ME 56900
MECHANICAL BEHAVIOR OF MATERIALS

Course Outcomes
1. Understand fundamental mechanical behavior of engineering materials.
2. Understand fundamental response of engineering materials to load and environmental conditions.
3. Understand fundamental models that describe these responses.
4. Understand the integration of the models and the material behavior in design process.
5. Enhance product/component design for durability.

Review of Material Science & Strength of Materials (1 wk)
1. Structure
2. Heat treatment
3. Deformation mechanisms
4. Stress/strain
5. Principal stresses

Elastic/Plastic Behavior (2 wks)
1. Elastic response
2. Static failure
3. Plastic response
4. Residual stress

Fatigue (4 wks)
1. Stress based
2. Strain based
3. Stress concentration
4. Life prediction
5. Residual stress

Fracture (3 wks)
1. Brittle fracture
2. Brittle transition
3. Fracture mechanics
4. Stress intensity
5. Fracture toughness
6. Plane stress
7. Plane strain

Student Projects
1. Case studies
   a. Stress analysis
   b. Environment
   c. Material structure
   d. Redesign

Failure Analysis (1 wk)
1. Case studies
2. Methods
3. Redesign

Environment (1 wk)
1. Corrosion
2. High temp

Crack Propagation (3 wks)
1. Dynamic
2. Fatigue
3. Models
4. Life prediction

Revision Date: 6-19-2013
1. **COURSE NUMBER:** ME 56900 Mechanical Behavior of Materials

2. **CREDITS AND CONTACT HOURS:** 3 credits  
   a. Lecture – 3 days per week at 50 minutes for 16 weeks

3. **COURSE COORDINATOR OR INSTRUCTOR:**  
   T. Siegmund

4. **TEXTBOOK:**  

5. **SPECIFIC COURSE INFORMATION:**  
   a. **Catalog Description:** A study of how loading conditions and environmental conditions can influence the behavior of materials in service. Elastic and plastic behavior, fracture, fatigue, low and high temperature behavior. Introduction to fracture mechanics. Emphasis is on methods of treating these conditions in design. Typically offered in the spring.  
   b. **Prerequisites:**  
      MSE 23000 – Structure and Properties of Materials  
   c. **Status:**  
      Elective

6. **SPECIFIC GOALS FOR THE COURSE:**  
   a. **Course Outcomes:**  
      1. Understand fundamental *mechanical behavior of engineering materials*.  
      2. Understand fundamental response of engineering materials to *load* and *environmental conditions*.  
      3. Understand fundamental *models* that describe these responses.  
      4. Understand the *integration* of the *models* and the *material behavior* in design process.  
      5. Enhance *product/component design* for *durability*.  
   b. **Related ME Program Outcomes:**  
      A1. Engineering Fundamentals; B3. Prof/Ethical Responsibility;  
      A3. Experimental Skills; B5. Life-Long Learning;  
      A4. Modern Engr Tools; C1. Leadership;  
      A5. Design Skills; C2. Global Engineering Skills;  
      A6. Impact of Engr Solns; C3. Innovation;  
      B1. Communication Skills; C4. Entrepreneurship  
      B2. Teamwork Skills

7. **LIST OF TOPICS:** See following page.

**PREPARED BY:** T. Siegmund  
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