

LESSON PLAN

Course Type :: Theory
Semester/Branch :: 3rd Semester, Civil Engineering
Subject (with code) :: Structural Mechanics (Th-1)
Contact hours/week :: 5 hours
Name of Faculty :: Dr. Sanjukta Sahoo

SL. NO	CLAS S ID	COURSE CONTENT	MODE OF DELIVERY	EXHIBIT/ REFERENCE
1	1	Basic Principle of Mechanics: Force, Moment, support conditions, Conditions of equilibrium, C.G & MI, Free body diagram	Lecture	Study material
2	2	Review of CG and MI of different sections	Lecture (Elaboration)	Study material
3	3	Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability	Video Content	https://youtu.be/6L-r3hx0NLM
4	4	Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains	Lecture	Personal Video Link
5	5	Problem Practice & Doubt Clearing		
6	6	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain	Lecture	Study material
7	7	Computation of stress, Strain, Poisson's ratio, change in dimensions and volume etc.,	Lecture	Study material

8	8	Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.	Lecture	Study material
9	9	Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress	Lecture	Study material
10	10	Percentage elongation, Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section, Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self-weight.	Lecture	Study material
11	11	Problem Practice & Doubt Clearing		
12	12	Unit Test-1		
13	13	Occurrence of normal and tangential stresses, Concept of Principal stress and Principal Planes, Major and minor principal stresses and their orientations	Lecture (Elaboration)	NPTEL Link https://youtu.be/Q10N3aYVgPc
14	14	Mohr's Circle and its application to solve problems of complex stresses	Lecture (Elaboration)	Study material
15	15	Problem Practice		
16	16	Bending stress in beams – Theory of simple bending – Assumptions	Lecture	Youtube Link https://youtu.be/Y3frZKsfYE
17	17	Moment of resistance – Equation for Flexure– Flexural stress distribution	Lecture (Elaboration)	Study material
18	18	Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus	Lecture	Study material
19	19	Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis	Lecture	Study material
20	20	Problem Practice		
21	21	Unit Test-2		
22	22	Concept of torsion, basic assumptions of pure torsion	Lecture	NPTEL Reference

				https://youtu.be/EpQgdvUXFMM
23	23	Torsion of solid and hollow circular sections & Problem Practice	Video Content	Youtube Link https://youtu.be/IQB0bJRCRxo
24	24	Quiz-1		
25	25	Polar moment of inertia, torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion	Lecture	NPTEL Link https://youtu.be/TiXKdutS8zQ
26	26	Problem Practice		
27	27	Unit Test-3		
28	28	Combination of stresses, Combined direct and bending stresses	Lecture	Study Material
29	29	Maximum and Minimum stresses in Sections, Conditions for no tension & Problem Practice	Lecture	Study Material
30	30	Limit of eccentricity, Middle third/fourth rule,	Problem Practice	Study Material
31	31	Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls	Demonstration	Study material
32	32	Problem Practice		
33	33	Unit Test-4		
34	34	Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column	Lecture	Personal Video Link
35	35	Euler's theory of long columns, Critical load for Columns with different end conditions	Peer assisted Learning	Youtube link https://youtu.be/0yKgI6C87Lo
36	36	Problem Practice		
37	37	Unit Test-5		
38	38	Quiz-2		
39	39	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports: Simple support, Roller support, Hinged support, Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction, Types of Beams based on support conditions	Demonstration	Study material

40	40	Calculation of support reactions using equations of static equilibrium	Lecture	Study Material
41	41	Problem Practice		
42	42	Shear Force and Bending Moment: Signs Convention for S.F. and B.M, S.F and B.M of 43 general cases of determinate beams with concentrated loads and udl only	Lecture	NPTEL Link https://youtu.be/nNcfzNjIifU
43	43	S.F and B.M diagrams for Cantilevers	Problem Practice	Study Material
44	44	S.F and B.M diagrams for Simply supported beams and Over hanging beams	Problem Practice	Study Material
45	45	Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.	Lecture	Study Material
46	46	Problem Practice		
47	47	Unit Test-5		
48	48	Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection	Lecture (Elaboration)	Youtube Link https://youtu.be/K8yy3cB9aM
49	49	Slope and deflection of cantilever and simply supported beams under concentrated by Double Integration method	Problem Practice	Study Material
50	50	Slope and deflection of cantilever and simply supported beams under uniformly distributed load by Double Integration method.	Problem Practice	Study Material
51	51	Slope and deflection of simply supported beams under concentrated and uniformly distributed load by Macaulay's method.	Problem Practice	Study Material
52	52	Indeterminacy in beams, Principle of consistent deformation/compatibility	Lecture	Study Material
53	53	Analysis of propped cantilever	Problem Practice	Study Material
54	54	Fixed and two span continuous beams by principle of superposition	Problem Practice	Study Material

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56	56	SF and BM diagrams (point load and udl covering full span)	Problem Practice	Study Material
57	57	Unit Test-6		
58	58	Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses.	Flipped Class	Study Material
59	59	Analytical method (Method of joints, method of Section)	Problem Practice	Study Material
60	60	Previous years Q&A Discussion		

Signature of Concern Teacher