DEPARTMENT OF CIVIL ENGINEERING
LESSON PLAN

Semester:3rd **Session- Winter 2024**

Subject Code: Th 1 **Name Of The Faculty:**

Subject: Structural Mechanics **Sri Dhanurjaya Behera**

Smt. Smitarani Patel

Sl No	Week No	Lecture Day	Topics to be covered	Remarks
1	W 1	1	1.1 Basic Principle of Mechanics: Force, Moment, support conditions,	
		2	Conditions of equilibrium, C.G & MI, Free body diagram	
		3	1.2 Review of CG and MI of different sections	
		4	Problems	
		5	2.1 Simple Stresses and Strains Introduction to stresses and strains:	
2	W 2	6	Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability	
		7	Types of stresses -Tensile, Compressive and Shear stresses	
		8	Types of strains - Tensile, Compressive and Shear strains	
		9	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction	
		10	Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio	
3	W 3	11	change in dimensions and volume etc, Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants	
		12	Problems	
		13	2.2 Application of simple stress and strain in engineering field: Behaviour of ductile and brittle materials under direct loads	

		14	Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress	
		15	Percentage elongation, Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section	
4	W 4	16	Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self weight.	
		17	Problems	
		18	2.3 Complex stress and strain	
		19	Principal stresses and strains	
		20	Occurrence of normal and tangential stresses	
5	W 5	21	Concept of Principal stress and Principal Planes, major and minor principal stresses and their orientations	
		22	Problems	
		23	Mohr's Circle and its application to solve problems of complex stresses	
		24	Problems	
		25	3.1 Stresses in beams due to bending	
6	W 6	26	Bending stress in beams – Theory of simple bendingAssumptions	
		27	Moment of resistance – Equation for Flexure	
		28	Flexural stress distribution – Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus	
		29	3.2 Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis	
		30	Problems	
		31	3.3 Stresses in shafts due to torsion: Concept of torsion	
		32	basic assumptions of pure torsion	
		33	torsion of solid and hollow circular sections, polar moment of inertia, torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion	

7	W 7	34	3.4 Combined bending and direct stresses: Combination of stresses, Combined direct and bending stresses,	
		35	Maximum and Minimum stresses in Sections, Conditions for no tension, Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls	
8	W 8	36	Problems	
		37	4.1 Columns and Struts, Definition, Short and Long columns, End conditions	
		38	Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column	
		39	Euler's theory of long columns, Critical load for Columns with different end conditions	
		40	Problems	
9	W 9	41	Shear Force and Bending Moment 5.1 Types of loads and beams: Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL),	
		42	Types of Supports: Simple support, Roller support, Hinged support, Fixed support,	
		43	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction, Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium.	
		44	5.2 Shear force and bending moment in beams: Shear Force and Bending Moment: Signs Convention for S.F. and B.M	
		45	S.F and B.M of general cases of determinate beams with concentrated loads and udl only	
		46	S.F and B.M diagrams for Cantilevers	
		47	S.F.D and B.M.D Simply supported beams and Over hanging beams	
		48	Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.	

10	W 10	49	Slope and Deflection 6.1 Introduction: Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.	
		50	6.2 Slope and deflection of cantilever under concentrated load (by Double Integration method).	
11	W 11	51	6.2 Slope and deflection of cantilever under concentrated load (by Macaulay's method).	
		52	6.2 Slope and deflection of cantilever under uniformly distributed load (by Double Integration method).	
		53	6.2 Slope and deflection of simply supported beams under uniformly distributed load (Macaulay's method).	
		54	6.2 Slope and deflection of simply supported beams under concentrated load (by Double Integration method).	
		55	6.2 Slope and deflection of simply supported beams under concentrated load (by Macaulay's method).	
12	W 12	56	6.2 Slope and deflection of simply supported beams under uniformly distributed load (by Double Integration method).	
		57	Problems	
		58	6.2 Slope and deflection of simply supported beams under uniformly distributed load (Macaulay's method).	
		59	7.1 Indeterminacy in beams	
		60	Principle of consistent deformation/compatibility	
13	W 13	61	Problems	
		62	Analysis of propped cantilever	
		63	fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load)	
		64	Problems	
		65	fixed and two span continuous beams by principle of superposition, SF and BM diagrams (udl covering full span)	
14	W 14	66	8.1 Introduction: Types of trusses	
		67	tatically determinate and indeterminate trusses	
		68	Degree of indeterminacy	

		69	stable and unstable trusses	
		70	advantages of trusses	
15	W 15	71	8.2 Analysis of trusses: Analytical method (Method of joints)	
		72	8.2 Analysis of trusses: Analytical method (Method of joints)	
		73	8.2 Analysis of trusses: Analytical method (method of Section)	
		74	8.2 Analysis of trusses: Analytical method (method of Section)	
		75	Revision	

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