Course Number: MECH 3130  
Course Title: Mechanics of Materials  
Credit Hours: 4 credit hours (3 Lec + 1 lab)  
Pre-Requisites: MATL 2100, MECH 2110, MATH 2650, MATH 2660  
Lecture Schedule: Tue, Thu, 12:30 – 1:45 pm (75 minutes) in AE 155

Instructor  
Dr. Hareesh Tippur, Professor, Dept of Mechanical Engineering, Rm 262 – Ross Hall  
Phone: 844-3327, e-mail: htippur@eng.auburn.edu  
Office Hours: T, R 10-11 am  
Course Web-Site: http://www.eng.auburn.edu/users/htippur (look for Mechanics of Materials link)

Teaching Assistants  
Rahul Jahver, ( jhavera@auburn.edu ), 4-3464, Office Hours: TBA, Office Location: Shop Bldg SB310  
Darshan Shinde ( shindda@auburn.edu ), 4.7123, Office Hours: TBA, Office Location: Wimore M103

Course Objectives  
1. To provide students with a mathematical and physical understanding of the concepts of stresses, strains, and deformations. (Program Outcome (P. O.) 1, 2).  
2. To teach students stress, strain, and deformation analysis of mechanical members subjected to pure axial loading, torsion, flexure, and combined loading of these situations. (P. O. 1, 2)  
3. To translate stress analysis concepts to mechanical design under static loading situations. (P. O. 1)  
4. To provide hands-on experience in instrumentation, measurements and computer simulations related to stress analysis of mechanical members. (P. O. 5, 6, 7)

Textbook  
• A laboratory manual (part-I & -II available at Ramsay Copy Center is to be purchased prior to first laboratory meeting).

Course Outline  
stress – normal stress, shear stress; strain – normal and shear strains; stress-strain relations – Hooke’s Law; axial loading, stress concentration; torsion of circular sections; bending of beams – bending moment and shear force diagrams; combined loading and pressure vessels; transformation of stresses – principal stresses; failure theories; beam deflection analysis; buckling of columns, strain energy.

Tentative Text Coverage‡:  
Stress: Chapter-1 (sections 1.1-1.6) (2 classes)  
Strain: Chapter-2 (section 2.1-2.2) (2 classes)  
Stress-Strain Relations: Chapter-3 (sections 3.1-3.4, 3.6-3.7) (1 classes)  
Axial Loading, Temperature Effects, Stress Concentration: Chapter-4 (sections 4.1-4.7) (3 classes)  
Torsion of Circular Sections: Chapter-5 (sections 5.1-5.5) (3 classes)  
Bending Stresses in Beams: Chapter-6 (sections 6.1 – discontinuity functions – 12.3, 6.3, 6.4) (3 classes)  
Shear Stresses in Beams: Chapter-7 (sections 7.1-7.3) (1 classes)  
Deflection of Beams: Chapter-12 (sections 12.1-12.2, 12.7-using discontinuity functions) (3 classes)  
Combined Loading and Pressure Vessels: Chapter-8 (8.1-8.2) (2 classes)  
Stress and Strain Transformations, Mohr’s Circle: Chapters 9, 10 (sections 9.1-9.5, 10.1-10.2) (3 classes)  
Failure Theories: Chapter 10 (section 10.7) (2 classes)  
Buckling of Columns: Chapter-13 (sections 13.1-13.3) (2 classes)  
Strain Energy: Chapter-14 (sections 14.1-14.2) (1 classes)  
Exams: (2 classes)

‡ based on March 2002 syllabus revision approved by ME Department.
### Laboratory Component (Labs Meet in Shop Building Room 221 and 308)

Section-1 Thursday 2-4:30 pm  
Section-2 Thursday 5-7:30 pm  
Section-3 Friday 5-7:30 pm  
Section-4 Friday 2-4:30 pm

### Tentative Laboratory Schedule

<table>
<thead>
<tr>
<th>Week #</th>
<th>Monday’s Date</th>
<th>Laboratory Topic</th>
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<tbody>
<tr>
<td>1.</td>
<td>January 8</td>
<td>No Lab</td>
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<tr>
<td>2.</td>
<td>January 15</td>
<td>Lab-1 Cetroids &amp; Moment of Inertia</td>
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<td>3.</td>
<td>January 22</td>
<td>Lab-2 Strain Gage Mounting &amp; Measurements</td>
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<td>4.</td>
<td>January 29</td>
<td>Lab-3 Uniaxial Testing, Material Properties</td>
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<td>5.</td>
<td>February 5</td>
<td>Lab-4 Torsion Testing, Shear Modulus</td>
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<td>6.</td>
<td>February 12</td>
<td>Lab-5 Stresses &amp; Strain in Beams</td>
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<td>7.</td>
<td>February 19</td>
<td>Lab-6 Photoelastic Analysis Stresses in Beams</td>
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<td>8.</td>
<td>February 26</td>
<td>Lab-7 Beam Deflection Measurement</td>
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<td>9.</td>
<td>March 5</td>
<td>Lab-8 Introduction to FEA</td>
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<td>10.</td>
<td>March 12</td>
<td>Lab-9 FEA of a Truss</td>
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<td>11.</td>
<td>March 19</td>
<td>Lab-10 FEA of Beams</td>
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<td>12.</td>
<td>March 26</td>
<td><strong>Spring Break</strong></td>
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<td>13.</td>
<td>April 2</td>
<td>Lab-11 FEA of Beams</td>
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<td>14.</td>
<td>April 9</td>
<td>Lab-12 FEA of 2-D Components</td>
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<td>15.</td>
<td>April 16</td>
<td>Lab-13 FEA of 2-D Components &amp; Stress Concentration</td>
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<td>16.</td>
<td>April 23</td>
<td>No lab / Review</td>
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### General Rules Pertaining to Labs and Lab Reports

1. Laboratory Reports are due on the following laboratory period. Late submissions are strongly discouraged and penalized.
2. The reports are to be prepared according to the prescribed format described in the laboratory manual.

### Course Evaluation

- **30%** - Mid-term exams (2 exams, to be announced)
- **20%** - Quizzes (6-8 unannounced quizzes; includes 1 pre-requisites quiz)
- **30%** - Final exam
- **20%** - Lab Reports (Report format can be found in the laboratory manual)
- **0%** - Home works (list of homework problems can be found at the class web-site; students are expected to solve the assigned problems following each class)

### Grading Policy

- Above Class Average: **A, B**  
- Below Class Average: **C, D, F**

### Attendance

Class attendance is expected but not recorded. It will be assumed that information disseminated in class has been received by all students. Laboratory attendance is expected, will be recorded, and will be reflected in grading and evaluation. Late submission of assigned work or make-up examinations will be allowed only if accompanied by an approved University excuse.

### Accessibility

The policy of Auburn University is to provide accessibility to its programs and activities, and reasonable accommodation for persons defined as having a disability under Section 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act of 1990. Students needing special accommodations should see the instructor as soon as possible, or contact the Students with Disabilities Program office at (334) 844-5943 (Voice/TT).

### Academic Honesty

All portions of the Auburn University Student Academic Honesty Code, as found in the *Tiger Cub* and defined in the SGA Code of Laws, Title XII, will apply in this class.