Western University
Department of Mechanical & Materials Engineering

ES 1021B – Properties of Materials

COURSE OUTLINE – 2019

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 and design.

CALENDAR DESCRIPTION:

An Introduction to the relationship between the microstructure and the engineering properties of metals, ceramics, polymers, semi-conductors and composites. This relationship will be applied to demonstrate effective methods used to select materials for the design of engineering components.

COURSE INFORMATION:

Instructor:	Dr. Hamid Abdolvand Room SEB 3077 Email: hamid.abdolvand@uwo.ca
Lectures:	M, W, F, 8:30-9:30 (SSC- 2050)
Tutorials:	Thursdays, 16:30-18:30 (002- AHB 1B06, 003-AHB 1B08, 004-SH 2355, 005-SH 3317, UCC 67, 006-SEB 2099)

CONSULTATION HOURS:

To be set during the first week of class.

ACCREDITATION UNITS:

Science= 50%, Engineering Science = 50%

TOPICS:

1. Classification of Materials
2. Materials and Design
3. Elastic Response of Materials
4. Plastic Response of Materials
5. Fracture Toughness and Fatigue
6. Materials at Elevated Temperature
7. Electrical, Magnetic and Optical Properties

SPECIFIC OBJECTIVES:

On the successful completion of this course, the student will be able to:
1. a) Classify materials as a metal, ceramic, polymer or composite based on a knowledge of the atomic bonding and structure. b) Further classify polymers as either thermosets, thermoplastics or elastomers based on a knowledge of their molecular structure c) Further classify ceramics as engineering (technical) ceramics, traditional ceramics or ceramic glasses based on a knowledge of their atomic structure.
2. Given one or more equations describing the performance of a simple component (e.g. a tie-rod, column or beam) determine the material properties that govern the performance of the components.
3. Predict the elastic response of a simple component given a knowledge of the geometry and mode of loading.
4. Use constitutive relationships to calculate the plastic response of metals based on their microstructure
5. Estimate the fracture strength of engineering materials subjected to monotonic and cyclic loads.
6. Predict the response of engineering materials subjected to a known stress at elevated temperature.
7. Identify engineering materials as electrical conductors, semi-conductors or insulators based on atomic structure.

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

REFERENCES: The science and Engineering of Materials, 7th edition, by D. R. Askeland, and W. J. Wright. Online edition accessed through MindTap in OWL.

Materials: Engineering, science, processing, and design, 3rd edition, M. Ashby, H. Shercliff, and D. Cebon.

EXAMINATIONS AND QUIZZES: Quizzes will be held during the first thirty minutes of each tutorial period except Feb 7 and Mar 14

Two midterm tests are held during first hour of Thursdays tutorials on the following days:
February 7
March 14
Locations to be announced in class and on the course OWL site.

TUTORIAL Two-hour tutorial sessions will be held every week to discuss the materials covered in the lectures. Students are advised, but not required, to attend tutorials.

EVALUATION: The performance of students in this course will be evaluated on the basis of marks attained on quizzes, two mid-terms, and a final exam.

Basis of final grade.		
Quizzes	Best 8 of 10	10%
Mid-term tests	2 x 20%	40%
Final Exam		50%

COURSE POLICIES: The following course specific policies will be enforced throughout the course:

The use of large memory programmable calculators will be permitted.

Tutorials:

Failure to attend a tutorials will translate into a zero mark for the quiz taken in that tutorial.

Students who arrive 15 min after the scheduled tutorial quiz will get zero for that quiz.
Missed tutorial quizzes with academic consideration will automatically shift the weight of the missed quiz into the final exam.

Midterm and Final exams:
No make-up midterm options will be offered regardless of the circumstances for which the midterm was missed.

Missing the midterm exam with academic consideration will automatically shift the weight of the missed midterm exam into the final exam.

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

The final exam will be a limited Open Book examination. An equations sheet will be provided.

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.

Western Engineering

Western University
Faculty of Engineering
2018-2019

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 accommodation will not be granted automatically on request. You must demonstrate to your department (or the Undergraduate Services office if you are in first year) that there are compelling medical or compassionate grounds that can be documented before academic accommodation will be considered. Different regulations apply to term tests, final examinations and late assignments. Read the instructions carefully. (see the 2018 Western Academic Calendar).

A. *GENERAL REGULATIONS & PROCEDURES*

1. All first year students will report to the Undergraduate Services Office, SEB 2097, for all instances.

2. If you are an upper year student and you are missing a test/assignment/lab or examination that is worth LESS THAN 10% of your mark, you should report to your department office to request relief. If your course work is MORE THAN 10% of your final grade, you will report to the Undergraduate Services Office, SEB 2097.

3. Check the course outline to see if the instructor has a policy for missed tests, examinations, late assignments or attendance.

4. Documentation must be provided as soon as possible. If no one is available in your department office or the Undergraduate Services Office, leave a message clearly stating your name & student number and reason for your call. The department telephone numbers are given at the end of these instructions.

5. If you decide to write a test or an examination you should be prepared to accept the mark you earn. Rewriting tests or examinations or having the value of a test or examination reweighted on a retroactive basis is not permitted.

B. *TERM TESTS*

1. If you are in first year and you are unable to write a term test, contact the Undergraduate Services Office, SEB 2097 PRIOR to the scheduled date of the test.

2. If you are an upper year student and you are unable to write a term test, inform your instructor PRIOR to the scheduled date of the test. If the instructor is not available, leave a message for him/her at the department office. If the test is worth LESS THAN 10% of your mark, you should report to your department office to request relief. If the test is worth MORE THAN 10% of your final grade you will report to the Undergraduate Services Office, SEB 2097 to request relief.

3. Be prepared to provide supporting documentation to the Department Chair and/or the Undergraduate Services Office (see next page for information on documentation).

4. Discuss with the instructor if and when the test can be rescheduled. **N.B.** The approval of the Chair or the Undergraduate Services Office is required when rescheduling term tests.

C. *FINAL EXAMINATIONS*

1. If you are unable to write a final examination, contact the Undergraduate Services Office PRIOR TO THE SCHEDULED EXAMINATION TIME to request permission to write a Special Final Examination. If no one is available in the Undergraduate Services Office, leave a message clearly stating your name & student number (please spell your full name).

2. Be prepared to provide the Undergraduate Services Office with supporting documentation (see next page 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, 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 sign a "Recommendation for a Special Examination Form" available in the Undergraduate Services Office. The Undergraduate Services Office will then notify the course instructor(s) and reschedule the examination on your behalf.

PLEASE NOTE: **It is the student's responsibility to check the date, time and location of the Special Examination.**

D. *LATE ASSIGNMENTS*

1. Advise the instructor if you are having problems completing the assignment on time (**prior** to the due date of the assignment).
2. Be prepared to provide documentation if requested by the instructor (see reverse side for information on documentation).
3. If you are granted an extension, establish a due date. The approval of the Chair of your Department (or the Associate Dean if you are in first year) is not required if assignments will be completed prior to the last day of classes.
4. i) Extensions beyond the end of classes must have the consent of the instructor, the department Chair and the Associate Dean. Documentation is mandatory.
   ii) A Recommendation of Incomplete Form must be filled out indicating the work to be completed and the date by which it is due. This form must be signed by the student, the instructor, the department Chair and the Associate Dean.

E. *SHORT ABSENCES*

If you miss a class due to a minor illness or other problems, check your course outlines for information regarding attendance requirements and make sure you are not missing a test or assignment. Cover any readings and arrange to borrow notes from a classmate.

F. *EXTENDED ABSENCES*

If you are absent more than one week or if you get too far behind to catch up, you should consider reducing your workload by dropping one or more courses. (Note drop deadlines listed below). You may want to seek advice from the academic counsellor in your Department or the counsellors in the Undergraduate Services Office if you are in first year.

G. *DOCUMENTATION*

If you consulted an off-campus doctor or Student Health Services regarding your illness or personal problem, **you must provide the doctor with a Student Medical Certificate** to complete at the time of your visit and then bring it to the Department (or the Undergraduate Services Office if you are in first year). **This note must contain the following information: severity of illness, effect on academic studies and duration of absence. Regular doctor's notes will not be accepted; only the Student Medical Certificate will be accepted.**

In Case of Serious Illness of a Family Member: Provide a Student Medical Certificate to your family member's physician to complete and bring it to the Department (or the Undergraduate Services Office if you are in first year).

In Case of a Death: Obtain a copy of the death certificate or the notice provided by the funeral director's office. You must include your relationship to the deceased and bring it to the Department (or the Undergraduate Services Office if you are in first year).

For Other Extenuating Circumstances: If you are not sure what documentation to provide, ask the Departmental Office (or the Undergraduate Services Office if you are in first year) for direction.

Note: Forged notes and certificates will be dealt with severely. To submit a forged document is a scholastic offence (see below).

H. *ACADEMIC CONCERNS*

1. You need to know if your instructors have a policy on late penalties, missed tests, etc. This information may be included on the course outlines. If not, ask your instructor(s).

2. **You should also be aware of attendance requirements in some courses. You can be debarred from writing the final examination if your attendance is not satisfactory.**

3. If you are in academic difficulty, check out the minimum requirements for progression in the calendar. If in doubt, see your academic counsellor.

Calendar References: Check these regulations in your 2016 Western Academic Calendar available at www.westerncalendar.uwo.ca.

Absences Due to Illness
Academic Accommodations for Students with Disabilities
Academic Accommodations for Religious Holidays
Course Withdrawals
Examinations
Scheduling of Term Assignments
Scholastic Offences
Student Medical Certificate
Engineering Academic Regulations

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 14, 2018
Full courses and full-year half course (i.e. "E", "Y" or no suffix) September 14, 2018
Second term half course (i.e. "B" or "G") January 15, 2019

***Drop Deadlines*:** First term half course (i.e. "A" or "F"): November 12, 2018
Full courses and full-year half courses (i.e. "E", "Y" or no suffix): November 30, 2018
Second term half or second term full course (i.e. "B" or "G"): March 7, 2019

Undergraduate Services Office:	SEB	2097	Tel: (519) 661-2130	E-mail:	engugrad@uwo.ca
Dept. of Chemical and Biochemical Engineering:	TEB	477	Tel: (519) 661-2131	E-mail:	cbeugrad@uwo.ca
Dept. of Civil and Environmental Engineering:	SEB	3005	Tel: (519) 661-2139	E-mail:	civil@uwo.ca
Dept. of Electrical and Computer Engineering, Software Engineering Mechatronics Engineering	TEB	279	Tel: (519) 661-3758	E-mail:	eceugrad@uwo.ca
Dept. of Mechanical and Materials Engineering:	SEB	3002	Tel: (519) 661-4122	E-mail:	mmeundergraduate@uwo.ca

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