THE OHIO STATE UNIVERSITY

Introduction to Engineering Materials

MATSCEN 2010

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Course Components:

Lecture Recitation

Course Description:

Introduction to the properties (mechanical, electrical, thermal, diffusive, degradative, magnetic, optical), structure, and processing of engineering materials, including ceramic, metals, polymers, biological, and composite materials.

Prerequisites and Co-requisites:

Prereq: Physics 1250 or 1260; and Math 1151, 1161, or 1154 and enrollment in BSET program; and Chemistry 1210 or 1250 or 1910H; or permission of instructor.

Course Goals / Objectives:

- Define engineering material properties and their range of values
- Demonstrate the relation between material properties and underlying structure and atomic bonding
- Demonstrate how structure can be manipulated via thermal and mechanical processing
- Provide examples of how materials selection can enable improved performance in engineering applications (e.g., structural, thermal, electrical, optical, magnetic)

Course Topics:

- Inter-relation between properties, structure, and processing
- Electronic structure, bonding, and properties that are inferred from these features
- Structures of metals, ceramics, and polymers
- Imperfections in solids
- Diffusion in solids
- Mechanical properties: ceramics, metals, and polymers
- Strategies to strengthen materials
- Mechanical failure: ceramics, metals, and polymers
- Thermal properties: ceramics, metals, and polymers
- Composite materials: thermal and mechanical response
- Hard and soft tissue: structure and mechanical response
- Electrical properties: metals, insulators, and semiconductors
- Magnetic materials
- Optical properties
- Corrosion and degradation
- Phase diagrams
- Phase transformations
- Synthesis, fabrication, and processing of materials
- Case studies involving materials selection in engineering applications: structural, electrical, thermal, biological, magnetic, optical

Designation:

Required Elective