

Western University  
*Department of Mechanical & Materials Engineering*

## MME 4453A –Corrosion and Wear

### COURSE OUTLINE – 2025-2026

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**CALENDAR  
DESCRIPTION:**

To present an overview of the principles of electrochemical corrosion, types of corrosion, and methods to prevent corrosion of metals. Also to present an overview of surface characterization, friction, lubrication and wear of metals.

**COURSE  
INFORMATION:**

Instructor            Dr. Yang Zhao  
Room SEB 2053A  
Email: yzhao628@uwo.ca

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

**PREREQUISITES:**

ES1021

**ACCREDITATION  
UNITS:**

Engineering Science = 100%

**TOPICS:**

1. *Principles of corrosion*
2. *Corrosion rate measurement and prediction*
3. *Environmental effects on corrosion*
4. *Forms of corrosion*
5. *Corrosion properties of specific metals*
6. *Characteristics of surfaces*
7. *Friction, laws, mechanism and phenomena*
8. *Lubrication: types, properties of oils and grease*

**LEARNING  
OUTCOMES:**

Corrosion

- To be able to give an electrochemical interpretation to corrosion in water, to the types of corrosion, to the methods of protection and to corrosion rate measurement so that an informed response can be made to practical corrosion situations. (KB2)
- To be able to identify the types of corrosion and so select appropriate corrosion-resistant materials and designs for practical engineering situations. (KB2)
- To be able to select an appropriate method of corrosion protection based upon knowledge of the relevant chemical, physical and engineering considerations. (LL2)

Tribology

- Apply Hertzian contact theory to calculate surface stresses. (KB2)
- Understand the nature of friction, frictional heating and the mechanism of stick-slip. (KB2)
- Know the types of wear so that wear failures can be identified and appropriate remedial suggestions made. (KB2)

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**UNITS:** SI

**CONTACT HOURS:** 3 lecture hours, 2 laboratory exercises are to be completed in the scheduled periods, half course

**RECOMMENDED TEXTBOOKS:** Mars Fontana; Corrosion Engineering (2nd or 3rd editions), 1978 or 1986, McGraw-Hill Publishers.

Stephen D. Cramer, Bernard S. Covino Jr; Corrosion: Fundamentals, Testing, and Protection, ASM Handbook Vol. 13A, ASM International

Pradeep L. Menezes, Michael Nosonovsky, Sudeep P. Ingole, Satish V. Kailas, Michael R. Lovell; Tribology for scientists and engineers: from basics to advanced concepts

**REFERENCES:** N/A

**EXAMINATIONS** Two 1 hour term tests

**AND QUIZZES:** 3 hours final exam

The term tests and the final exam will be closed book. Formula sheets will be provided. Only non-programmable calculators will be allowed during the tests and final exam.

**EVALUATION:**

Basis of the final grade		
Term Tests	2 x 20%	40%
Laboratories	2 x 10%	20%
Final	1 x 40%	40%

If a minimum mark of 50% is not obtained on the final examination, the student cannot receive a final mark greater than 48%.

#### Term tests

- No make-up term test options will be offered regardless of the circumstances for which the term test was missed.
- Missing a term test with written academic accommodation will automatically shift the weight of the missed term test to the final exam.
- Missing any of the exams without academic consideration will translate to zero mark for the Missed ones.
- Collaboration is not permitted in any of the exams.
- No technical assistance will be offered during exams.

**COURSE POLICIES:**

#### Labs

- Lab attendance is mandatory. If missing a lab with written academic accommodation, you will be able to join other groups for labs.
  - Missing any labs without academic consideration will translate to zero mark.
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**CONSULTATION HOURS:** Please contact me first using the email address above for an appointment.

**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.

**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. Scholastic offences are taken seriously and students are directed to the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: [uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

**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:** The above topics and outline are subject to adjustments and changes as needed. Students who have failed an Engineering course (ie.<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.

### **STATEMENT ON GENDER-BASED AND SEXUAL VIOLENCE**

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](mailto:support@uwo.ca).

**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.

**USE OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI)**

Students can use generative AI only for editing their work throughout the course so long as the use of generative AI is referenced and cited. Use of generative AI outside the stated use of editing without citation will constitute academic dishonesty. It is the student's responsibility to be clear on the limitations for use and to be clear on the expectations for citation and reference and to do so appropriately.