

ENGG2120

Material Science - Fall 2007

Professor, Support and GTA Information

Professor: John Phillips, Office: Room 229, Thornbrough Building (south end), Phone: (519) 824-4120 (Extension 56195), Fax: (519) 836-0227, E-Mail: jphill02@uoguelph.ca

Office Hours: By appointment (if you've got a quick question/concern please feel free to send me an email or talk to me before or after class; if you have a question(s)/concern(s) that requires more time, we can set a time to meet that will work for both of our schedules) or any time I am in my office (my schedule is posted on the door).

Support: Ken Graham, Office: Room 1177 (Shop), Thornbrough Building

Graduate Teaching Assistants (GTA):

Lauren Bailey, E-Mail: lbaile01@uoguelph.ca

Amanda Farquharson, E-Mail: aportela@uoguelph.ca

Lindsay Lafleur, E-Mail: llafleur@uoguelph.ca

**The teaching assistants can be contacted before or during the end of all laboratory sessions

Course and Schedule Information

Course Description: The course emphasizes the relationship of the properties of solid materials to their structure at several levels. Atomic order and disorder in solids, single-phase metals, and multiphase materials (their equilibria and micro-structure) are examined as a basis for understanding the causes of material properties. Interwoven throughout the course is an introduction to materials selection and design considerations.

Prerequisites: CHEM 1040, PHYS 1130

Class Time: Tues./Thurs. - 8:30-9:50 a.m. Room 204, Landscape Architecture Building.

Lab Time: Mon./Wed. 12:30 - 2:20, 2:30-4:20 p.m. Room 1119, Thornbrough Building. Please refer to the 2007 Material Science Laboratory Handout for lab procedures and schedule (available on blackboard).

Text (Required): Callister, W.D. Material Science and Engineering: An Introduction (7th Edition), John Wiley and Sons, Inc., Toronto, 2007 (available for purchase in the bookstore).

Course Website: login to blackboard (formerly WebCT)

Course Listserv: ENGG2120@LISTSERV.UOGUELPH.CA The course listserv is to be used only for engg2120 questions and inquiries. The listserv will be closely monitored by the network administrator and course instructor.

Learning Objectives

Upon successful completion of this course, students will be able to:

- Appreciate the relationship between the structure of a material, its properties, applications, and factors involved in manufacturing and using materials
- Describe the chemical and engineering aspects of materials.
- Use typical material properties (particularly mechanical, thermal and electrical ones) to predict the behaviour of engineering components

Schedule of Topics

Topic	Callister 7 th Edition Reference Chapters	Approx. Date(s)	Approx. # of Lectures
Introduction: Course Outline and Course Expectations		Sept. 11	1
Review: the nature of materials and chemical structures	1, 2	Sept. 13, 18	2
Crystalline state and disordered structures	3, 4, 5	Sept. 20, 25	2
Mechanical and electrical properties	6, 18	Sept. 27, Oct. 2	2
Hardening and strengthening	7	Oct. 4, 9	2
Phase diagrams	9	Oct. 11, 16, 18	2.5
NX™ FEA introduction (information for your assignment)		Oct. 18	0.5

MID TERM TEST

OCTOBER 23 8:30AM – 9:40AM (in class)

Properties of iron and steel	10, 11	Oct. 25, 30	2
Properties and processing of copper and its alloys, aluminum, nickel, magnesium and titanium	11	Nov. 1	1
Properties of polymers	14, 15	Nov. 6	1
Properties of ceramics	12, 13	Nov. 8	1
Composites	16	Nov. 13	1
Failure, corrosion and degradation of materials	8, 17	Nov. 15, 20	2
Materials selection and design considerations and relation to fabrication		Nov. 22, 27	2
Review lecture		Nov. 29	1

EXAM

DECEMBER 3 8:30AM – 10:30AM (room TBA)

Marking

Activity	Percentage of Final Grade
Group laboratory write-ups (4)	20%
UGS NX™ FEA assignment, Due before your scheduled lab time during week 10 (Nov. 12 th - Nov. 16 th)	15%
Midterm Exam - Oct. 23th, 2007 8:30-9:40 a.m. (Room 204, Landscape Architecture)	30% or 0% (which ever provides the highest overall course grade)
Final Exam - Dec. 3rd, 2007 8:30-10:30 a.m. (Room TBA)	35% or 65% (which ever provides the highest overall course grade)

UGS NX™ FEA assignment tutorial:

One (1.5 hour long) tutorial will be held during **week 7** (Oct. 22th - Oct. 26th) to help you with the NX™ FEA assignment. Tutorial times are as follows: 2:30-3:50, 4:00-5:20 pm Tues. and Wed., 4:00-5:20 pm Fri. in room 1135 Thornbrough. The tutorials will be run during Engg. 2100 (Design) tutorial times by Engg. 2100 and 2120 teaching assistants. If you are not enrolled in Engg. 2100 but have taken 2100 previously, you will need to attend tutorials in a time slot that will work with your schedule (you will need to contact your course instructor to receive a FEA part). If you are a transfer student and are currently not enrolled in, or have not taken Engg. 2100, you will need to attend one of the tutorial times listed in each of weeks 1 and 2 in addition to week 7 to help you learn basic NX™ drawing (you will need to contact your course instructor to receive a FEA part). The FEA assignment is due before your scheduled lab time during **week 10** (Nov. 12th - Nov. 16th). You must hand in your assignment to the drop-off cabinet located in the main stairwell of the engineering building (you will be informed of the box number during the lab) before your scheduled lab starts. Late assignments will not be marked (a mark of zero will be assigned).

Please be aware that there may be questions from material covered in the laboratories, NX™ Tutorials and NX™ assignment on both the midterm and final examinations.

Midterm/Exam weightings:

If a student does not write the midterm exam, the percentage weighting will be shifted to the final exam such that the final exam will be worth 65% of the student's final grade. Students are strongly advised to study for and write the midterm exam because material from the second half of the course builds on first half course material.

Stipulations for passing the course:

In order to pass the course, students must pass both the laboratory/FEA assignment and exam course portions. Students must obtain a grade of 50% or higher on the exam portion of the course in order for the laboratory write-up and FEA assignment portions of the course to count towards the final grade. Students must attend, complete and participate in the write-up of all laboratories in order to pass the course. If a laboratory is missed due to illness or other valid extenuating circumstance for which the student has obtained the required documents according to School of Engineering regulations, students will be allowed to complete and write-up a make-up lab.

Laboratory Experiments

Five laboratory sessions have been scheduled, with students working in groups of 5-6 as follows:

1. Introduction (includes laboratory safety) and Measurement Instruments
2. Compressive testing of materials
3. Tensile testing of materials
4. Heat treatment of steel
5. Impact testing of materials

Specific instructions for the preparation of laboratory reports are contained in the Material Science Laboratory Manual 2007 which should be downloaded from blackboard.

General Policies Regarding Laboratories

All labs must be submitted for marking in the assignment drop-off cabinet located in the main stairwell of the engineering building (you will be informed of the box number during the lab) by 12:00 noon one week after the laboratory is performed (labs which are due on Thanksgiving Monday can be handed in on Tuesday October 9th by 12:00 noon). The TA's will be collecting the labs from the drop-off cabinet immediately after the due date time, late labs will not be marked (a mark of zero will be assigned). Marked labs will be handed back to a member of your group during your next scheduled lab session. In order to receive a mark for a lab report you must have contributed to the writing of the lab report and your signature **must** be present on the cover page.

Disclaimer

The instructor reserves the right to change any or all of the above in the event of appropriate circumstances, subject to the University of Guelph Academic Regulations.