

# MASC/AME 551

## Mechanical Behavior of Engineering Materials

Fall Term 2012

Lectures: OHE 120 TTh 9:30-10:50

Professor: Professor A.M. Hodge  
Office: RTH 503  
Office Hours: MW 10:00-11:00am or by appointment

TA I-Chung Cheng, [ichungch@usc.edu](mailto:ichungch@usc.edu)  
RTH 522  
Office Hours: TTH 11-12:00pm or by appointment

There is no required textbook for this class. Further instructions will be given during the first day of class.

Supplemental Texts: (available at the eng. library for reference use)  
"Mechanical Behavior of Materials" Meyers and  
Chawla, Cambridge University Press; 2 edition (2008-2009)

"Mechanical Metallurgy", G.E. Dieter  
"Mechanical Behavior of Materials", T.H. Courtney  
"Deformation and Fracture of Engineering Materials", R.W.  
Herzberg

"Mechanical Behavior of Materials", McClintock and Argon  
"Fracture of Structural Materials", Tetelman and McEvily

"Introduction to Dislocations" D. Hull and D.J. Bacon 4<sup>th</sup> ed.  
Butterworth

Introductory Books: (available at the eng. library for reference use)

"Materials Science and Engineering"  
5<sup>th</sup> ed. William D. Callister

"Principles of Engineering Materials", Barrett, Nix  
and Tetelman

## Objectives:

This course focuses on the mechanical properties of materials. The lectures will emphasize stress and strain relationships how the macroscopic mechanical behavior is related to the structure and microstructure of the material. This course will discuss elementary dislocation theory and relate this to basic strengthening mechanisms. Physical and chemical mechanisms that alter the mechanical properties will be discussed. Crystalline metals and ceramics will be emphasized and polymers and non-crystalline materials will be discussed as well. Fatigue and fracture will also be discussed in terms of fundamental mechanisms.

## Grading:

Midterms (2)	50%
Presentations (1)	10%
Final Exam	40%

## MASC/AME 551 MECHANICAL PROPERTIES OF ENGINEERING MATERIALS

<u>WEEK</u>	<u>DATE</u>	<u>LECTURE TOPICS</u>
1	8/23 8/25	Introduction Elasticity I
2	8/30 9/1	Basic Plasticity True Stress and Strain
3	9/6 9/8	Dislocations intro Dislocation
4	9/13 9/15	Dislocations Strengthening mechanism
5	9/20 9/22	Strengthening mechanism Strengthening mechanism
6	9/27 9/29	Strengthening mechanism cont. Annealing
7	10/4 10/6	Annealing Introduction to steels

8	10/11 10/13	<b>EXAM #1*</b> Heat Treatment of Steels
9	10/18 10/20	Materials processing and characterization Testing techniques
10	10/25 10/27	Nano mechanics Presentations Part 1
11	11/1 11/3	Brittle Fracture Ductile Fracture
12	11/8 11/10	Fatigue Creep- Superplasticity
13	11/15 11/17	<b>EXAM #2*</b> Thin films mechanics
14	11/22 11/24	Presentations Part 2 HOLIDAY – no class
15	11/29 12/1	Porous materials mechanics Material Review
16	Thursday, Dec. 8	<b>FINAL EXAM</b> 11-1 PM

\*the tests dates are only tentative and can change during the semester