GOVT. POLYTECHNIC, NAYAGARH

3RD SEMESTER, MECHANICAL ENGINEERING (2025-26)

SUBJECT:- TH:2- STRENGTH OF MATERIALS **(Course Code: MEPC203)**

Semester from 14.07.25 to 15.11.25	Total Periods -45, Theory- 3P/WEEK

NAME OF FACULTY:- Sri Saurav Ranjan Pradhan

Sl. No.	Week	Day	Topics to be covered
1	1st	1st day	<u>Simple Stresses and Strains:</u> Types of forces; Stress, Strain and their nature; Mechanical properties of common engineering materials
		2nd day	Significance of various points on stress – strain diagram for M.S. and C.I. specimens; Significance of factor of safety
		3rd day	Relation between elastic constants;
Sl. No.	**Week**	**Day**	**Topics to be covered**
2	2nd	1st day	Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces
		2nd day	Thermal stresses in bodies of uniform section and composite sections
		3rd day	Related numerical problems on the above topics
Sl. No.	**Week**	**Day**	**Topics to be covered**
3	3rd	1st day	<u>Strain Energy:</u> Strain energy or resilience, proof resilience and modulus of resilience
		2nd day	Derivation of strain energy for the following case: i) Gradually applied load
		3rd day	Derivation of strain energy for the following case:n ii) Suddenly applied load
Sl. No.	**Week**	**Day**	**Topics to be covered**
4	4th	1st day	Derivation of strain energy for the following case: iii) Impact/ shock load Related numerical problems. **Revision of CH-1**
		2nd day	<u>Shear Force & Bending Moment Diagrams:</u> Types of beams with examples: a) Cantilever beam, b) Simply supported beam, c) Over hanging beam, d) Continuous beam, e) Fixed beam
		3rd day	Types of Loads – Point load, UDL and UVL; Definition and explanation of shear force and bending moment
Sl. No.	**Week**	**Day**	**Topics to be covered**
		1st day	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method - Cantilever with point loads (Related numerical problems)

5	5th	2nd day	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method - Cantilever with uniformly distributed load (Related numerical problems)
		3rd day	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method - Simply supported beam with point loads (Related numerical problems)
Sl. No.	**Week**	**Day**	**Topics to be covered**
6	6th	1st day	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method - Simply supported beam with UDL (Related numerical problems)
		2nd day	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method - Over hanging beam with point loads, at the center and at free ends (Related numerical problems)
		3rd day	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method - Over hanging beam with UDL throughout (Related numerical problems)
Sl. No.	**Week**	**Day**	**Topics to be covered**
7	7th	1st day	Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method - Combination of point and UDL for the Over hanging beam (Related numerical problems), **Revision of CH-II**
		2nd day	**Theory of Simple Bending and Deflection of Beams:** Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section
		3rd day	Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending
Sl. No.	**Week**	**Day**	**Topics to be covered**
8	8th	1st day	Bending Equation $M/I = \sigma/Y = E/R$ with derivation
		2nd day	Problems involving calculations of bending stress, modulus of section and moment of resistance
		3rd day	Calculation of safe loads and safe span and dimensions of cross- section
Sl. No.	**Week**	**Day**	**Topics to be covered**
9	9th	1st day	Definition and explanation of deflection as applied to beams
		2nd day	Deflection formulae without proof for cantilever beams with point load and UDL only (Standard cases only)

		3rd day	Deflection formulae without proof for simply supported beams with point load and UDL only (Standard cases only), **Revision of CH-III**
Sl. No.	**Week**	**Day**	**Topics to be covered**
10	10th	1st day	Related numerical problems
		2nd day	**Torsion in Shafts and Springs:** Definition and function of shaft; Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion
		3rd day	Derivation of the equation $T/J=fs/R=G\theta/L$
Sl. No.	**Week**	**Day**	**Topics to be covered**
11	11th	1st day	Problems on design of shaft based on strength and rigidity; Numerical Problems related to comparison of strength and weight of solid and hollow shafts
		2nd day	Problems on design of shaft based on strength and rigidity; Numerical Problems related to comparison of strength and weight of solid and hollow shafts
		3rd day	Problems on design of shaft based on strength and rigidity; Numerical Problems related to comparison of strength and weight of solid and hollow shafts
Sl. No.	**Week**	**Day**	**Topics to be covered**
12	12th	1st day	Classification of springs; Nomenclature of closed coil helical spring
		2nd day	Deflection formula for closed coil helical spring (without derivation); stiffness of spring
		3rd day	Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils
Sl. No.	**Week**	**Day**	**Topics to be covered**
13	13th	1st day	Numerical problems on closed coil helical spring to find safe load, deflection, size of coil and number of coils, **Revision of CH-IV**
		2nd day	**Thin Cylindrical Shells:** Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell
		3rd day	Explanation of longitudinal and hoop stresses in the light of circumferential and longitudinal failure of shell
Sl. No.	**Week**	**Day**	**Topics to be covered**
14	14th	1st day	Derivation of expressions for the longitudinal stress for seamless shells
		2nd day	Derivation of expressions for the hoop stress for seamless shells
		3rd day	Derivation of expressions for the longitudinal stress for seam shells
Sl. No.	**Week**	**Day**	**Topics to be covered**

15	15th	1st day	Derivation of expressions for the hoop stress for seam shells
		2nd day	Related numerical Problems for safe thickness and safe working pressure
		3rd day	Related numerical Problems for safe thickness and safe working pressure, Revision of CH-V

REFERENCES:

1. Strength of Materials – D.S. Bedi, Khanna Book Publishing Co. (P) Ltd., Delhi, 2017
2. Strength of Materials – B.C.Punmia, Ashok Kumar Jain & Arun Kumar Jain, Laxmi Publica- tions, New Delhi, 2013
3. Strength of Materials – R.S. Khurmi, S.Chand Company Ltd. Delhi

18/02/25

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