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

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

---

Designation:

Elective
Required