

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II Year B.E. (Civil Engg.) (Full Time)			
Subject Code & Name	Instructions Hours per Week			Credits			
	L	T	P	L	T	P	Total
VLR3C2:Applied Mechanics And Strength of Material	3	1	2	3	1	1	5
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- 1 . To provide the fundamentals of the elastic behavior of the engineering materials.
- 2 . To provide the knowledge of Strength/Load Bearing capacity of Different Materials.
- 3 . To give basic concepts of different types of stresses & strain.
- 4 . To Understand the applications of stress and strain in engineering field.
- 5 . To understand the geometrical properties of sections.
- 6 . To Analyze Pin Jointed Frames analytically and graphically.

Pre requisites: Engineering Physics, Engineering Mathematics

COURSE CONTENTS

Unit I: Geometrical Properties of Sections

Centroid: Definition of centroid and Centre of gravity – Centroid of regular geometrical figures, Centroid of symmetric and anti-symmetric practical Sections, Built up structural sections- Numerical problems.

Moment of Inertia: Definition and notation of Moment of Inertia, Polar moment of inertia, Radius of gyration, Parallel and perpendicular axes theorems; M.I. of regular geometrical plane sections, MI of symmetric, asymmetric, and built up sections.

Unit II: Analysis of Trusses

Determinate and indeterminate frames, Classification of frames, Perfect and imperfect frames, Deficient and redundant frames, Assumptions, Analysis of statically determinate pin-jointed frames method of joints, method of section and Graphical method.

Virtual work: Concept and principle of virtual work, application of virtual work for problems on beam.

Unit III: Simple Stress and Strain

Mechanical properties of materials: strength, stiffness, elasticity, plasticity, toughness, hardness, ductility etc.

Normal stress and shear stress, Normal strain and shear strain, Hooke's law, Poisson's, Deformation of axially loaded bars of constant and varying section, Principle of superposition. Composite sections, Elastic constants, Relationship between elastic constants, Temperature stresses.

Unit IV: Principal Stresses and Principal Strains

Principal Planes. Principal Stress. Stresses on an Oblique Section of a Body subjected to a Direct Stress in One direction and Two Mutually Perpendicular Directions. Stresses on an Oblique Section of a Body subjected to a Simple Shear Stress. Stresses on an Oblique Section of a Body Subjected to a Direct Stress in One Plane and Two Mutually Perpendicular Directions accompanied by a simple shear Stress. Mohr's circle of stress.

Unit V: Strain Energy

Resilience and Proof Resilience, Modulus of resilience, Strain Energy in Materials subjected to gradually applied load, suddenly applied load, impact load, strain energy stored in a body of varying section, strain energy stored in a body due to shear, Castigliano's theorem, Maxwell reciprocal theorem

Learning Outcomes:

Upon Completing the Course, Student will able to:

1. Learn behavior of different material under different types of loading.
2. To understand the basic concepts of Principal Stress & Strain.
3. Learn basic fundamentals used in Designing a structural Component.

Books recommended:

1. R.K. Rajput, strength of materials
1. Nash; Strength of Materials (Schaum), TMH.
2. Rattan SS; strength of Materials; TMH
3. Negi; Strength of materials; TMH
4. Surendra Singh; Strength of Materials,
5. Ramamrutham; Strength of Materials,
6. Subramaniam; Strength of Materials; R; Oxford

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 Impact test to obtained Impact Strength of the materials.