

**MECH-212: Mechanics II**  
**Summer Term 2001**

**2001 catalog data:** Credit: 4 (4-0-4)  
Prerequisites: MECH-210 Mechanics I

The fundamental topics of this course include: normal and shear stress and strain, Hooke's law, Poisson's ratio, generalized Hooke's law, axial translation, torsion of circular bars, angle of twist, bending of beams, flexure formula, flexural shear stress, beam deflections, combined stresses, transformation of stresses, Mohr's circle, statically indeterminate problems, columns. The use of basic computational tools will be introduced at the end of several lecture modules including: axial loading, torsional loading, and flexural loading. Homework and design projects will be assigned.

**Textbook(s):** Mechanics of Materials by Beer and Johnston, 2<sup>nd</sup> Ed., McGraw-Hill

**References:**

**Coordinator:** Jacqueline El-Sayed

**Course learning objectives and outcomes:**

*Objective 1: Model elastic deformable body structures for stress, strain and deformation analysis [ME PEO's 1,3,4]*

- 1.1 Given the drawing or sketch of a structure, students will be able to determine the stresses, strains, and deformation present throughout the structure.

*Objective 2: Analyze deformable body structures under loading [ME PEO's 1,2,3]*

- 2.1 The students will be able to analyze deformable structures under the following types of loading : axial, torsional, flexural, transverse, buckling, and combined.

*Objective 3: Perform transformation of stress and strain [ME PEO's 1,2,3]*

- 3.1 The student will be able to use Mohr's circle for plane stress to find the principal planes, stresses and strains, as well as the stresses and strains at an angle.  
3.2 The student will be able to use Mohr's circle for plane strain to find the principal planes, and strains.

*Objective 4: Apply computational tools to analyze structures. [ME PEO's 1,2,3]*

- 4.1 The student will be able to use computational tools to find the stress, strain and deformation present in structures.

**Prerequisites by topic:**

1. Rigid body equilibrium and free body diagrams
2. Centroids, Center of Gravity
3. Internal forces in structural members
4. Moments of inertia
5. Basic computer skills

**Topic covered:**

<b>Week</b>	<b>Topic</b>
1	Introduction Review of Stress and Strain- Axial Loading Hooke's Law, Poisson's Ratio, Shearing Strain, Stress Concentrations
2	Axial Loading Statically Indeterminate Problems FEM –Axial loading application
3	Torsion-Stresses in Elastic Range Angle of Twist, Statically Indeterminate Shafts, FEM application
4	Pure Bending Stresses in Elastic Range, Stress Concentrations
5	Statically Indeterminate Problems, FEM applicaiton
6	Transverse Loading
7	Transformation of Stress and Strain - Mohr's Circle for Plane Stress
8	Analysis of Strain, Mohr's Circle for Plane Strain Strain Rosette
9	Design of Beams and Shafts for Strength
10	Deflection of Beams by Integration, Statically Indeterminate problems
11	Euler's Column Formula Course Review

**Schedule:** *Two sessions per week of 120 minutes*

**Computer usage:** Basic Computer Skills (MathCAD/Working Model/Excel/MS-Word/or equivalent program)

**Laboratory projects:** One or two analysis projects.

**Relationship to professional component:**

Four credits of Engineering Science.

**Prepared by:** Jacqueline El-Sayed, Assistant Professor of Mechanical Engineering

Date: 7/19/2000