



THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

Mechanical Behavior of Crystalline Solids at Lower Temperature

MATSCEN 5761.71

Credit Hours:

1.50 - 1.50

Course Levels:

Undergraduate (1000-5000 level)

Graduate (5000-8000 level)

Course Components:

Lecture

Course Description:

Strength and Deformation Mechanisms in Crystalline Solids at Low Temperatures.

Prerequisites and Co-requisites:

Prereq: 3261 or 3332; or Grad standing; or permission of instructor.

Course Goals / Objectives:

- Quantitative survey of the deformation characteristics of crystalline solids including metals and ceramics focusing on inelastic deformation mechanisms via dislocation motion or twinning with a focus on low temperature behavior.
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Course Topics:

- Introduction/Motivation
 - Fundamentals Motion of Isolated Dislocations Release of Pinned Dislocations Dislocation density & multiplication Dislocation reactions Work hardening & the development of substructure Effects of diffusion Stress redistribution & backstress Twinning
 - Macroscopic phenomenology Stable & unstable flow Strain hardening and rate sensitivity Yield surfaces Single crystal plasticity and analysis Constitutive equations Power-law Activation Isotropic & Kinematic hardening & the Bauschinger effect
 - Overview of Deformation and Strengthening Mechanisms Deformation mechanism maps Low temperature plasticity/creep; Solute Strengthening Precipitate Strengthening Grain size Strengthening
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Designation:

Elective