LESSON PLAN FOR WINTER SESSION (2023-24)

PROGRAMME : CIVIL ENGINEERING	NAME OF THE FACULTY: MR. ARABINDA SAHU
COURSE NAME : STRUCTURAL MECHANICS	SESSION : 2023-24
COURSE CODE : TH.1	DATE : 01/08/23 To 30/11/23
SEMESTER : 3RD	
PERIODS/WEEK: 5	
TOTAL PERIODS:75	

WEEK	PERIODS	UNITS	TOPICS
Aug. 1st Week	1	1	**1. Review Of Basic Concepts :** **1.1** Basic Principle of Mechanics: Force, Moment, support conditions.
	2	1	Conditions of equilibrium, C.G & MI, Free body diagram.
	3	1	1.2 Review of CG and MI of different sections.
	4	2	**2. Simple And Complex Stress, Strain** **2.1 Simple Stresses and Strains :** Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity. Compressibility, Hardness, Toughness, Stiffness.
	5	2	Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability.
Aug. 2nd Week	1	2	Types of stresses -Tensile, Compressive and Shear stresses.
	2	2	Types of strains - Tensile, Compressive and Shear strains, Complimentary shear stress - Diagonal tensile /
	3	2	Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio.
	4	2	Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.
	5	2	**2.2 Application of simple stress and strain in engineering field:** Behavior of ductile and brittle materials under direct loads.
Aug. 3rd Week	1	2	Stress Strain curve of a ductile material, Limit of proportionality,
	2	2	Elastic limit, Yield stress, Ultimate stress, Breaking stress.
	3	2	Percentage elongation and Percentage reduction in area.
	4	2	Significance of percentage elongation and reduction in area of cross section.
	5	2	Deformation of prismatic bars due to uniaxial load.
Aug. 4th Week	1	2	Deformation of prismatic bars due to its self-weight.
	2	2	Deformation of prismatic bars due to its self-weight.
	3	2	**2.3 Complex stress and strain :** Principal stresses and strains: Occurrence of normal and tangential stresses.
	4	2	Concept of Principal stress and Principal Planes.
	5		**Monthly Test-1**
Sept. 1st Week	1	2	Major and minor principal stresses and their orientations.
	2	2	Mohr's Circle and its application to solve problems of complex stresses.
	3	2	Mohr's Circle and its application to solve problems of complex stresses.
	4	3	**3. Stresses In Beams and Shafts:** 3.1 Stresses in beams due to bending: Bending stress in beams.
	5	3	Theory of simple bending – Assumptions
Sept. 2nd Week	1	3	Moment of resistance – Equation for Flexure– Flexural stress distribution.
	2	3	Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus.
	3	3	Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus.
	4	3	**3.2 Shear stresses in beams:** Shear stress distribution in beams of rectangular section.
	5	3	Circular and standard sections symmetrical about vertical axis.
Sept. 3rd Week	1	3	**3.3 Stresses in shafts due to torsion:** Concept of torsion, basic assumptions of pure torsion
	2	3	Torsion of solid and hollow circular sections, polar moment of inertia
	3	3	Torsion of solid and hollow circular sections, polar moment of inertia.
	4	3	Torsional shearing stresses, angle of twist.
	5	3	Torsional rigidity, equation of torsion.
Sept. 4th Week	1	3	**3.4 Combined bending and direct stresses:** Combination of stresses, Combined direct and bending stresses
	2	3	Maximum and Minimum stresses in Sections.
	3	3	Conditions for no tension, Limit of eccentricity
	4	3	Middle third/fourth rule, Core or Kern for square, rectangular and circular, chimneys, dams and retaining walls
	5		**Monthly Test-2**
Oct. 1st Week	1	4	**4. Columns and Struts** **4.1** Columns and Struts, Definition, Short and Long columns.
	2	4	End conditions, Equivalent length / Effective length.
	3	4	Slenderness ratio, Axially loaded short and long column.
	4	4	Euler's theory of long columns.
	5	4	Critical load for Columns with different end conditions.
	1	**Internal Assessment Exam**	

WEEK	PERIODS	UNITS	TOPICS
Oct. 2nd Week	2	5	**5. Shear Force and Bending Moment** **5.1 Types of loads and beams:** Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL)
	3	5	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL).
	4	5	Types of Supports: Simple support, Roller support, Hinged support, Fixed support.
	5	5	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction.
Oct. 3rd Week	1	5	Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium
	2	5	**5.2 Shear force and bending moment in beams:** Shear Force and Bending Moment: Signs Convention for S.F. and B.M.
	3	5	S.F and B.M of general cases of determinate beams with concentrated loads and udl only.
	4	5	S.F and B.M diagrams for Cantilevers.
	5	5	S.F and B.M diagrams for Simply supported beams & Overhanging beam.
Oct. 4th Week	**Puja Holidays**		
Nov. 1st Week	1		**Monthly Test-3**
	2	5	Position of maximum BM, Point of contra flexure & Relation between intensity of load, S.F and B.M.
	3	6	**6. Slope and Deflection** **6.1 Introduction:** Shape and nature of elastic curve (deflection curve)
	4	6	Relationship between slope, deflection and curvature & Importance of slope and deflection.
	5	6	**6.2** Slope and deflection of cantilever beam under concentrated load. (By Double Integration method, Macaulay's method)
Nov. 2nd Week	1	6	Slope and deflection of cantilever beam under uniformly distributed load
	2	6	Slope and deflection of simply supported beams under concentrated load. (By Double Integration method &
	3	6	Slope and deflection of simply supported beams under uniformly distributed load (By Macaulay's method & Double
	4	7	**7. Indeterminate Beams** **7.1** Indeterminacy in beams, Principle of consistent deformation/compatibility
	5	7	Analysis of propped cantilever & Fixed beams by principle of superposition
Nov. 3rd Week	1	7	Analysis of Fixed beams by principle of superposition.
	2	7	Two span continuous beams by principle of superposition.
	3	7	SF& BM diagrams (point load)
	4	7	SF & BM diagrams (udl covering full span)
	5	8	**8. Trusses** **8.1 Introduction:** Types of trusses, statically determinate and indeterminate trusses.
Nov. 4th Week	1	8	Degree of indeterminacy, Stable and unstable trusses, advantages of trusses
	2	8	**8.2 Analysis of trusses:** Analytical method (Method of joints)
	3	8	**8.2 Analysis of trusses:** Analytical method (method of Section)
	4		**Monthly Test-4**
	5		**Doubt Clearing Class & Previous year question Paper discussion.**

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31.7.23
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