



MASTER COURSE OUTLINE

Prepared By: James Saucedo

Date: Sep 2017

COURSE TITLE

Material Science

GENERAL COURSE INFORMATION

Dept.: ENGR

Course Num: 201

(Formerly:)

CIP Code: 14.1901

Intent Code:

Program Code:

Credits: 5

Total Contact Hrs Per Qtr.: 55

Lecture Hrs: 55

Lab Hrs: 0

Other Hrs: 0

Distribution Designation: Natural Science NS

COURSE DESCRIPTION (as it will appear in the catalog)

An introduction to Materials Science that includes the atomic, molecular, and crystalline structures of materials and their relationship to electrical, mechanical, thermal, and chemical properties, as well as an introduction to materials processing and fabrication techniques.

PREREQUISITES

PHYS& 221, CHEM& 161

TEXTBOOK GUIDELINES

Materials Science and Metallurgy, 4th edition, Herman A. Pollack, or similar text. Access to the internet will be required and resources will be accessed through a specified online platform.

COURSE LEARNING OUTCOMES

Upon successful completion of the course, students should be able to demonstrate the following knowledge or skills:

1. Relate the physical and mechanical properties of materials to the basic nature of their bonds.
2. Describe the effects of structure and defects on the mechanical properties of solids.
3. Interpret phase diagrams.
4. Create phase diagrams.
5. Explain the concepts of stiffness, hardness, toughness, ductility, fatigue, and resiliency and how these qualities are measured.
6. Describe the processes used to fabricate materials for engineering applications.
7. Analyze material failure and explain the factors that lead to failure.

INSTITUTIONAL OUTCOMES

None

COURSE CONTENT OUTLINE

- I. Atomic Structure and bonding, Crystalline Structures.
- II. Imperfections and defects.

- III. Multicomponent material systems, phase diagrams, and start of diffusion.
- IV. Diffusion in solids.
- V. Mechanical Properties, measurement and testing.
- VI. Phase transformations and processing metals.
- VII. Ceramics structure, properties, and processing.
- VIII. Polymer and other organic systems, structure and processing.
- IX. Composites structure, processing, and properties.
- X. Corrosion and degradation, materials selection

DEPARTMENTAL GUIDELINES *(optional)*

PO5 should be assessed: Students will be able to solve problems by gathering, interpreting, combining and/or applying information from multiple sources.

DIVISION CHAIR APPROVAL

DATE