MSE 3005 - MECHANICAL BEHAVIOR OF MATERIALS

{Fall 2005 - Lectures MWF 11:05-11:55 pm, Room 299 - LOVE}

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Learning Objective: To introduce the mechanical behavior of major classes of materials including metals, ceramics, polymers, and composites. The course will emphasize the correlation of monotonic and time-dependent deformation and fracture response and mechanical properties with fundamental concepts of atomic bonding, microstructure, and micromechanics of materials. Applications of mechanical behavior relevant to materials selection and design, processing by mechanical forming, and failure analysis will be described.

Texts: Deformation & Fracture Mechanics of Engineering Materials, by R.W. Hertzberg, 4th edition, 1996, Wiley and Sons.

References:
Mechanical Behavior of Materials (T. Courtney, 2nd ed., McGraw Hill, 2000)
Mechanical Behavior of Materials (Meyers & Chawla, Prentice-Hall, 1998)
Mechanical Metallurgy, 3rd Edition (Dieter, McGraw-Hill)
Introduction to Ceramics (Kingerey, Wiley Interscience)
Principles of Polymer Systems (Rodriquez)
Mechanical Properties of Composites (Chawla)

Grading:

Two Tests (Sep 26 and Nov 18)	15% each
Two Exams (I-Week of 10/8-10/20, and II - finals week)	30% each
Homeworks	10%

Homeworks: Homework will be given on a regular basis and will be due on the same day of the following week. All homework should be done in compliance with the student academic honor code.

Expectations: All students are expected to come to every class and be on time. Inform either of the instructors before-hand, if you will be out of town or are not feeling well.

Teaching Assistants: TO BE DETERMINED

STUDENTS ARE EXPECTED TO ABIDE BY THE GEORGIA TECH HONOR CODE AND AVOID ANY INSTANCES OF ACADEMIC MISCONDUCT

Tentative Course Schedule:

Topic No	TOPICS TO BE COVERED	INSTRUCTOR
1.	Introduction and Review of Static/Dynamics (2 lectures)	WSJ
2.	Tensile Response and Stress/strain relations (2 lectures)	NNT
3.	Theory of Elasticity and elastic properties (3 lectures)	NNT
4.	Dislocations and Plastic Deformation (4 lectures)	NNT
	LABOR DAY HOLIDAY (September 5)	
5.	Plastic Deformation by Slip and Twinning (1 lecture)	NNT
	FIRST TEST (Topics 1-5) Monday, September 26	**NNT**
6.	Strengthening Mechanisms (3 lectures)	NNT
7.	High Temperature Deformation – Creep (4 lectures)	NNT
8.	Microstructural Aspects of Fracture (3 lectures)	NNT
	MID-TERM RECESS (October 18)	
	EXAMINATION - I (2 hours, Topics 1-8) Week of 10/18-20	**NNT**
9.	Deformation behavior of polymers (2 lectures)	WSJ
10.	Composite Materials (4 lectures)	WSJ
11.	Fracture Mechanics Theories (3 lectures)	WSJ
12.	Engineering Aspects and Fracture Toughness Testing (2 lectures)	WSJ
	SECOND TEST (Topics 9-12) Friday, November 18	WSJ
13.	Transition Temperature phenomenon (1 lectures)	WSJ
14.	Environmental-assisted Cracking (1 lectures)	WSJ
15.	Cyclic Stress and Strain Controlled Fatigue (3 lectures	WSJ
16.	Fatigue Crack Growth and Predictions – (2 lectures)	WSJ
	THANKSGIVING HOLIDAY (November 26)	
17.	Analysis of Engineering Failures – Case Histores (3 lectures)	WSJ
	EXAMINATION – II (2 hours, Topics 9-17) Week of finals	**WSJ**