communication skills to effectively communicate engineering ideas verbally and in writing. (CS1, CS2, CS3)
- Manage and apply the principles of effective team interaction: organization, management, and motivation. (ITW1, ITW2, ITW3, LL1)
- 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. (EPM2, IES1, IESE2, PR2)
- Demonstrate effective time management skills, supported through the use of project management software. (EPM2)
- Demonstrate the ability to identify and communicate technical, financial and timing risks associated with an engineering project. (EPM3)
- Demonstrate personal accountability in the performance of project activities. (EE3)

TEXTBOOK:

No textbook will be assigned.

REFERENCES:

Dependent upon choice of project. Use of engineering books and design codes and standards will be required.

TECHNICAL REQUIREMENTS:

Students will be expected to have a computer that is capable of running the entire MS Office set of software, including but not limited to; Excel, Powerpoint, Project, Visio, and Word. In the event a pivot to online learning is required, students will be expected to have a stable internet connection.

UNITS:

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

EVALUATION: Report Rubrics, including items to be evaluated will be available on the course website. A mark breakdown for the course may be found in the table below.

Item	Deliverable	Weight	Due Date
1	Team Formation	-	Thursday, Sept. 12th, 2025
2	Project Selection	2%	Monday, Sept.15th, 2025
3	Report 1: Problem statement, state-of-the-art review, design specifications	10%	Tuesday, Sept. 23rd, 2025
4	Report 2: Conceptual Design	15%	Friday, Oct. 17th, 2025
5	Concept Design Presentations **(Designated Assessment)**	10%	Week of November 2nd, 2025
6	Individual Design Reviews	5%	Week of November 17th, 2025
7	Report 3: Detailed Design (including drawing package and prototype test plans)	15%	Friday, January 16th, 2026
8	Design Day Presentation **(Designated Assessment)**	10%	Week of March 23rd, 2026
9	Final Project Report Prototyping, Testing, Design Iterations	25%	Friday, Apr. 10th, 2026
10	Participation and professionalism (including lecture attendance)	8%	Attendance will be taken on an ongoing basis - 3% Individual Report, Friday Apr. 10th, 2026 - 5% Mandatory design review for MME 2259a presentations (Course Pass /Fail)

1. A passing grade in this course shall be equivalent to 60%. The items on the table above are subject to adjustments and changes as needed. Students who have failed the 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.

2. All course deliverables must be completed to pass the course.

3. Professional-level deliverables are expected in the course, regardless of their format (written or oral). Please keep this in mind while preparing your submissions and make sure to allocate enough time for this step.

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

5. The deliverables in the table above are assigned to teams except for Individual Design reviews, Participation and Professionalism which is an individual mark. Based on the contribution of individual team members, a multiplier for the mark assigned to each team member may be applied by the faculty advisor and by the project sponsor (only applicable for industry and not-for-profit projects) if they elect to do so.

6. Project teams will be comprised of 3 to 4 students and will not exceed 4 members with no exceptions unless deemed necessary by the course coordinator. Individuals who do not join a project group by the due date will be assigned to a group at the discretion of the instructional team. Faculty advisors reserve the right to assign students team to projects as appropriate.

7. Project teams will select a project to work on from a list of approved project topics to be determined early in the course. Project topics are proposed by i) project advisors; ii) external to the course faculty members; iii) student clubs; iv) third party/industry and community

partners v) lab managers and UMS. Depending on the project origin, certain projects may be blocked or reserved for specific groups of students.

8. All team members are expected to contribute equally to the team's efforts. At the latitude of the project advisor, extensively prolonged unsatisfactory assessment and/or project progress by a group or by any team member in a group may result in immediate project termination, removal from the project and course failure.

9. If it is deemed by the faculty advisor that all group members are not contributing equally to project deliverables, individual group member contributions will be updated on a weekly basis with individual marks assigned accordingly.

10. Project team and project team member performance will be periodically verified by project advisors with team members being held accountable for their activities. To that end, meetings between the faculty advisor and their respective teams will be held weekly and will be a minimum of ½ hour in duration. These meetings will be held either in-person or via MS Teams during the designated tutorial time, or at another mutually agreeable time. Attendance at these meetings by all team members is mandatory without exception.

11. Students will be required to present reports at various times during the year to the MME 4499 class with all team members expected to present their work.

12. Teams will be provided with a project budget of $800. Any additional funding requirements will be provided through the project sponsor if applicable. All project material acquisition being made through the established procedure that will be communicated during the course, or through the project sponsor where appropriate.

CLASSROOM DEMEANOR:

The instructor is committed to providing a respectful learning environment for all students involved in this course. This is a collective responsibility of the instructor and students, and therefore students participating in this course agree to abide by this criterion.

- Arrive to class on time
- Keep in mind the different cultural and linguistic backgrounds of the students in the course.
- Be courteous toward the instructor, your colleagues, and authors whose work you are discussing.
- Be respectful of the diversity of viewpoints that you will encounter in the class and in your readings. The exchange of diverse ideas and opinions is part of the scholarly environment.
- Be professional and scholarly in all course activities. Cite the ideas of others appropriately.

Disruptive behaviour of any type during classes is unacceptable. Students engaging in disruptive behaviour may be subject to disciplinary measures under the Code of Student Conduct.

ATTENDANCE:

Attendance in lectures is mandatory and will contribute towards participation and teamwork grade. There are 23 lectures tentatively planned for the 2025-2026 academic year. A failing course grade will result for students who are in attendance for less than 80% of the lectures without academic accommodation.

USE OF AI:

Generative AI may be used as a tool to help generate ideas and edit portions of the course deliverables; however, it is expected that students are the primary authors of all course deliverables and are responsible for the majority of the content. **All use of Generative AI in any deliverable or contribution must be fully and clearly disclosed**. In particular, it should be clear how students assessed the validity and accuracy of all generated content, along with any corrections that were necessary. ***Furthermore, to verify effective use of AI in a submitted course deliverable, students may be selected randomly for an interview pertaining to parts of the deliverable they were assigned to by their design team***. If irresponsible use of GenAI tools is determined by the instructor, the deliverable will receive a grade of **zero**. Repeated offences may result in further academic offence penalties.

LATE SUBMISSION POLICY:

All course deliverables are due on the dates indicated above. Since project deliverables are a team effort, it is expected that the team has sufficient capacity to accommodate the illness or absence of one or more team members. In other words, there will not be any academic consideration given for

group submissions. If extenuating circumstances affect all team members, then the team may choose to submit deliverables up to 48 hours after the due date without penalty. To encourage effective project and time management, **no further extension will be granted** and **submissions later than 48 hours past the deadline will not be accepted**. Further, **as flexible deadlines are used in this course, requests for academic consideration will not be granted.** If a team member has a long-term academic consideration or an accommodation for disability that allows greater flexibility than provided here, please reach out to your instructor at least one week prior to the posted deadline.

NOTICES:

Students are responsible for checking their Western email and notices posted on OWL/Brightspace (http://owl.uwo.ca) for news and updates. This is the primary method for disseminating information to all students in the class. If students need assistance with the course site, they can seek support on the Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

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 polices 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.