

ME 306: Materials Science

Winter 2010

Instructor and Class Information

Instructor: Dr. Harold Park, Assistant Professor of Mechanical Engineering

Office: TBD

Email: parkhs@bu.edu

Phone: (617) TBD

Office Hours: TBD

Class Hours: Tuesdays and Thursdays 12-2 PM

Classroom: Photonics 206

Lab Coordinator Kara Mogensen (karam@bu.edu, 617.358.1565)

Lab Hours: Monday 10-12 and 2-4, Tuesday 10-12 and 2-4, Wednesday 10-12 and 2-4, Thursday 10-12, Friday 10-12

Lab Location: 730 Commonwealth, Room 307

Course Website: <http://blackboard.bu.edu>

GTF Information

(1) Mr. Eric Gratz

Office: Room B07, 750 Commonwealth Avenue

Email: egratz@bu.edu

Office phone: (617) 353-0375

Labs: Tuesday 10-12, Tuesday 2-4, Thursday 10-12, Friday 10-12

Office hours: TBD

(2) Mr. Shuangxing Dai

Office: TBD

Email: dsx1986@bu.edu

Office phone: TBD

Labs: Monday 10-12, Monday 2-4, Wednesday 10-12, Wednesday 2-4

Office hours: TBD

The GTFs (Eric and Shuangxing) will be responsible for running and grading the laboratory sessions.

Grader

(1) TBD

Email: TBD The grader will be responsible for grading all homework assignments, and (if necessary) holding discussion sections to go over the homework as needed during the semester.

Course Summary

This course serves as an introduction to materials science. We will discuss structures, processing and properties of key engineering materials, i.e. metals, ceramics, polymers, and composites. A major emphasis will be

placed upon relating the properties of materials to their underlying microstructural constituents, and how the microstructures are formed and produced by the interplay between thermodynamics and transformation kinetics.

Textbook

Materials Science and Engineering: An Introduction by William D. Callister, Jr., seventh edition, John Wiley and Sons 2007

Reference Book

- *Essentials of Materials Science and Engineering* by Donald R. Askelund and Pradeep P. Fulay, second edition, Cengage Learning 2009

Class Policies

- Homework not turned in by the end of class (i.e. 2 PM) on the due date, either to myself in class or in my mailbox in the ME office, will be considered to be late. Late homework will receive a maximum of 80% of the available score. Homeworks that are more than one class late will not be accepted.
- Laboratory reports are due at the beginning of the next scheduled laboratory session. As with homeworks, late laboratory reports will receive a maximum of 80% of the available score, and laboratory reports that are more than one class late will not be accepted.
- It is your responsibility to check with the GTF (who will be in charge of the grade sheet on blackboard) to make sure that all homeworks have been recorded correctly, and that you are not missing any points on the grade sheet.
- One midterm and one final exam will be given.
- Making up of missed examinations will be permitted only when proof of medical or personal emergency is furnished.
- All complaints related to grading of homework assignments, quizzes, and examinations must be reported to the instructor immediately after the grades are announced.
- A group project (4-6 people in each group) will be assigned. A pre-proposal, outlining the design of your experimental work and the objective of your project, needs to be submitted to Kara Mogensen before you can begin project related experiments. An intermediate project report (Introduction, including a detailed literature review, and experimental design) is due prior to the final report submission as detailed in the laboratory schedule. The group project will require a final oral presentation and submission of a typed final report.

Approximate Laboratory Schedule

- Lab safety/metallography demo (Week of January 25-29)
- Microstructural characterization (Week of February 1-5)

- Structural analysis by X-Ray and SEM (Week of February 8-12)
- Diffusion/solid solutions (Week of February 22-26)
- Phase diagrams (Week of March 22-26)
- Project pre-proposals due (March 5)
- Project proposal discussion (Week of March 15-19)
- Intermediate project reports due (March 26)
- Project work (March 29-April 23)
- Project final report due (April 29, in class)

Project Information

- Each project group needs to submit a project pre-proposal to Kara Mogensen (due about the 6th week of class). It should be 1 page or less, and contain the following information: (1) Project title, (2) Group members, (3) Major objective of the project, (4) A very brief description of the proposed experiments, preferably in a list format that includes details such as materials, temperatures, times, mechanical and microstructural characterizations planned, and number of samples
- An intermediate project proposal will be due about 2-3 weeks after the pre-proposal. It should be about 3 pages in length, and should be written only after Kara has approved the details in the pre-proposal. The intermediate proposal should include: (1) Title, (2) Group members, (3) Introduction that includes (a) Objectives, (b) Literature review, and (4) Experimental design in descriptive detail

Approximate List of Topics to be Covered

- Chapter 1: Introduction to Materials.
- Chapter 2: Atomic Structure and Interatomic Bonding.
- Chapter 3: The Structure of Crystalline Solids
- Chapter 4: Imperfections in Solids
- Chapter 5: Diffusion
- Chapter 6: Mechanical Properties of Metals
- Chapter 7: Dislocations and Strengthening Mechanisms
- Chapter 8: Failure
- Chapter 9: Phase Diagrams
- Chapter 10: Phase Transformations in Metals
- Chapter 12: Structure and Properties of Ceramics
- Chapter 14: Polymer Structures
- Chapter 15: Characteristics, Applications, and Processing of Polymers
- Chapter 16: Composites

Grading

- Homeworks: 10%
- Labs: 15%
- Midterm: 30%
- Final: 30%
- Lab project: 15%