

## ME 276 - Stress Analysis

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**Hour:** Lecture: 2 Hrs.

Tutorial: 2 Hrs.

Credit: 3.

**Coordinator:** Mostafa Rostom

### **Text Book:**

- Beer and Johnson "Mechanics of Materials", McGraw Hill, 1992, 2<sup>nd</sup> edition.
- Benham, Crawford and Armstrong "Mechanics of Engineering Materials", Prentice Hall, 1996, 1<sup>st</sup> edition.

### **Reference Books:**

- West "Fundamentals of Structural Analysis" John Wiley and Sons, 1993, 1st edition.
- Gere and Timoshenko "Mechanics of Materials ", PWS. Publisher, 1997, 4th edition.
- Muvadi and McNabb "Engineering Mechanics of Materials", Macmillan Pr., 1984, 2nd edition.
- Hibbeler "Mechanics of Materials", Prentice Hall, 2007, 7th edition.

### **Specific course information**

- a. Concept of stress and strain, Normal stresses and strains, shearing stresses and bearing stresses, Stresses due to torsion, Normal forces, shearing forces and bending moments in beams, Stresses due to bending, Stress and strain transformations, Thin and thick walled cylinders, Stress concentration, Experimental stress analysis, Deflection and buckling of beams and columns
- b. Prerequisite: ME 274
- c. Designation: Required

### **Specific goals for the course:**

- Design and conduct experiments, and collect, analyze and interpret data.
- Design a system, process, or component to meet desired needs subject to given constraints. Analyze and evaluate alternative solutions.
- Identify, formulate, and solve engineering problems. Make appropriate and necessary assumptions. Suggest and evaluate new approaches.
- Ability to visualize the impact of the Mechanical technological development on the environment

### **Course instruction outcomes:**

- The students will be able to calculate normal forces, shearing forces and bending moments in members subjected to various types of loadings.
- The students will be able to determine different types of stresses in different members and to calculate the deflection and buckling of beams and columns.

**Student outcomes:**

B, C, E

**Topics Covered:**

- Introduction to the concept of stress and strain: Normal stresses and strains.
- Shear stresses, shearing strains and bearing stresses.
- Shear stresses and deformations due to torsion.
- Normal forces, shearing forces and bending moments in beams.
- Stresses due to bending.
- Stress and strain transformations: Introduction.
- Stress and strain transformations: Principal stresses and planes and Mohr's circle of stress
- Maximum shear stress, yield criteria, analysis of strain.
- Analysis of stresses in thin walled and thick walled pressure cylinders.
- Stress concentration in machine elements.
- Experimental stress analysis: strain gauges.
- Deflection due to bending: Double integration
- Deflection due to bending: Strain energy and Castigliano's method.
- Buckling of columns: Euler equation.
- Buckling of columns: Eccentric loading of slender columns.

Course / credit hours	Math & Basic Sciences	Engineering Topics	General Education
Stress analysis(ME276)/3		3	