Western University
Department of Mechanical & Materials Engineering

MME 4453A –Corrosion and Wear

COURSE OUTLINE – 2025-2026

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

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 = 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:

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.

Upon successful completion of this course, students will:

Corrosion

• 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)

• be able to identify the types of corrosion and so select appropriate corrosion-resistant materials and designs for practical engineering situations. (KB2)

• be able to select an appropriate method of corrosion protection based upon knowledge of the relevant chemical, physical and engineering considerations. (LL2)

Tribology

• be able to 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)

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 AND QUIZZES: Two 1 hour term tests

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%.

COURSE POLICIES:

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 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.
- Term test 1 is the designated assessment. As such, academic consideration will not be granted for undocumented absences.
- Collaboration is not permitted in any of the exams.
- No technical assistance will be offered during exams.

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.

CONSULTATION HOURS:

Please contact me first using the email address above for an appointment.

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.

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.

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.