Western University
Department of Mechanical & Materials Engineering

MME 4453A –Corrosion and Wear

COURSE OUTLINE – 2026-2027

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:

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)

The terms in parentheses following each learning outcome refer to Graduate Attributes (GAs) established by the Canadian Engineering Accreditation Board (CEAB) of Engineers Canada. These attributes are used in the accreditation process to ensure that accredited engineering programs are providing the academic requirements for licensure as a professional engineer in Canada. Information on Graduate Attributes and Indicators can be found at GA Indicators. The table below indicates which specific attributes are measured in this course and the level at which it is measured, wherein I=*Introduced*, D=*Developed* and A=*Advanced*/*Applied*

CEAB Graduate Attribute Learning Levels for this course:

Knowledge Base	A	Engineering Tools		Impact on Society	
Problem Analysis		Individual & Teamwork		Ethics and Equity	
Investigation		Communication		Economics & Project Mgmt.	
Design		Professionalism		Life-Long Learning	D

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 2 hour term tests (Oct 8, 3:30-5:30 pm; Nov 12, 3:30-5:30 pm)

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			**CEAB GAs Assessed**
Term Tests	2 x 20%	40%	
Laboratories	2 x 10%	20%	LL2
Final	1 x 40%	40%	KB2

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.

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

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.

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 policies 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.

The policy covers:

- Absence/Late Accommodation Policy
- Religious Accommodation
- Academic Integrity
- Academic Offences
- Faculty of Engineering AI Policy
- Accessibility
- Inclusivity, Diversity, and Respect
- Health and Well-being
- Gender-Based and Sexual Violence