

## **ES 1021A - Properties of Materials**

### **COURSE OUTLINE – 2019**

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This is the first course in the field of structure-property relationships for engineers. However, for some engineering disciplines at Western, this is the only course on material properties. Therefore, the course material includes a combination of fundamental concepts in materials science and specific examples to illustrate the impact of material choice on component performance.

**CALENDAR DESCRIPTION:** An introduction to the relationship between the microstructure and the engineering properties of metals, ceramics, polymers and composites. This relationship 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 2097
	Email: <a href="mailto:jtwood@uwo.ca">jtwood@uwo.ca</a>
Lectures:	M, W, F 8:30 – 9:30 (NS 145)
Tutorials:	Th 4:30 – 6:30
Office Hours:	Tu 4:30 – 5:30 (Location TBD)

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

- TOPICS:**
- 1. Price and Availability of Materials**
  - 2. Elastic Deformation**
  - 3. Plastic Deformation**
  - 4. Fracture**
  - 5. Fatigue**
  - 6. Creep Deformation**
  - 7. Oxidation and Corrosion**
  - 8. Friction and Wear**
  - 9. Thermal Properties**

**SPECIFIC LEARNING OBJECTIVES:**

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

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

**CONTACT HOURS:** 3 lecture hours, 2 tutorial hours, half course

**TEXT:** “Engineering Materials 1” 5<sup>th</sup> Edition by D.R.H. Jones and M.F. Ashby. Butterworth-Heinemann, 2019. ISBN 978-0-08-102051-7

**QUIZZES and  
TERM TESTS:**

Quizzes will be held during the first thirty minutes of each tutorial period except Sept. 12, Oct 10 and Nov. 14. It is each student's responsibility to attend the quiz during the tutorial session in which they are registered.

Two midterm tests are held during the first 1.5 hours of the Thursday afternoon tutorial periods on the following days:

**Oct. 10, 2019**

**Nov. 14, 2019**

There will be no make-up midterms. In the event of an **approved absence** (i.e. illness with doctors note) the missed midterm grade will be added to the final exam.

**TUTORIAL:**

Two-hour tutorial sessions will be held every week (except the midterm dates listed above) to reinforce the material covered during the previous week(s) and complete tutorial exercises that will be submitted for grading. Quizzes and midterms are mandatory.

**EVALUATION:**

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

**BASIS OF FINAL GRADE**

Tutorial Exercises	Best 7 of 9	20%
Mid-Term Tests	(2 x 15%)	30%
Final Examination		50%

The final examination will be a closed book examination. A formula sheet will be provided. The use of large memory programmable calculators will not be permitted. If a minimum of 50% is not obtained on the final examination, the student cannot receive a course grade greater than 48%.

**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. (see Scholastic Offence Policy in the Western Academic 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:**

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.