MME 4499 - Mechanical Engineering Design Project

COURSE OUTLINE – 2024-2025

CALENDAR DESCRIPTION:

MME 4499 is the full-year 4th year capstone project course that is the culmination of what students have learned in their program. 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, prototyping, testing, and preparation of design documentation. Students will not only be evaluated on technical deliverables, but also on project management, time management, and communications skills.

COURSE INFORMATION:

Instructors	Email	Office	Phone	Office Hours
Dr. J. Makaran, P.Eng. (Course Coordinator)	jmakaran@uwo.ca	SEB 3095	x 86045	By Appointment
Dr. L. Jiang, P.Eng.	ljiang55@uwo.ca	SEB 3076	x 80422	By Appointment
Dr. D. Langohr, P.Eng.	glangohr@uwo.ca	SEB 2063A	x 84859	By Appointment
Dr. R. Willing, P.Eng.	rwilling@uwo.ca	TEB 363	x 80295	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.
Full Course	1.0 Credits

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:

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 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
  - Generate complete embodiments of the selected design solution through the application of the relevant engineering standards, codes and design practices D3, IES3
  - 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 a physical prototype 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 MS Project. EPM2

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.

NOTE: The due dates for reports may be found in the table below. In order to encourage effective project and time management, **there will be no extensions granted**. If one group member misses a project deliverable with academic consideration, the remaining group members must submit their progress and contributions on the due date. Documentation is required to miss Concept Design Presentations, Design Reviews, and the Design Day presentation (term A and B *designated assessments*).

Item	Deliverable	Weight	Due Date
1	Team Formation	2%	Thursday, Sept. 12th, 2024
2	Project Selection	3%	Monday, Sept.16th, 2024
3	Report 1: Problem statement, state-of-the-art review, design specifications	10%	Friday, Sept. 27th, 2023
4	Report 2: Conceptual Design	10%	Friday, Oct. 18th, 2024
5	Design Review	10%	Week of Nov. 18th, 2023
6	Report 3: Detailed Design (including drawing package and prototype test plans)	15%	January 19th, 2024
7	Design Day Presentation	10%	Friday, Mar. 28th, 2024
8	Final Project Report Prototyping, Testing, Design Iterations	25%	Monday, Apr. 8th, 2024
9	Participation and professionalism (including lecture attendance)	15%	Attendance will be taken on an ongoing basis - 3% Fall term design review (date TBD) - 4%, Individual Report, Monday Apr. 8th, 2024 - 8% Mandatory design review for MME 2259a presentations (Course Pass /Fail)

A passing grade in this course shall be equivalent to 60%. The items in 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.

• The deliverables in the table above are assigned to teams except for Team Formation, Participation and Professionalism which is an individual mark.

• Design teams will be formed around approved project topics to be determined early in the course.

• Design teams can be formed by a minimum of 3 and a maximum of 4 members. No exceptions from this rule will be allowed.

• Individuals who do not join a project group by the due date will forfeit the marks allotted for this task and will be assigned to a group at the discretion of the faculty team. Faculty advisors reserve the right to assign students to groups and projects as appropriate.

• Faculty members will set up the individual team sites for the teams that they are supervising.

• 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.

• 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.

• At the latitude of the project advisor, extensively prolonged unsatisfactory assessment and/or project progress may result in immediate project termination and course failure.

• All team members are expected to contribute equally to the team's efforts. This will be periodically verified by project advisors with team members being held accountable for their activities. To that end, 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. At the latitude of the project advisor, students who continue to demonstrate insufficient contribution may be removed from the team resulting in course failure.

• Project topics could be 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.

• 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.

TEAMWORK:

Students will be working in design teams, typically of 3 to 4 students (max.). Students will be required to present reports at various times during the year with all team members expected to present their work.

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 partaking in this course agree to abide by this criterion.

Please 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 the participation and teamwork grade.

USE OF AI:

The use of generative artificial intelligence is not officially prohibited in this course, however <u>if it is used in the production of any materials submitted for marks in the context of this course, its use must be disclosed in full</u>. This includes, for example, the use of AI tools for text generation, editing, and/or refinement.

KEY SESSIONAL DATES:

<u>Fall Term</u>

Classes begin:	September 5
Thanksgiving:	October 14
Fall Reading Week:	October 12 – October 20
Classes end:	December 6
Study days:	December 7-8
Exam period:	December 9 – 22

<u>Winter Term</u>

Winter Classes Begin:	January 8
Winter Reading Week:	February 17 – February 25
Winter Classes End:	April 8
Winter Exam period:	April 11 – 30, 2024

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

In the event of contradictions between course-specific policies above and general Faculty / University policies described below, please contact your course instructor for clarification.

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 Associate Dean Academic (after due warning has been given). On the recommendation of the Department concerned, and with the permission of the Associate Dean Academic, the student will be debarred from taking the regular examination in the course.

Missed/Late Accommodation Policy

1. Students missing a test/assignment/lab or examination you will report the absence by submitting an Academic Consideration Request form through STUDENT ABSENCE PORTAL.
2. **Documentation must be provided as soon as possible.**

Exam Accommodation

1. If you are unable to write a final examination, report your absence using the Academic Consideration Request Form through STUDENT ABSENCE PORTAL.
2. Be prepared to provide the Undergraduate Services Office with supporting documentation (below 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, headache, 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 submit an Academic Consideration Request Form through STUDENT ABSENCE PORTAL.

   PLEASE NOTE: It is the student's responsibility to check the date, time and location of the Special Examination.

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 submit the Academic Consideration Request Form and provide documentation if requested by the instructor (see below 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 Assistant Dean, First Year Studies, if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. Some courses may have built-in flexibility for assignment deadlines or the total number of assignments that will be graded. See course-specific policies for details.
5. Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean, Undergraduate Studies. Documentation is mandatory.

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

Medical Accommodation

1. The Academic Consideration Request Form is available through the STUDENT ABSENCE PORTAL.
2. Requests for academic consideration must include the following components:
   a. Indication of the course(s) and assessment(s) affected by the request
   b. Medical note, and
   c. Additional supporting documentation as relevant
3. Requests for academic consideration without a medical note or other supporting documentation may be accepted once per term, per course.

4. Undocumented absences cannot be used for examinations scheduled by the Office of the Registrar during official examination periods (including take-home final exams and December mid-year exams for full courses) and practical laboratory and performance tests typically scheduled in the last week of the term. Undocumented absences also cannot be used for the "designated assessment" in each course. When flexibility in assessment exists and is clearly stated on the course outline, both undocumented absences and academic consideration requests with documentation may be denied.

5. **Students must request academic consideration as soon as possible and no later than 48 hours after the missed assessment.**

6. Once the request and supporting documents have been received and reviewed, appropriate academic consideration, if granted, shall be determined by the instructor in consultation with the academic advisor, in a manner consistent with the course outline.

   Academic consideration may include extension of deadlines, waiver of attendance requirements for classes/labs/tutorials, or re-weighting of course requirements. Some forms of academic consideration, such as arranging Special Examinations, assigning a grade of Incomplete, or granting late withdrawals without academic penalty, may only be granted by the Academic Advising office of the Faculty of Registration.

7. An instructor may deny academic consideration for any assessment that is not required in the calculation of the final grade (e.g., "8 of 10 quizzes"). Assessment flexibility must be indicated on the course outline.

8. An instructor may deny academic consideration relating to the timeframe submission of work where there is already flexibility in the submission timeframe (e.g., 72-hour submission window). This assessment flexibility must be indicated on the course outline.

Religious Accommodation

When scheduling unavoidably conflicts with religious holidays, which (a) require an absence from the University or (b) prohibit or require certain activities (i.e., activities that would make it impossible for the student to satisfy the academic requirements scheduled on the day(s) involved), no student will be penalized for absence because of religious reasons, and alternative means will be sought for satisfying the academic requirements involved. If a suitable arrangement cannot be worked out between the student and instructor involved, they should consult the appropriate Department Chair and, if necessary, the student's Dean.

It is the responsibility of such students to inform themselves concerning the work done in classes from which they are absent and to take appropriate action.

Academic Integrity

In the Faculty of Engineering, we encourage students to create a culture of honesty, trust, fairness, respect, responsibility, and courage, befitting the professional degree you are pursuing.

Please visit Academic Integrity Western Engineering for more information

Academic Offences

Plagiarism means using another's work without giving credit. The university has rules against plagiarism and other scholastic offences. Western Engineering has a zero-tolerance policy on plagiarism. The minimum penalty is zero on the course work and a repeat offence will earn you zero on the course. A third offence may lead to expulsion from the university.
Scholastic Discipline for Undergraduate Students & Cheating, Plagiarism and Unauthorized Collaboration: What Students Need to Know

Students must write their reports, 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

Faculty of Engineering AI Policy

The use of generative Artificial intelligence (GenAI) tools won't be discouraged in the Faculty of Engineering. As we pride ourselves on building the future we can't hide from the use of GenAI tools to contribute to the understanding of the course materials. However, the use of GenAI tools in any assignment or contribution during the course will have to be disclosed, as a resource.

GenAI tools use won't be permitted in any type of examination or other assessments where the faculty have prohibited their use. If use of GenAI tools is detected by the instructor in these instances, academic offences penalties might be imposed against the student.

Use of English Policy

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 except for 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.

Accessibility

Western is committed to achieving barrier free accessibility for persons with disabilities studying, visiting and working at Western. As part of this commitment, there are a variety of services, groups and committees on campus devoted to promoting accessibility and to ensuring that individuals have equitable access to services and facilities. To help provide the best experience to all members of the campus community, please visit the Accessibility Western University for information on accessibility-related resources available at Western.

Students with disabilities may arrange for academic accommodation at Western. For a more detailed explanation, please visit Academic Support & Engagement -Academic Accommodation.

Inclusivity, Diversity, and Respect

The Faculty of Engineering at Western University is committed to creating equitable and inclusive learning environments that value diverse perspectives and experiences. We recognize that university courses often marginalize students based on social identity characteristics such as, but not limited to, Indigeneity, race, ethnicity, nationality, ability, gender identity, gender expression, sexuality, age, language, religion, and socioeconomic status. Understanding this, we strive to facilitate equitable experiences and inclusion within the classroom by respecting and integrating multiple ways of knowing, being, and doing. Please visit the Office of Equity, Diversity and Inclusion.

Health and Well-Being

- Health & Wellness Services – Students - Offers appointment-based medical clinic for all registered part-time and full-time students.
- Mental Health Support - Provides professional and confidential services, free of charge, to students needing assistance to meet their personal, social and academic goals. Services include consultation, referral, groups and workshops, as well as brief, change-oriented psychotherapy.
- Crisis Support - For immediate assistant, please visit Thames Hall Room 2170 or call 519-661-3030. The crisis clinic operates between 11:00 am - 4:30 pm. For after-hours crisis support, click here.
- Gender-Based Violence and Survivor Support - Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced gender-based or sexual violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts, here. To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Important Links

- **WESTERN ACADEMIC CALENDAR**
- **ACADEMIC RIGHTS AND RESPONSIBILITIES**
- **ENGINEERING PROGRESSION REQUIREMENTS AND ACADEMIC REGULATIONS**
- **UNIVERSITY STUDENTS' COUNCIL (USC) - SERVICES**
- **IMPORTANT DATES AND DEADLINES**
- **ACADEMIC CONSIDERATION FOR MEDICAL ILLNESS - UNDERGRADUATE STUDENTS**
- **ACCOMMODATIONS FOR RELIGIOUS HOLIDAYS**
- **SCHEDULING OF ASSIGNMENTS, TESTS, AND EXAMINATIONS**
- **STUDENT FORMS**
- **OFFICE OF THE REGISTRAR**
- **RETENTION OF ELECTRONIC VERSION OF COURSE OUTLINES (SYLLABI)**
- **ACADEMIC APPEALS**
- **STUDENT ABSENCE PORTAL**

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.

Add Deadlines:

First term half course (i.e. "A" or "F")	September 13, 2024
Full courses and full-year half course (i.e. "E", "Y" or no suffix)	September 13, 2024
Second term half course (i.e. "B" or "G")	January 14, 2025

***Drop Deadlines*:**

First term half course without penalty (i.e. "A" or "F")	November 12, 2024
Full courses and full-year half courses without penalty (i.e. "E","Y" or no suffix)	December 2, 2024
Second term half or second term full course without penalty (i.e. "B" or "G")	March 7, 2025

Contact Information:

Undergraduate Services Office: SEB 2097
Phone: 519-661-2130 E-mail: engugrad@uwo.ca

Mechanical Engineering: SEB 3002
Phone: 519-661-4122 E-mail: mmeundergraduate@uwo.ca

Chemical & Green Process Engineering: TEB 477
Phone: 519-661-2131 E-mail: cbeugrad@uwo.ca

Civil Engineering: SEB 3005
Phone: 519-661-2139 E-mail: civil@uwo.ca

Computer, Electrical, Mechatronic Systems & Software Engineering TEB 279
Phone: 519-661-3758 E-mail: eceugrad@uwo.ca

Integrated Engineering ACEB 2410
Phone: 519-661-6725 E-mail: engceli@uwo.ca

Office of the Registrar/Student Central WSSB 1120
Phone: 519-661-2100