

Introduction to the Mechanical Behavior of Materials

MATSCEN 3261

Credit Hours:

3.00

Course Levels:

Undergraduate (1000-5000 level)

Course Components:

Lecture

Course Description:

Mechanical response of solids to forces and stresses. Responses studied include elastic, viscoelastic, plastic deformation and fracture.

Prerequisites and Co-requisites:

Prereq: 2010, and MechEng 2020 or 2040, and enrollment as MatScEn-BS student; or permission of instructor.

Course Goals / Objectives:

• Students will gain basic understanding of the response of solid materials to forces and stresses through the application of mathematic, scientific, and engineering principles.

Course Topics:

- Solid Mechanics review including, review of important stress invariants and diving forces and associated response.
- Standard test methods for elastic, viscoelastic, plastic and fracture response and qualitative linkage to associated microstructrual mechanisms.
- Elasticity (continuum, including anisotropic); phenomenology, computations, trends and physical basis.
- Plastic strength of crystals and polycrystals including both phenomenology (stress-strain laws, yield surfaces), mechanisms including dislocation motion and strengthening mechanisms.
- Deformation response of non-crystalline materials including glasses and polymers including timeindependent and time dependent responses.
- Creep and deformation mechanisms at elevated temperatures (including deformation mechanism maps)
- Fracture and toughening mechanisms including introduction to engineering methods such as LEFM and Weibull and fracture surface analysis.
- Fatigue basic mechanisms of damage, engineering approaches and fatigue resistant design.
- Case studies and design.

Designation:

Required