

**GOVERNMENT POLYTECHNIC, MALKANGIRI**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

**LESSON PLAN**

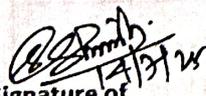
Discipline: Mechanical Engineering	Semester: 4th 3rd	Name of the Teaching Faculty: SHARMILA SABAR
Subject: STRENGTH OF MATERIALS	No. of days/week class allotted 3	Semester From date:14.07.2025 To date:15.11.2025 No. of Week: 15
PRE-REQUISITE	ENGG MECHANICS	
Course Outcomes	<p>Apply the concept of Simple Stresses and Strains.</p> <ul style="list-style-type: none"> <li>Describe the concept of Strain Energy.</li> <li>Define the concept of Shear Force and Bending Moment Diagrams.</li> <li>Apply the concept of Theory of Simple Bending and Deflection of Beams.</li> <li>Outline the concept of Torsion in Shafts and Springs.</li> <li>Illustrate the concept of Thin Cylindrical Shells.</li> </ul>	
Week	Class Day	Theory/Practical Topics
1st	1st	Simple Stresses and Strains:Introduction
	2nd	Types of forces; Stress, Strain and their nature
	3rd	Mechanical properties of common engineering materials;
2nd	1st	Significance of various points on stress – strain diagram for M.S. and C.I. specimens
	2nd	Significance of factor of safety; Relation between elastic constants
	3rd	Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces
3rd	1st	Strain Energy: Strain energy or resilience, proof resilience and modulus of resilience;
	2nd	derivation of strain energy for the following cases: i) Gradually applied load;
	3rd	derivation of strain energy for the following cases: ii) Suddenly applied load,
4th	1st	iii) Impact/ shock load; Related numerical problems.
	2nd	Shear Force & Bending Moment Diagrams: Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam, d) Continuous beam, e) Fixed beam; Types of Loads – Point load, UDL and UVL
	3rd	Definition and explanation of shear force and bending moment
5th	1st	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases: a) Cantilever with point loads
	2nd	b) Cantilever with uniformly distributed load
	3rd	c) Simply supported beam with point loads,
6th	1st	d) Simply supported beam with UDL
	2nd	e) Over hanging beam with point loads, at the centre and at free ends
	3rd	f) Over hanging beam with UDL throughout
7th	1st	g) Combination of point and UDL for beam
	2nd	Theory of Simple Bending and Deflection of Beams: Explanation of terms: Neutral layer, Neutral Axis
	3rd	Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending
8th	1st	Bending Equation $M/I = \sigma/Y = E/R$ with derivation
	2nd	Problems involving calculations of bending stress, modulus of section and moment of resistance
	3rd	Calculation of safe loads and safe span and dimensions of cross- section;
9th	1st	Definition and explanation of deflection as applied to beams
	2nd	Deflection formulae without proof for cantilever beams with point load and UDL only
	3rd	Deflection formulae without proof for simply supported beams with point load and UDL only
10th	1st	numerical problems.
	2nd	Torsion In Shafts and Springs: Definition and function of shaft

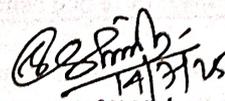
11th	3rd	Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion
	1st	Derivation of the equation $T/I = f_s/R = G\theta/L$
	2nd	Derivation of the equation $T/I = f_s/R = G\theta/L$
	3rd	Problems on design of shaft based on strength and rigidity
12th	1st	Numerical Problems related to comparison of strength and weight of solid and hollow shafts
	2nd	Classification of springs; Nomenclature of closed coil helical spring; Deflection formula for closed coil helical spring
	3rd	stiffness of spring; Numerical problems on closed coil helical spring to find safe load
13th	1st	deflection, size of coil and number of coils.
	2nd	Thin Cylindrical Shells- introduction
	3rd	Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell
14th	1st	Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell
	2nd	Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells
	3rd	Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells
15th	1st	Derivation of expressions for the longitudinal and hoop stress for seamless and seam shells
	2nd	numerical Problems for safe thickness and safe working pressure.
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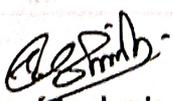
#### Learning

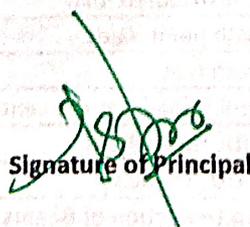
#### Resources:

1. Strength of Materials – B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publications, New Delhi, 2013
2. Strength of Materials – R.S. Khurmi, S.Chand Company Ltd. Delhi

  
Signature of  
Faculty

  
Signature of HOD/

  
Signature of Academic  
Coordinator

  
Signature of Principal