<table>
<thead>
<tr>
<th><strong>Course</strong></th>
<th>ME 30400 – Mechanics and Materials Laboratory</th>
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<tr>
<td><strong>Type of Course</strong></td>
<td>Required for ME program</td>
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<tr>
<td><strong>Catalog Description</strong></td>
<td>Experimental determination of mechanical properties of selected engineering materials. Experimental verification of assumptions made in ME 252. Use of strain measuring devices. Design of experiments.</td>
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<tr>
<td><strong>Credits</strong></td>
<td>1</td>
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<tr>
<td><strong>Contact Hours</strong></td>
<td>3</td>
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<tr>
<td><strong>Prerequisite Courses</strong></td>
<td>ME 29300 and ME 30300</td>
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<td><strong>Corequisite Courses</strong></td>
<td>None</td>
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<td><strong>Prerequisites by Topics</strong></td>
<td>Sensors, devices, experiments, methods for recording, interpretation and presentation of experimental results, design of experiments, Crystal structure, imperfection in solids, mechanical properties of metals, dislocation and strengthening, failure, phase diagrams and transformations, metal alloys</td>
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<td><strong>Course Objectives</strong></td>
<td>Teach students with the Design of Experiments (DOE), and introduce the experiments for stress-strain diagrams of different materials, measurement of modulus of elasticity and the Poisson’s ratio, relationships of beam deflections with torsional or transverse load and geometries, stress concentration factors, determination of Brinell and Rockwell hardness numbers, fracture resistance of materials, principal strains and stress, constant stress beams, strain hardening, stress distribution in thin cylinder.</td>
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<td><strong>Course Outcomes</strong></td>
<td>Students who successfully complete this course will have demonstrated an ability to: 1. Use strain measuring devices to determine mechanical properties of engineering materials. (a, b, k)</td>
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2. Use commercial engineering test equipment to determine mechanical properties of engineering materials. (a, b, k)
   a. Tinus Olsen Tensile Test Machine
   b. Brinell Hardness Tester
   c. Rockwell Hardness Tester
   d. Charpy Impact Tester
   e. Creep Test Machine

3. Experimentally verify the assumptions made in the study of Mechanics of Materials. (a, b)

4. Write formal technical report and convey engineering message efficiently. (g)

5. Work in teams to perform experimental tasks. (g, k)

6. Design experiments to solve engineering problems. (b)

Laboratory Topics

1. Safety procedures, general instructions, and lectures about labs
2. Tensile testing
3. Modulus of elasticity-flextural and Poisson’s ratio
4. Bending test
5. Strain hardening
6. Torsion test
7. Cantilever flexural and Stress and strain concentrations
8. Temperature effect on impact toughness
9. Constant stress beam and Principle strains and stresses
10. Combined loading/pressure vessels
11. Design of experiments

Computer Usage

Low

Laboratory Experience

High

Design Experience

Medium

Coordinator

Zhuming Bi, Ph.D.

Date

30 September 2015