



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Mechanical Behavior of Materials

MATSCEN 6765

Credit Hours:

3.00 - 3.00

Course Levels:

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Mechanical response of materials to loads and deformation.

Prerequisites and Co-requisites:

Prereq: Grad standing in MatScEn, or permission of instructor.

Course Goals / Objectives:

- The development of a quantitative understanding of the scientific principles that govern the material response to mechanical forces or stresses
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Course Topics:

- Stress and Strain; Fundamentals, Variation, and Invariants
 - Elastic Behavior of Solids, Physical Origins and Concepts; Anisotropy and Mathematics
 - Continuum Plasticity
 - COMSOL Finite Element Analysis Module 1
 - COMSOL Finite Element Analysis Module 2
 - Dislocations: Basic Concepts, Movement of Dislocations
 - Dislocations: Elastic Properties of Dislocations
 - Dislocations: Dislocations in Crystals, Dislocations in FCC Metals (perfect dislocations, partials, stacking faults), Dislocations in Other Crystal Structures
 - Dislocations: Intersections of Dislocations, Dislocation Pile-ups, Multiplication of Dislocations
 - Strengthening Mechanisms Part 1: Strengthening Models, Lattice Resistance
 - Strengthening Mechanisms Part 2: Dislocation-Solid Solution Interaction and Strengthening, Dislocation-Precipitate Interaction Strengthening
 - Strengthening Mechanisms Part 3: Dislocation-Precipitate Interaction Strengthening, Dislocation-Grain Boundary Interaction Strengthening
 - Strengthening Mechanisms in Thin Films and Nano materials
 - Mechanical Behavior of Polymers, Composites, and Ceramics
 - Mechanical Behavior of Ceramics
 - Fatigue & Fracture Mechanics
 - High Temperature Deformation
 - Environmental Degradation
 - Corrosion Fatigue & Stress Corrosion Cracking
 - Experimental Techniques For Understanding Mechanical Behavior
 - Enhancing Mechanical Properties, Case Study: Aluminum Alloys
 - Enhancing Mechanical Properties, Case Study: SiC/Al Composites
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Designation:

Elective

Required