

Course Code	Name of Course	L	T	P	Credit
MCR 13101	Mechanical Engineering I	3	1	0	11

Course Objective
<ul style="list-style-type: none"> <li>Basic understanding of mechanics of material's behaviour under external loadings</li> <li>To understand the elastic problem including stress/strain and various mathematical formulation.</li> <li>To introduce theory of Machines and certain related applications.</li> </ul>
Learning Outcomes
<p>Upon successful completion of this course, students will:</p> <ul style="list-style-type: none"> <li>be able to design different machine parts based on strength of materials.</li> <li>be able to understand basic principles of operation of various machine parts such as, gears, governors, flywheel, etc.</li> </ul>

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	The principles and basic concepts of mechanics of materials	1	Understanding basics of strength of material.
2	Stress strain behavior of engineering materials	2	Understanding material property and characterization
3	Concept of stress and strain field <ul style="list-style-type: none"> <li>Stress –strain transformation</li> <li>Mohr's circle representation for plane stress and plane strain</li> <li>Thermal stresses and strain</li> <li>Volumetric stress and strain</li> </ul>	7	This unit is focused on detail analysis of stress-strain developed in material body of generic nature.
4	Stresses in pressure vessels: thin and thick cylinders	3	The students will be able to design a pressure vessel mostly used in industry
5	Beam Analysis: analysis of simple bending, deflection in beams, stresses in beam	7	This unit is focused on beam analysis, which is useful for structural design
6	Torsion of a circular members and thin walled tubes.	3	The students will understand the basics for shaft design
7	Introduction to theory of Machines: degrees of freedom, kinematic constrains, linkages, mechanisms.	3	The students will understand the basics of mechanisms and machines
8	Different types of gears, gear trains, reduction ratio, torque assessment and application of gearboxes.	5	The students will be able to select a proper gear type and gear ratio in certain applications
9	Basic principles and constructions of governors, flywheels, brakes, clutches and dynamometers.	5	The students will learn the basics of key control mechanisms
10	Case study based on laboratory setups on the above broad areas.	3	The students will increase technical competency on material behaviour and machine dynamics

Total lecture Hour (excl. tutorial)

39

#### Text Books:

1. Mechanics of Materials, James M. Gere, 6th Edition, McGraw –Hill
2. Theory of Machines and Mechanisms, SI Edition, 2014, J. E. Shigley, J. J. Wicker, McGraw hill

#### Reference Books:

1. Engineering Mechanics of solids, Eger P. Popov, Pearson Education, 2<sup>nd</sup> Edition, 2015.
2. Elements of strength of Materials by S.P. Timoshenko & D.H. Young, 5<sup>th</sup> Edition, 2003
3. Kinematics and Dynamics of Planar Machinery, Burton Paul, Prentice Hall Inc. 1979.
4. Theory of Machines, W. G. Green, 2nd Edition, 1964.