

University of California  
Department of Mechanical Engineering  
**Mechanical Behavior of Engineering Materials (ME108)**  
Fall 2019

**Course Content<sup>[1]</sup> and Labs<sup>[2]</sup>**

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**Part I**

Introduction (chapter 1)  
Microstructure and Deformation of Materials (chapter 2)  
Alloying and Hardening (chapter 3)  
Heat Treatment (class notes)  
Slip Planes, Dislocations, Twinning (class notes)  
Introduction to Mechanical Testing (chapter 4)  
Stress and Strain (chapter 5)  
Complex Stress/Strain States (chapter 6)  
Special topics on complex stress states (class notes)  
Yielding and Fracture Criteria (chapter 7)

**Part II**

Plastic Deformation (chapter 12)  
Ductile and Brittle Fracture (chapter 8)  
Fracture Mechanics (chapter 8, class notes)  
Fatigue, Stress-based Approach (chapter 9)  
Fatigue, Strain-based Approach (chapter 14, class notes)  
Cumulative Fatigue Damage (class notes)  
Notch Effects in Fatigue (chapter 10)  
Crack Growth (chapter 11)  
Time-dependent Deformation, Creep (chapter 15)

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<sup>[1]</sup>Chapters assigned for each topic are from the class text.

**Labs\***

Lab 1: Heat Treatment/Phase Diagrams and Indentation Hardness  
Lab 2: Deformation due to Monotonic Loading and Fracture Toughness  
Lab 3: Time- and Rate-Dependent Deformation  
Lab 4: Deformation due to Cyclic Loading  
Lab 5: Fatigue

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<sup>[2]</sup>Each lab is detailed in the lab text and is accompanied by representative results aimed to assist you in determining the validity of your tests.

\***Important note:** You must bring the signed Safety Form in your first lab appearance. If you do not have safety glasses and/or wear sandals, you will not be allowed to participate.