

**Western University**  
**Department of Mechanical & Materials Engineering**  
**MSE 3380b – “Mechanical Components Design”**

**COURSE OUTLINE – 2023-2024**

**CALENDAR DESCRIPTION:**

The objective of this course is to consider the mechanical analysis and design of various components of a machine, e.g. an automobile.

**PREREQUISITES:**

MME 2200Q/R/S/T or MSE 2200Q/R/S/T, MME 2202A/B or MSE 2212A/B, MSE 2202A/B, MME 3381A/B or MSE 3381A/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. 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.

**ACCREDITATION UNITS:**

Engineering Science = 60% Engineering Design = 40%

**TOPICS:**

1. Displacement and Stress Analysis of Mechanical Components
2. Static Failure Theory and Design
3. Fatigue Failure Theory and Design
4. Gearing Types and Load Analysis
5. Spur Gear Design
6. Shaft Design and Analysis
7. Bearing Selection and Analysis
8. Bolt Selection and Analysis
9. Welding Processes, Weld types and Analysis
10. Fits and Geometric Dimensioning and Tolerancing (GD&T)
11. Flexible Mechanical Elements

**LEARNING OUTCOMES:**

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

By the end of this course, the student should be proficient in the:

- 1) analysis of a mechanical component for strength, stiffness, durability, etc.; (KB3, D4, ET1)
- 2) quantification of the propensity for mechanical failure to occur; (KB3, PA3)
- 3) specification of suitable dimensions and materials to achieve a desired factor of safety or design goal; (PA2, D4)

- 4) understanding of potential failure processes such as fracture, fatigue and wear. (PA2, I3)
- 5) design and selection of typical components of mechanical systems; (D4, CS3)
- 6) preparation of a project report including detailed design approaches and team management/resources. (EPM2, ITW2)
- 7) preparation of engineering drawings; (KB4, ET2, CS1, CS3)
- 8) effective communication of design to others. (CS1, CS3)

**CONTACT HOURS:** Three (3) synchronous class sessions, Three (3) laboratory hours twice in the term.

**UNITS:** SI and Imperial (SI for the midterm and final)

**TEXT:** *Shigley's Mechanical Engineering Design* by Budynas and Nisbett, McGraw-Hill, 11<sup>th</sup> ed.

**COMPUTING:** SOLIDWORKS will be made available to registered students for the duration of the course, free of charge. This software is available on lab computers and can be installed on students' computers.

**EXAMINATIONS** There is a midterm which will be 1.5 hours in duration. There is a final examination which will be 3.0 hours in duration. For both the midterm and final exam the use of the textbook is required. Programmable calculators will be permitted. No other aids are permitted in the examinations.

**EVALUATION:** The final grade is computed as follows:

<b>Labs:</b> 2 labs of equal weighting are due at end of each lab.	<b>8%</b>
<b>Design Project (group):</b>	
Phase 1 Report	7%
Phase 2 Report	15%
<b>Midterm (Open Book):</b>	<b>20%</b>
<b>Final Exam (Open Book):</b> To be scheduled during the final exam period.	<b>50%</b>
<b>WEC Bonus Mark</b> If competing in WEC (2024)	<b>1%</b>

Students are required to submit all laboratory reports, design reports, and write the examination.

**POLICIES**

The following course-specific policies will be strictly enforced throughout the course:

**Laboratory sessions**

- All students are to attend the laboratory session to which they signed up.
- Failure to pass the laboratory component of the course will attract automatic course failure.
- Passing of the laboratory component is equivalent with obtaining more than 50% on the laboratory component of the course.
- A maximum of **one** make-up session will be offered to students who have missed a laboratory session **with** academic consideration.
- All approved make-up laboratory sessions will be offered in the final week of the term.
- Missing of a laboratory session **without** academic consideration will translate into a mark of zero for that laboratory session.
- When academic consideration has been obtained for a particular laboratory session, it is the student's responsibility to contact the instructor of the course in a *timely* fashion in order to seek alternate arrangements for the missed laboratory session (*i.e.*, within maximum three days after consideration has been obtained from the Engineering Undergraduate Services Office).
- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

**Midterm**

- The midterm will take place as indicated under Evaluation above.
- The midterm will be 1.5 h long.
- Missing of the midterm **without** academic consideration will translate into a mark of zero.
- **One** make-up midterm will be offered to students who have missed the primary midterm with academic consideration. If the make-up is missed, then the weight of this grade will be transferred to the final exam grade.
- When academic consideration has been obtained, it is the student's responsibility to contact the instructor of the course in a *timely* fashion in order to seek alternate arrangements for the missed session (*i.e.*, within maximum three days after consideration has been obtained from the Engineering Undergraduate Services Office).
- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

**Project**

- Project teams will be formed in the fourth week of classes via OWL sign-up.
- The maximum team size will be four students, while the minimum team size will be three students.
- It is expected that the team will self-delegate for the various aspects of the project. Hence, wide-ranging expertise including CAD, component analyses, assembly and report-generation is expected.
- Students who do not choose a team will be assigned to one.
- SolidWorks will be used for the design drawings and layouts.
- The default assumption is that everyone contributes equally to the team effort (*i.e.*, project and labs) and hence everyone should receive the same mark for the common team submission.

- Please note that whenever individual contributions to the team effort are not equitably shared by the team members, individual adjustments of the marks might occur at the discretion of the instructional team of the course (*i.e.*, course instructor and teaching assistants).

**Term work**

- If a minimum of 50% is not obtained on term work (midterm, Phase I & II of the project, and laboratory sessions), the student will fail the course irrespective of the mark obtained in the final examination.

**Final examination**

- The exam will take place during the April examination period. The timing will be announced in advance.
- The length of the final exam will be three hours.
- If a minimum of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48%.

**Submissions**

- Lab reports will be due at the end of the lab session in which data was provided and was processed. No late submissions will be accepted.
- Late submissions of the project will be penalized with 20% per day.
- Students are required to contact the instructor of the course for any other circumstances that appear to not be covered by the non-exhaustive list above.

**UNITS:**

Metric and US customary.

**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 the 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.

**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. This includes arriving at lectures on time, and acting in a professional manner during class.

**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 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.

**NOTE:** 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.