

Western University
Department of Mechanical & Materials Engineering
ES 1021B - Properties of Engineering Materials

COURSE OUTLINE – 2024/25

CALENDAR DESCRIPTION: An introduction to the relationships between the microstructure and the engineering properties of metals, ceramics, polymers and composites. These relationships will be applied to demonstrate effective methods used to select materials for the design of engineering components.

COURSE INFORMATION:

Instructor: J. T. Wood
Room: SEB 2103
Email: jtwood@uwo.ca

Lectures: Mon, Wed, Fri @ 8:30am HSB-40
Tutorials: Mon 3:30 – 5:30pm (various locations)
Office Hours: By appointment

ACCREDITATION UNITS: Science = 50%, Engineering Science = 50%

- TOPICS:**
1. Materials and Engineering Design Objectives
 - a. Mass, cost and environmental impact
 2. Materials and Energy
 - a. Origin of thermal properties
 - b. Introduction to heat transfer
 3. Mechanical Properties
 - a. Modes of loading, stress and strain
 - b. Introduction to mechanical testing
 - c. Elastic deformation
 - d. Plastic deformation
 - e. Viscoelastic behaviour
 - f. Fatigue and Fracture
 4. Electrical Properties
 - a. Conductors and insulators
 - b. Semiconductors and semiconductor devices

COURSE LEARNING OBJECTIVES: Engineering Programs at Western have been accredited by the 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.

On the successful completion of this course, the student will be able to:

1. Identify physical, mechanical, thermal and chemical properties of engineering materials (KB2)
2. Demonstrate effective use of the Cambridge Engineering Selector as a database of material properties and to screen candidate materials for engineering applications (ET2)
3. Relate the behaviour characterized by material properties to the underlying physics and chemistry that governs their behaviour. (KB2)
4. Perform basic calculations using material property data to justify engineering decisions. (KB3)
5. Present and justify engineering opinions using clear, concise language and calculations. (CS3)

TEXT:

There are no REQUIRED textbooks for this course.

The following are standard undergraduate textbooks that you may find useful as an additional source of material.

“Materials Science and Engineering” W.D. Callister Jr. and D.G. Rethwisch

“The Science and Engineering of Materials” D. Askeland, P. Fulay, W. Wright

“Materials: Science, Engineering, Processing and Design” H. Sherclif, D. Cebon, M.F. Ashby

“Engineering Materials 1: An Introduction to Properties, Applications and Design” D.R.H. Jones, M.F. Ashby

EVALUATION:

The performance of students in this course will be evaluated on the basis of marks attained on the quizzes, tutorial exercises, a midterm, a term project, and a final exam.

BASIS OF FINAL GRADE

Quizzes		20%
Tutorial Assignments		20%
Midterm Test		20%
Term Project		20%
Final Exam		20%

Quizzes: There will be four, 45-minute quizzes held during the tutorial periods on:

Jan. 27, Feb. 10, Mar. 10, and Mar. 24, 2025.

If you miss a quiz with a validated absence (i.e. through the UGS office/web portal), then your quiz grade will be calculated as the average of the remaining quiz grades. Quizzes missed without a validated absence will count as zero.

Tutorial Exercises: There will be four tutorial exercises conducted on:

Jan. 20, Feb. 3, Mar. 3, and Mar 17, 2025

The tutorial exercises are set to develop your ability to use material properties in a design context and will prepare you to complete the term project.

Midterm Test: There will be one midterm test, conducted in-person during the tutorial period. The date for this test is: **3:30 pm, Monday, February 24, 2025**. The test will be 90 minutes in duration. The midterm test is a “Designated Assessment” for the course – an undocumented absence may not be used for this assessment.

There will be no make-up midterm test. If you miss the midterm test with a validated absence (i.e. through the UGS office/web portal), then the weight of the midterm will be shifted to the Final Exam. Students missing the midterm without a validated absence will receive a grade of zero.

Term Project: The term project will be released to the class on Mon. Mar. 10 and will be due at 6:00pm on Friday March 28. It will be accepted without penalty up to 6:00pm April 4, 2025 (last day of classes). It will consist of a series of design-type questions similar to those in the tutorial exercises. The project will be graded for both technical correctness and proper engineering presentation.

Final Examination: The final examination will be three hours in duration and will be scheduled by the Registrar during the April examination period.

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.

**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.

**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_under_grad.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 assistance, 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

Office of the Registrar/Student Central

WSSB 1120

Phone: 519-661-2100

January 8, 2025