

<b>Semester:</b>	3				
<b>Course Code:</b>	CE2080				
<b>Course Name:</b>	Mechanics of Materials				
<b>Credit Value:</b>	3 (Notional hours: 150)				
<b>Pre-requisites:</b>	CE1010				
<b>Core/Optional</b>	Core				
<b>Hourly Breakdown</b>	Lecture hrs.	Tutorial hrs.	Practical class hrs.	Assignment hrs	Independent Learning & Assessment hrs.
	32	-	-	26	92

**Course Aim:** To introduce the fundamental concepts of mechanics of materials to provide basic approaches for analysis of various types of structural members subjected to different loadings and their combinations.

**Intended Learning Outcomes:**

On successful completion of the course, the students should be able to;

- **identify** different structural elements along with corresponding boundary conditions and loading.
- **apply** the fundamental concepts of equilibrium, compatibility and constitutive relationships in deriving the governing differential equations.
- **evaluate** internal resultant forces, stresses, strains and displacements for designing of the members.
- **analyze** the state of stress and strain in 2D plane stress and plane strain conditions.

**Course Content:**

- **Introduction & review**
- **Torsion of a circular member:** Derivation of torsion formula and its applications; non-uniform torsion; stresses and strains in pure shear; analysis of statically indeterminate torsional members.
- **Review of symmetrical bending of prismatic beams:** Analysis of statically determinate beam structures; Geometrical characteristics of cross sections; Euler- Bernoulli beam theory and its applications; doubly symmetric beams with inclined loads (bi-directional bending of beam)
- **Design of beams for bending:** Allowable stress design principle, Inelastic bending of beams
- **Analysis of composite beams:** The method of transformation of section
- **Deflection of beams:** Derive the governing differential equation of beam bending; deflection of statically determinate beams by solving the governing differential equation in closed form, moment-area theorems of Mohr; statically indeterminate beam analysis.
- **Shear stress in beams of different sections:** shear formula; built-up beams and shear flow.

<ul style="list-style-type: none"> <li>➤ <b>Bending of beams with unsymmetrical sections:</b> The shear-center concept; shear stresses in beams of thin-walled open cross sections.</li> <li>➤ <b>Analysis of stress and strain:</b> Plane stress and plane strain concepts; Transformation of 2-D stress and strain; Hooke's law for plane stress;</li> <li>➤ <b>Introduction to 3D stress strain relationship;</b> Introduction to failure criteria</li> <li>➤ <b>Applications of plane stress:</b> Pressure vessels, beams under combined loadings.</li> <li>➤ <b>Eccentric loading in a short column and buckling of a slender column</b></li> </ul>			
<p><b>Teaching /Learning Methods:</b> Lectures, Laboratory classes, group studies, presentations</p>			
<p><b>Assessment Strategy:</b> Assignments/quizzes, Mid semester examination, End semester examination</p>			
<p>Continuous Assessment 50%</p>		<p>Final Assessment 50%</p>	
<p>Details: Quizzes/assignments 25% Mid Semester Examination 25%</p>		<p>Theory (%)  50%</p>	<p>Practical (%)  </p>
<p><b>Recommended Reading:</b></p> <ul style="list-style-type: none"> <li>➤ Gere, JM and Goodno, BJ 2009, Mechanics of Materials, 7<sup>th</sup> edition, Cengage Learning</li> <li>➤ Hibbeler, RC 2014, Mechanics of Materials, 9th edition, Prentice Hall, London.</li> <li>➤ Timoshenko, SP and Young, DH 2011, Elements of Strength of Materials, 5th edition, East-West Press. <ul style="list-style-type: none"> <li>○ Timoshenko, SP 2002, Strength of Materials Part 1 and 2, 3rd edition, CBS Publisher.</li> </ul> </li> </ul>			