Devi Ahilya Vishwavidhyalaya, Indore, India Institute of Engineering & Technology					II Year B. Tech. (Mechanical Engineering) Full Time
Course Code & Name	**Instructions Hours per Semester and Credits**				
3RMPC1 **STRENGTH OF MATERIALS**	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**		
	30	**10**	**20**	**60**	**120**	**4**

Course Learning Objectives:

1. To provide the knowledge of Strength/Load Bearing capacity of Different Materials
2. To develop the Idea for drawing Shear Force and Bending Moment Diagram under Different type of Loading
3. To give basic concepts of different types of stresses & strain/ Mechanics of Material.
4. To develop skill to analyze the distribution of stresses in material.
5. To know how to find the Torsional stresses and Beam strength of column.

Pre requisite(s): Engineering Physics, Engineering Mathematics

COURSE CONTENTS

UNIT-I

Stress and strain: Tensile, compressive and shear stresses, complimentary shear stresses with varying cross section, Temperature stresses, Modulus of Elasticity. Modulus of rigidity, Bulk modulus, Poisson's ratio, Relations between the three moduli, Stress on oblique Section of a bar subjected to axial stress, Compound stresses, Principle stresses & strain, Mohr's circle of stresses and strain.

Elastic strain energy, Different type of loading, Resilience, Proof resilience, Strain energy in Tensile, Static, Sudden falling, gradually applied and Impact loading. Strain energy due to shear stresses.

UNIT-II

Shear force and Bending moment of Beams: Beams, Classification of beams, Types of loading, span, Shear force and Bending moment, Relation between load, shear force and bending moment, shear force and bending moment diagram for cantilever and simply supported beam with concentrated load, Point load, uniformly distributed load, gradually varying load, Eccentric point load.

UNIT-III

Bending stresses & Deflection of Beams: Introduction, Pure Bending ,Simple Bending theory, Expression for Bending Stress, Moment of inertia of section, Bending Stresses in Symmetrical Section, Shearing stresses in Beams, Distribution of shearing stress in different sections.

Slope & Deflection of Beam subjected to Uniform Bending Moment, Relation between Slope, Deflection and Radius of Curvature, Deflection of simply supported beam carrying a point load and

uniform distributed load, Macaulay's Method and Moment Area Method for finding out deflection of beam.

UNIT-IV

Torsion of Circular shaft: Introduction, Pure Torsion, Torsional stress & strain in circular shafts, Polar moment of Inertia, Torsional moment of resistance, Torsion equation of circular shaft, Power transmitted by shaft, composite shaft, Strength of shaft, Torsional shear stress in shaft, Shaft of varying section.

UNIT-V

Columns & Struts: Introduction, Classification of column, Failure of column Euler's theory for column, End conditions of column and struts, Equivalent length of column, Calculation of equivalent length for different end conditions of column, Slenderness ratio, limitations of Euler's formula, Rankin's formula for long column and eccentric loading. Formula for Indian standard code of practice.

BOOKS RECOMMENDED:

[1] Warnock Ramamurtham, *Strength of Materials,* 16/e ,Dhanpat Rai Publications, 2011

[2] Bansal R K, *Strength of Materials,*4/e,Laxmi Publications(P) Ltd,2012

[3] Popov *Mechanics of Solids,*2/e, Pearson Education (India), 1998

[4] Timoshenko, *Elements of Strength of Materials,* 3/e,Wadsworth Publishing;2004

LIST OF PRACTICAL ASSIGNMENT

1. Performance of Tensile test to obtained tensile properties of the material.
2. Performance of Tensile test to obtained Stress-Strain curve for Different Material.
3. Performance of Compressive test to obtained Compressive properties of the material.
4. Performance of Shear test to obtained Shear properties of the material.
5. Performance of Bending test to obtained Bending properties of the material.
6. Performance of Brinell hardness Test.
7. Performance of Vickers Hardness Test.
8. Performance of Torsion test to obtained torsional properties of the material.
9. Performance of Torsion test to obtained T-θ Curve.
10. Performance of Impact test to obtained Impact Strength of the materials.

Course Out Come (CO)	After completion of the course, students will be able to:
CO1	To know the how to find out the stress on a material under different type of Loading, Relationship with Elastic Module, Principal Stress & Strain, Strain Energy
CO2	Draw the shear Force and Bending Moment under different type of Loading in different type of Beams
CO3	Find out the Stress & Deflection in a Beam under different Loading Condition by using Bending Equation & Macaulay's Theorem
CO4	Derive the Torsion Equation for Single Shaft & Multiple Shaft, can find different Mechanical Propertied generated in Helical Spring under Torsion.
C05	Find out the Crippling Load in as Column under different End Condition, Can derive the relationship between Eulers and Rankine Formula for Crippling Load.

CO-PO-PSO Relationship

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	0	0	0	0	0	0	2	2	0
CO2	3	3	3	3	2	0	0	0	0	0	0	2	2	0
CO3	3	3	3	3	2	0	0	0	0	0	0	2	2	1
CO4	3	2	2	2	2	2	0	0	0	0	0	2	0	1
CO5	3	2	2	2	2	2	2	0	0	0	0	2	0	1