

MATE 201/202 W2008 Syllabus

Instructor: Section B2 –Dr. H. Zhang, hao.zhang@ualberta.ca,

Office Hours/Help Sessions:

710B CME, Monday 14:30-16:30

TA Led Help Session – Tue/Wed 11:00 – 13:00

E-mails: No email response on Sunday

Lectures: MWF 13:00 to 13:50 in ETLE 2-001

Labs: Lab Manual - must be purchased at bookstore for a nominal fee
Lab Schedule - see website for details

Text: W.D. Callister, Jr., “Materials Science and Engineering – An Introduction”, 7th edition John Wiley and Sons Inc., New York, 2007.

Syllabus: See WebCT

Course Grading:

Home work: 10% (201 : 10%)

Laboratories: 13% (201 : 0%)

Mid Term: 25% (201 : 30%) on Thur. Mar 13 at 7:00 P.M.

The midterm will cover sections 1-7

Final Exam : 52% (201 : 60%) on Sat. Apr. 26 at 9:00 AM

The final exam will cover the **ENTIRE** course.

- Exams are closed-book; however a sheet with appropriate data and formulae will be provided. Approved non-programmable calculators are permitted.
(<http://www.engineering.ualberta.ca/calculator.cfm>)
- Information on the grading system: www.uofaweb.ualberta.ca/grades.
- The conversion of marks from assignments and examinations into a final grade based on the four-point system will be performed by using absolute measures in combination with the subjective procedures described in Section 23.4 (4) of the University Calendar.

Course Survival Skills

RIGHTS:

The **student** has the right to be respected, to be registered in the University of Alberta and to take this course.

The **instructor** has the right to be respected and to teach the course as they deem fit to fulfill their responsibility.

RESPONSIBILITIES:

The **student** is responsible for learning the content of the course and for demonstrating the knowledge that they have acquired.

The **instructor** is responsible for enabling the student in learning the content of the course, for testing the knowledge of the student in the subject and for reporting the results of the testing.

For the student to fulfill his/her responsibility in a course:

- Read the textbook the day before a lecture,
- Attend the lecture,
- Review the material in the textbook and notes within a day of the lecture,
- Do the homework on time, and
- Review the material and study for the test.

For the instructor to fulfill his/her responsibility in a course:

- Prepare and present lectures,
- Prepare and assign homework,
- Be accessible to answer questions,
- Prepare and administer test(s), and
- Grade and report outcomes from test(s).

Course Policies:

Assignments

- **Assignments** are all to be submitted online through WEBCT.
- **Assignments** will be due every Wednesday at 11:59PM the week after they are first available.
- **NO ASSIGNMENTS WILL BE ACCEPTED AFTER THIS TIME!**
- For **Assignments** always use SI units and an appropriate number of significant figures in answer.

Labs

- Labs must be completed in lab period.
- Bring lab manual to lab ****manual must be purchased at the bookstore.**
- All [AM] labs start at **8:00 AM** and all [PM] labs begin at **2:00 PM.**
- **Safety Glasses and closed-toe shoes (no sandals) must be brought to each Lab.**

Code of Student behaviour

- Policy about course outlines can be found in Section 23.4(2) of the University Calendar. The University of Alberta is committed to the highest standards of academic integrity and honesty. Students are expected to be familiar with these standards regarding academic honesty and to uphold the policies of the University in this respect. Students are particularly urged to familiarize themselves with the provisions of the Code of Student Behaviour (online at www.ualberta.ca/secretariat/appeals.htm) and avoid any behaviour which could potentially result in suspicions of cheating, plagiarism, misrepresentation of facts and/or participation in an offence. Academic dishonesty is a serious offence and can result in suspension or expulsion from the University. Handouts on plagerism and cheating can be found at <http://www.uofaweb.ualberta.ca/TIE/nav01.cfm?nav01=22065&>

Student Services

- Students who require accommodations in this course due to a disability affecting mobility, vision, hearing, learning, or mental or physical health are advised to discuss their needs with Specialized Support and Disability Services, 2-800 SUB, 492-3381 (phone) or 492-7269 (TTY).
- Other student services can be found at Student Services www site <http://www.uofaweb.ualberta.ca/student-services/>
- If you are having academic difficulties there are resources available at <http://www.uofaweb.ualberta.ca/academicsupport/nav02.cfm?nav02=50367&nav01=5>
- Information on student ombudsmen services is available at: <http://www.uofaweb.ualberta.ca/OmbudService/>
- Information on important university deadlines can be found at <http://www.registrar.ualberta.ca/calendar/Academic/Schedule/11.html>

Course Outline/Syllabus
Readings based on Callister, 7th edition

Topic	Date	Lectures	Reading	Laboratory
1. Introduction - types of materials	Jan. 7	0.5	Chap 1	
2. Mechanical Properties - tension testing : elastic and plastic deformation - hardness testing - variability of material properties	Jan 9-16	4	6.1-6.3, 6.5-6.6, 6.8 6.10(Rockwell), 6.11	
3. Failure - fundamentals of fracture : ductile and brittle - impact testing : Charpy, DBTT - fatigue : S-N curve, crack initiation/propagation - creep : steady state creep, stress and T effects	Jan 18-23	3	8.1-8.4 8.6 8.7-8.11 8.12-8.13, 8.15	Lab 1 Impact Transition Tension Test The Microscope
4. Structure of Materials - interatomic bonds : covalent, ionic, metallic - crystalline solids: systems, unit cells atomic packing , density, polymorphism, - crystallographic features : directions, planes, linear and planar density - crystalline vs. noncrystalline - imperfections : vacancies, solid solutions, dislocations, grain boundaries	Jan 25- Feb 4	4.5	2.5, 2.6 3.1-3.4, 3.7 3.5, 3.6 3.8-3.10 3.11, 3.12 3.13-3.14, 3.17 4.1-4.6	Lab 2 Creep of Metals Crystal Structures
5. Atom Movements in Materials - diffusion : interstitial, vacancy - Arrhenius equation	Feb 4 – Feb 6	1.5	5.1-5.3 5.5	
6. Plastic Deformation - mechanism: dislocation motion - grain boundary strengthening - solution hardening - strain hardening: cold working - precipitation hardening	Feb 8-13	2.5	7.1-7.2 7.8 7.9 7.10 11.9	
7. Annealing - recovery, recrystallization and grain growth - hot working	Feb 13-15	1.5	7.11- 7.13 11.4	Lab 3 Strain Hardening Annealing and Recrystallization Eutectic mixture
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8. Phase Diagrams <ul style="list-style-type: none"> - basic concepts and definitions - binary phase diagram : isomorphous, lever rule - binary phase diagram : eutectic - iron carbon phase diagram 	Feb 25- Mar 3	4	9.1-9.5 9.6-9.10 9.11- 9.12 9.14, 9.18- 9.19	
9. Transformations <ul style="list-style-type: none"> - kinetics : time dependence, Avrami equation - TTT diagram steel : phases, properties of phases - CCT diagram steel - tempering of martensite - Hardenability : Jominy End Quench - Precipitation heat treatment of aluminum 	Mar 5- Mar 14	5	10.1-10.4 10.5,10.7 10.6 10.8 11.8 11.9	Lab 4 Steel Microstructures Tempering Heat Treatment of Steels
10. Corrosion <ul style="list-style-type: none"> - fundamentals : corrosion cells, EMF, Nernst equation, galvanic series - types of corrosion - corrosion control : material selection, coatings, cathodic protection 	Mar. 17 -26	3	17.1-17.3 17.7 17.8, 17.9	
11. Plastics (Polymers) <ul style="list-style-type: none"> - types of engineering polymers - polymer microstructure : monomer, chain length, degree of polymerization, crystallinity - mechanical behaviour : linear, crosslinked, crystallinity, alignment of chains - glass transition temperature - degradation 	Mar 28- Apr. 4	4	14.9,15.15 14.1-14.7, 14.11, 14.12 15.2-15.4 15.12-15.14 17.11-17.13	Lab 5 Viscoelastic Deformation Galvanic Series
12. Ceramics <ul style="list-style-type: none"> - structures - properties, - processing : powder methods 	Apr. 7-9	2	12.1-12.3 12.8-12.9 13.9-13.12	