Fall 2015
Manufacturing Systems Engineering and Management
MSE 527 and MSE 527L - Mechanical Behavior of Materials (2+1 units)

A survey of relationships between mechanical behavior and materials structure. Elements of
creep, fracture, and fatigue of metals, ceramics, and composites. Introduction to applied
fracture mechanics and environmentally assisted cracking laboratory methods for evaluating
structural property relationships, fracture toughness measurements and failure analysis using
Scanning Electron Microscopy.

Textbook: R. W. Hertzberg, R. P. Vinci and J.L. Hertzberg, Deformation and Fracture

Instructor:  Dr. Behzad Bavarian
Dept. of Manufacturing Systems Engineering and Management
Office: JD3513, 818/677-3917
Email: bavarian@ecs.csun.edu
Office Hour: W 5:30-6:00 PM

Course Description: Class#14995
Prerequisites: MSE 227 and MSE 227L
Two hours of lectures and one 2.5 - hour laboratory per week, Design units: 1.0

The main techniques used in this course, center around the application of scientific principles
to real-life situations. Library research is necessary in order to develop and achieve most of
the topic discussions.
The course covers dislocation theory and plastic deformation in order to explain strengthening
mechanisms in different materials. Materials applications in elevated temperature are studied
to understand the design criteria for these applications.
Fundamental of fracture mechanics, microstructure aspects of fracture toughness, transition
temperature, environment-assisted cracking, and fatigue crack propagation is discussed to be
able to design based on the damage tolerant concept, and failure analysis using scanning
electron microscopy.
This course requires extensive design problems solving, technical presentation, and a term
paper on a current topic in materials application or design.

Time: Wed 18:00-19:45 PM, Room JD1504

Course Syllabus:

<table>
<thead>
<tr>
<th>Date</th>
<th>Subject</th>
<th>Homework</th>
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<tbody>
<tr>
<td>8/26</td>
<td>Introduction</td>
<td>1.35, 1.41, 1.54</td>
</tr>
<tr>
<td>9/2</td>
<td>Dislocation Theory</td>
<td>2.10, 2.18</td>
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<tr>
<td>9/9</td>
<td>Plastic Deformation</td>
<td>2.34, 2.35, 2.38</td>
</tr>
<tr>
<td>9/16</td>
<td>Strengthening Mechanisms</td>
<td>3.28, 3.29, 3.31</td>
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<tr>
<td>9/23</td>
<td>Time-Dependent Deformation</td>
<td>4.31, 4.34, 4.42</td>
</tr>
<tr>
<td>9/30</td>
<td>Deformation Map</td>
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Last day to drop: Friday, Sept. 11, 2015

Course Method and Expectations:
The main techniques to be used in this course, center on the application of scientific principles to real-life situations.
Library research is necessary in order to develop and achieve most of the topic discussions.

Grading Policy

<table>
<thead>
<tr>
<th></th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
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<tr>
<td>Mid-term Exam</td>
<td>35%</td>
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<tr>
<td>Term project</td>
<td>10%</td>
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<tr>
<td>Final Exam</td>
<td>45%</td>
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Grading System:

<table>
<thead>
<tr>
<th>Letter Grades</th>
<th>Grade Points</th>
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<tbody>
<tr>
<td>A Outstanding</td>
<td>4.0</td>
</tr>
<tr>
<td>B Excellent</td>
<td>3.0</td>
</tr>
<tr>
<td>C Acceptable</td>
<td>2.0</td>
</tr>
<tr>
<td>D Passing</td>
<td>1.0</td>
</tr>
<tr>
<td>F Failure</td>
<td>0.0</td>
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Plus/Minus Grading

References:
Course Objectives

1. This course will increase your ability to apply your knowledge of mathematics, chemistry, and physics in the mechanical behavior of materials and structural design.
2. This course will increase your ability to design structural components based on proper knowledge of materials properties, manufacturing processes and environmental effects.
3. This course will increase your ability to identify, formulate, and solve engineering problems and develop solutions that are competitive and economical.
4. This course will increase your ability to understand ethical responses and to address contemporary issues and civic responsibilities and to develop an involvement in the professional roles.
5. This course will increase your ability to design processes for manufacturing and influence designers for manufacturing.

Standard Operating Procedures

1. Class members are expected to maintain personal and professional standards consistent with the Code of Ethics of the National Society of Professional Engineers, the Preamble and Fundamental Canons of which are as follows:

   Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:
   - using their knowledge and skills for the enhancement of human welfare,
   - being honest and impartial, and serving with fidelity the public, their employers and clients;
   - striving to increase the competence and prestige of the engineering profession; and supporting the professional technical societies of their disciplines.

   Engineers shall:
   - hold paramount the safety, health and welfare of the public in the performance of their professional duties
   - perform services only in the areas of their competence
   - issue public statements only in an objective and truthful manner
   - act in professional matters for each employer or client as faithful agents or trustees, and avoid conflicts of interest
   - build their professional reputation on the merit of their services, and not compete unfairly with others
   - act in such a manner as to uphold and enhance the honor, integrity and dignity of the profession
   - continue their professional development throughout their careers and provide opportunities for the professional development of those engineers under their supervision

2. Class members are expected to submit original work except in joint projects in which the activities are cooperative and collaborative.

3. Class members are expected to attend class except when circumstances are outside the member’s control.
4. Class members are responsible for material in the reading assignments, class presentations, discussions, and homework examples.
5. Homework sets and project reports are due at the time requested
6. Class members are expected to be cooperative with other class members and to collaborate when appropriate with colleagues.
7. Class members are expected to participate in the oral presentations are required.
8. Class members are expected to comply with University regulation governing intellectual property, origin of work, and honesty. Failure to maintain these standards will result in student disciplinary action and a grade of F in the course.

**Formats for Work**

1. Homework problems should be submitted on engineering paper, written on one side, numbered, stapled, and identified by name and course number.

2. The format for the project design report is described in the MSE 227L laboratory manual found at [http://www.csun.edu/~bavarian/mse_227_lab.htm](http://www.csun.edu/~bavarian/mse_227_lab.htm).