

ENGR 220 - MATERIALS I

Fall 2009

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Office Hours: Mondays 10-12,

Room 444 LeBow, or by appointment

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Purpose and Rationale

The development and use of engineering technology involves in every instance the consideration of materials. It is common for an engineering “breakthrough” to follow closely on the heels of the development of a new or improved material. Many potentially significant engineering designs lie dormant awaiting improved materials. In addition, many engineering developments reach a catastrophic end due to misuse of the available materials of construction. Thus, contemporary engineers must have a basic understanding of materials in order to be able to capitalize on the development of new materials and to utilize effectively materials that are currently available.

Materials are endemic to all branches of engineering and without materials the engineer cannot function. Everything that is made utilizes materials and this mandates informed design with, and selection of, materials on the part of the engineer. Thus, materials constitute a “common denominator” across the several engineering disciplines and a broad-based treatment of the fundamentals of materials is essential for all engineering students.

Objectives

The key to understanding the nature and behavior of materials is recognition of the fact that material properties and therefore performance are a function of both composition and structure. The composition (chemical) variable is usually obvious; the structure variable can often be obscure since it includes the effects of electron configurations, atomic arrangements, and defects at the atomic level. Further, processing, or synthesis control the structure of a material. For a given composition of material, different processing routes can give rise to different structures, and hence to different property levels.

The overall objective of the course is to provide a clear understanding of processing, microstructure and properties.

Specific course objectives are to:

- Recognize and differentiate between the several types of engineering solids.
- Understand solids at the atomic level in terms of bonding and energy.
- Establish a quantitative picture of the architecture of crystalline and non-crystalline solids.
- Explain atomic movements in solids in terms of diffusion mechanisms and the mathematical laws of diffusion.
- Characterize quantitatively the electrical behavior of insulators, semiconductors and conductors in terms of the number and mobility of charge carriers.
- Understand the processes that give rise to the degradation of materials, in general and the corrosion of metals in particular.
- Explain the origin of diamagnetism, paramagnetism and ferromagnetism, differentiate between soft and hard magnetic materials.
- Interpret the optical behavior of metals and nonmetals in terms of the interaction of electromagnetic radiation with the material.

Methodology

MATE 220 is a four credit course taught through 3 hours of lecture and 2 hours of recitation each week. Lectures focus on the presentation and discussion of new material. Small group recitations are intended primarily for homework review, problem solving, and clarification of lecture material.

Grading

There will be two Midterm Examinations and a Final Examination. In addition, there will be \approx five quizzes throughout the term which are given during the recitation period.

Quizzes (based on HW)		20%	Given during recitations. Attendance = 1 Quiz.
Midterm (#1)	WEEK 5	20%	Given during lecture, 10/21
Midterm (#2)	WEEK 8	20%	Given during lecture, 11/11
Final		40%	

Textbook

William D. Callister, Jr., Materials Science and Engineering: An Introduction, 7th Edition, John Wiley & Sons., Inc., New York, 2007.

Website

For posted documents (practice exams, electronic syllabus, etc) kindly refer to <http://in.materials.drexel.edu>

Email Communications

Please address all of the email correspondence with ENGR 220 in the subject line

Course Plan and Required Reading

		Estimated lectures devoted to topic
Chapter 1:	All sections	1
Chapter 2:	All sections	3
Chapter 3:	All sections <i>except</i> : Sections 3.8 to 3.11, 3.15, and 3.16	3
Chapter 4:	All sections <i>except</i> : 4.11	2
Chapter 5:	All sections	3
Chapter 12:	Sections: 12.1 to 12.4 only.	3
Chapter 14:	All sections	3
Chapter 17:	All sections <i>except</i> : Section 17.10	3
Chapter 18:	Sections 18.1-18.13	3
Chapter 20:	All sections	3
Chapter 21:	All sections	3

Teaching Assistants

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