ENGR 45: PROPERTIES OF MATERIALS

Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2022
Units:	5
Hours:	4 lecture, 3 laboratory per week (84 total per quarter)
Prerequisite:	CHEM 1B and MATH 1C.
Corequisite:	Completion of or concurrent enrollment in PHYS 4B.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU/UC
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

Student Learning Outcomes

- To ensure that our students are knowledgeable about all classes of materials and their structure, properties, processing, applications and performance;
- To ensure that our students can properly relate their hands-on laboratory experiences to solving real materials engineering problems

Description

Properties of engineering materials related to basic structure; applications to the selection and use of engineering materials.

Course Objectives

The student will be able to:
A. learn the nature of mechanical, physical, and chemical properties of materials.
B. correlate the mechanical, physical, and chemical properties of materials with the basic structures involved.
C. become familiar with the specifications required for typical engineering applications.
D. become familiar with the standard laboratory tests/procedures for verification.
E. develop an appreciation for the role of materials science in the development of new materials.

Course Content

A. Engineering requirements of materials
B. Atomic bonding in solids
C. Atomic arrangements: molecular, crystalline, and amorphous
D. Structural imperfections and atom movements
E. Electronic structures and processes
F. Metallic phases and their properties
G. Organic materials and their properties
H. Ceramic phases and their properties
I. Multiphase materials and equilibrium relationships
J. Reactions within solid materials
K. Modification of properties through changes in microstructure
L. Stability of materials in service environments
M. Composite materials

Lab Content

A. Construction of crystal modes
B. Hardness testing
C. Tensile testing
D. Microscopic examination of metals
E. Impact testing and tempering of steel
F. Hardenability test for steel
G. Recrystallization and cold working
H. Heat treatment of aluminum
I. Material joining
J. Aging of plastics

Special Facilities and/or Equipment

None

Method(s) of Evaluation

A. Examinations
B. Quizzes
C. Laboratory reports
D. Final examination

Method(s) of Instruction

Lecture

Representative Text(s) and Other Materials

Shackelford, J.F. Introduction to Materials Science for Engineers. 8th ed. Prentice Hall, 2015.
Callister, William D. Jr., and David G. Rethwisch. Materials Science and Engineering: An Introduction. 10th ed. Wiley, January 2018.

Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

A. Homework problems covering subject matter from text and related material. Students will need to employ critical thinking in order to complete assignments.
B. Reading and study of the textbook, related materials and notes.

Discipline(s)

Engineering