

**ME 276 – Stress Analysis**

CR: 3. Prerequisite: ME 274

Concept of stress and strain, Normal stresses and strains, shearing stresses and bearing stresses, Stresses due to torsion, Normal forces, and 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.

**ME276 - Stress Analysis****COURSE INFORMATION:**

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Course Title: Stress Analysis

Code: ME 276

Hours: Lecture: 2 Tutorial: 2 Credit: 3

Prerequisites: ME 274

**GRADING:**

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Class Performance/Attendance	10%
Midterm# 1/Assignments: (7 <sup>th</sup> week)	30%
Midterm# 2/Assignments: (12 <sup>th</sup> week)	20%
Final Exam	40%

**COURSE DESCRIPTION:**

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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.

**TEXT BOOKS:**

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- Beer and Johnson "Mechanics of Materials", MC Graw 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:**

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- West "Fundamentals of Structural Analysis" John Wiley and Sons, 1993, 1<sup>st</sup> edition.
- Gere and Timoshenko "Mechanics of Materials ", PWS. Publisher, 1997, 4<sup>th</sup> edition.

- Muvadi and McNabb "Engineering Mechanics of Materials", Macmillan Pr., 1984, 2<sup>nd</sup> edition.
- Hibbeler "Mechanics of Materials", Prentice Hall, 2007, 7<sup>th</sup> edition.

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**COURSE AIM:**

To present the advanced concepts and modern techniques of stress and strain analysis with applications to various mechanical components and structures and to introduce the students to the modern experimental techniques in stress analysis.

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**COURSE OBJECTIVES:**

To develop ability to calculate normal forces, shearing forces and bending moments in members subjected to various types of loadings. The course enables the students to determine different types of stresses in different members and to calculate the deflection and buckling of beams and columns.

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**COURSE OUTLINE:**

*Week No.1:* Introduction to the concept of stress and strain: Normal stresses and strains.

*Week No.2:* Shear stresses, shearing strains and bearing stresses.

*Week No.3:* Shear stresses and deformations due to torsion.

*Week No.4:* Normal forces, shearing forces and bending moments in beams.

*Week No.5:* Stresses due to bending.

*Week No.6:* Stress and strain transformations: Introduction.

*Week No.7:* Stress and strain transformations: Principal stresses and planes and Mohr's circle of stress - Quiz

*Week No.8:* Maximum shear stress, yield criteria, analysis of strain.

*Week No.9:* Analysis of stresses in thin walled and thick walled pressure cylinders.

*Week No.10:* Stress concentration in machine elements.

*Week No.11:* Experimental stress analysis: strain gauges.

*Week No.12:* Deflection due to bending: Double integration - Quiz

*Week No.13:* Deflection due to bending: Strain energy and Castigliano's method.

*Week No.14:* Buckling of columns: Euler equation.

*Week No.15:* Buckling of columns: Eccentric loading of slender columns.

*Week No.16:* Final Exam

