



**THE OHIO STATE UNIVERSITY**  
COLLEGE OF ENGINEERING

# Introduction to Engineering Materials

## MATSCEN 2010

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**Credit Hours:**

3.00

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**Course Levels:**

Undergraduate (1000-5000 level)

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**Course Components:**

Lecture  
Recitation

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**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.

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**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.

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**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)
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**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
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**Designation:**

Required

Elective