MATSCEN 3261 Introduction to the Mechanical Behavior of Materials

Course Description

A survey of the mechanical response of solids to forces and stresses. Responses studied include elastic, viscoelastic, plastic deformation and frature.

Prior Course Number: MSE 361 and MSE 564
Transcript Abbreviation: Mech. Beh. Matls.
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad
Student Ranks: Junior
Course Offerings: Spring
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 3.0 hr Lec
Expected out-of-class hours per week: 6.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: 2010, MechEng 2040, and enrollment as MatScEn-BS student; or permission of instructor.
Exclusions: Not open to students with credit for BOTH MSE 361 and MSE 564
Cross-Listings:

Course Rationale: Existing course.

The course is required for this unit's degrees, majors, and/or minors: Yes
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: No

Subject/CIP Code: 14.3101
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
MATSCEN	Materials Science and Engineering

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Solid Mechanics review including, review of important stress invariants and diving forces and associated response.	6.0							

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Standard test methods for elastic, viscoelastic, plastic and fracture response and qualitative linkage to associated microstructrual mechanisms.	3.0							
Elasticity (continuum, including anisotropic); phenomenology, computations, trends and physical basis.	3.0							
Plastic strength of crystals and polycrystals including both phenomenology (stress-strain laws, yield surfaces), mechanisms including dislocation motion and strengthening mechanisms.	6.0							
Deformation response of non-crystalline materials including glasses and polymers including time-independent and time dependent responses.	6.0							
Creep and deformation mechanisms at elevated temperatures (including deformation mechanism maps)	3.0							
Fracture and toughening mechanisms including introduction to engineering methods such as LEFM and Weibull and fracture surface analysis.	6.0							
Fatigue basic mechanisms of damage, engineering approaches and fatigue resistant design.	3.0							
Case studies and design.	9.0							

Grades

Aspect	Percent
Final Exam	35%
Mid Term Exam	25%
Projects	25%
Homework	15%

Representative Textbooks and Other Course Materials

Title	Author
TBD	

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	a	An ability to apply knowledge of mathematics, science, and engineering.
**	b	An ability to design and conduct experiments, as well as to analyze and interpret data.
**	c	An ability to design a system, component, or process to meet desired needs.
**	d	An ability to function on multi-disciplinary teams.
**	e	An ability to identify, formulate, and solve engineering problems.
*	f	An understanding of professional and ethical responsibility.
*	g	An ability to communicate effectively.
*	h	The broad education necessary to understand the impact of engineering solutions in a global and societal context.
*	i	A recognition of the need for, and an ability to engage in life-long learning.
*	j	A knowledge of contemporary issues.

Course Contribution		College Outcome
***	k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

In separate lab course, will deal with instrumentation, deformation, fracture as well as time and size dependences in these phenomena. A design competition may also be included.

Prepared by: Glenn Daehn

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