

Course URL: <http://widener.parameterid.com/index.php/fuseaction/courses.materials>

Textbook: **Materials Science and Engineering: An Introduction**
W.D. Callister, Jr., 7th edition, John Wiley and Sons, Inc.

References: *Principles of Materials Science and Engineering*, Smith
Elements of Materials and Engineering, Van Vlack
Engineering Materials & Their Applications, Flinn/Trojan
Materials for Civil & Highway Engineers, Derucher, Korfiatis & Ezeldin
Civil Engineering Materials, Somayaji
Concrete: Structure, Properties, and Materials, Mehta
Engineering Properties of Asphalt Mixtures & Relationship to Their Performance, Huber and Decker

Tentative Grading: (± will be used)	Three Mid-term test averages	75%
	Homework/Quizzes	25%
	Total:	100%

Class Schedule: Lecture, T, TH 2:00 – 3:30 PM (KIRK 237)

GENERAL CONDUCT OF COURSE

1. During the semester, 3 one-hour tests will be given. The student **MUST** take all tests. Basically **NO** make-ups are granted unless absence from a test is justified with proper documentation. All tests will be based on the material covered up to the date of test. Unless otherwise instructed, closed-book tests should be expected. Any grade review you see justified should be brought to my attention within the first week of receiving the grade.
2. Homework will be assigned and specified either as “suggested” or “to be collected” at that time. There will be in class unannounced quizzes.
3. It has been my experience in the past that when students study in groups, and communicate and share resources, they seem to perform better. Obviously, this is a generalization and I am sure there are many exceptions. However, please keep this in mind and take advantage of study groups whenever you can.

COURSE DESCRIPTION

The interrelationship between the structure of materials in the solid state (atomic, molecular, crystalline, and aggregate structure) and their engineering properties. Theory of the behavior of materials including metals, polymers, ceramics, asphalt, concrete, wood, and composites. Introduction to corrosion. Processing techniques. Discussion of topics of destructive and nondestructive testing, statistical quality control, joining, composite materials, polymers, and degradation. Prerequisites: ENGR 213 and CHEM 145. 3 semester hours

COURSE OBJECTIVES

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

1. Comprehend the scientific and practical interrelationships at play among the processing, structure, properties, and performance of all classes of materials that are useful to society
2. Become familiar with the processing techniques of materials, and choose a suitable material for a given application, based on design requirements and performance criteria
3. Examine the behavior of materials in hostile environments and the properties of structural materials such as Portland cement, wood, and asphalt

COURSE OUTCOMES

1. An ability to apply the fundamental knowledge of mathematics, science & engineering, as well as the ability to use the techniques, skills, & modern engineering tools to solve civil engineering problems in practice (CE-O2, ABET-a).
2. The ability to design a civil engineering system, component, or process to meet the requirements of safety, cost, quality, and performance (CE-O4, ABET-c).
3. An ability to conduct laboratory experiments, and to analyze and interpret data in various civil engineering disciplines (CE-O5, ABET-b).

COURSE OUTLINE

TOPIC	CHAPTER
1. General Introduction; Atomic Structure & Bonding	1, 2
2. Crystalline Structure	3
3. Imperfections, Diffusion	4, 5
4. Mechanical Properties of Metals	6
5. Dislocations, Failure	7, 8
6. Phase Diagram	9
7. Phase Transformations	10
8. Metal Processing, Alloys	11
9. Corrosion	17
10. Ceramics	12, 13
11. Polymers	14, 15
12. Composite & Civil Engineering Materials	16
13. Electrical, Thermal, magnetic & Optical Properties	18, 19, 20, 21