LESSON PLAN OF STRUCTURAL MECHANICS 3RD SEM SEC B			
DISCIPLINE : CIVIL ENGINEERING	**Semester : 3rd sem (sec. B)**	**Name of the Teaching faculty: Simadri kumar bal**	
Subject :- Structural Mechanics	**No.of Days/ week class**	**Semester from date: 15/09/2022 to 22/12/2022** **No. of Weeks :15** **Topics to be covered:-**	
Week	**Class Day**	**Topics**	**Remarks**
		1. Review of Basic Concepts (4P)	
1st Week (15 th Sept- 17 th Sept)	1st	**1.1** Basic Principle of Mechanics: Force, Moment, support conditions, Conditions of equilibrium, C.G & MI, Free body diagram	
	2nd	**1.2** Review of CG and MI of different sections	
	3rd	Simple numerical problems about C.G	
2nd Week (19 Sept - 24 Sept)	1st	Simple numerical problems about M.I.	
		2. Simple and Complex Stress, Strain.(15P)	
		2. 1 Simple Stresses and Strains	
	2nd	Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability -	
	3rd	- Types of stresses - Tensile, Compressive and Shear stresses - Types of strains - Tensile, Compressive and Shear strains	
	4th	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear - Elongation and Contraction - Longitudinal and Lateral strains - Poisson's Ratio	
	5th	Volumetric strain –computation of stress, strain, Poisson's ratio, change in dimensions and volume etc-Hooke's law	
3rd Week (26 Sept - 1 st Oct)	1st	Derivation of relationship between the elastic constants	
	2nd	Derivation of relationship between the elastic constants	
	3rd	Simple Numerical problems	
		2.2 Application of simple stress and strain in engineering field:	
	4th	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 .	

3rd Week (26 Sept - 1 st Oct)	5th	Percentage elongation - Percentage reduction in area - Significance of percentage elongation and reduction in area of cross section	
4th Week		**Puja vaccation**	
5th Week (10 th Oct - 15 Oct)	1st	Deformation of prismatic bars due to uniaxial load and Deformation of prismatic bars due to its self weight .	
	2nd	Simple numerical problem	
		2.3 Complex stress and strain	
	3rd	Principal stresses and strains: Occurrence of normal and tangential stresses - Concept of Principal stress and Principal Planes – major and minor principal stresses and their orientations.	
	4th	Simple numerical problems	
	5th	Simple numerical problems	
6th Week (17 th Oct - 22 Oct)	1st	2.3 Complex stress and strain Principal stresses and strains: Occurrence of normal and tangential stresses - Concept of Principal stress and Principal Planes – major and minor principal stresses and their orientations, Mohr's Circle - Simple numerical problems	
		3.0 STRESSES IN BEAMS (10P)	
	2nd	**3.1 Stresses in beams due to bending:** Bending stress in beams – Theory of simple bending – Assumptions - Moment of resistance	
	3rd	Equation for Flexure– Flexural stress distribution – Curvature of beam Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus	
	4th	Simple numerical problems	
	5th	**3.2 Shear stresses in beams :** Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.	
7th Week (25 th Oct - 29 Oct)	1st	Simple Numerical Problems	
	2nd	**3.3 Stresses in shafts due to torsion:** Concept of torsion, basic assumptions of pure torsion, torsion of solid and hollow circular sections, polar moment of inertia, torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion	
	3rd	Simple numerical problems	
	4th	**3.4 Combined bending and direct stresses:** Combination of stresses –Combined direct and bending stresses – Maximum and Minimum stresses in Sections	
	5th	Simple Problems – Conditions for no tension – Limit of eccentricity	
8th Week (31st Oct - 5th Nov)	1st	Middle third/fourth rule – Core or Kern for square, rectangular and circular sections, chimneys,dams and retaining walls	

8th Week (31st Oct - 5th Nov)		**4.0 COLUMNS AND STRUTS:(4P)**	
	2nd	4.1 Columns and Struts – Definition – Short and Long columns – End conditions – Equivalent length / Effective length	
	3rd	Slenderness ratio – Axially loaded short and long column – Euler's theory of long columns (No derivation) – Critical load for Columns with different end conditions – Expressions only	
	4th	Simple numerical problem	
	5th	Simple numerical problem	
9th Week (7th Nov - 12th Nov)		**5.0 SHEAR FORCE AND BENDING MOMENT (12)**	
	2nd	5.1 Types of loads and beams: Types of Loads- Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports- Simple support, Roller support, Hinged support, Fixed support.	
	3rd	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction- Types of Beams based on support conditions- –Support reactions calculation using static equilibrium equations.	
		5.2 Shear force and bending moment in beams	
	4th	Shear Force and Bending Moment – Signs Convention for S.F. and B.M – S.F and B.M of general cases of determinate beams – S.F and B.M diagrams for Cantilevers	
	5th	S.F and B.M diagrams for Simply supported beams	
10th Week (14th Nov - 19th Nov)	1st	Over hanging beams – Position of maximum BM - Point of contra flexure	
	2nd	Relation between intensity of load , S.F and B.M.	
	3rd	Simple numerical problem	
	4th	Simple numerical problem	
	5th	Simple numerical problem	
11th Week (21th Nov - 26th Nov)	1st	Simple numerical problem	
	2nd	Simple numerical problem	
	3rd	Simple numerical problem	
		6.0 SLOPE AND DEFLECTION (10p)	
	4th	**6.1 Introduction:** Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.	
	5th	**6.2** Slope and deflection of cantilever beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).	
12th Week (28th Nov - 3rd Dec)	1st	**6.2** Slope and deflection of simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).	
	2nd	Simple numerical problem	

12th Week (28th Nov - 3rd Dec)	3rd	Slope and deflection of propped cantilever from principle of superposition. Typical simple cases only: • under u.d.l (Covering Full Span),	
	4th	Slope and deflection of propped cantilever from principle of superposition. Typical simple cases only: • Point Load (At mid span or end)	
	5th	Simple numerical problem	
13th Week (5th Dec - 10th Dec)	1st	Simple numerical problem	
	2nd	Simple numerical problem	
	3rd	Simple numerical problem	
		7.Indeterminate Beams (10P)	
	4th	**7.1** Indeterminacy in beams, Principle of consistent deformation/compatibility,	
	5th	Analysis of propped cantilever beams carrying point loads by principle of superposition,draw SF and BM diagrams	
14th Week (12th Dec - 17th Dec)	1st	Simple numerical problem	
	2nd	Analysis of propped cantilever beams carrying udl covering full span by principle of superposition,draw SF and BM diagrams	
	3rd	Simple numerical problem	
	4th	Analysis of fixed beams carrying point loads by principle of superposition,draw SF and BM diagrams	
	5th	Simple numerical problem	
15th Week (19th Dec - 22th Dec)	1st	Analysis of fixed beams carrying udl covering full span by principle of superposition,draw SF and BM diagrams	
	2nd	Simple numerical problem	
	3rd	Analysis of two span continuous beams carying point loads and udl covering full span by principle of superposition, draw SF and BM diagrams	
Extra classes		**Trusses (10P)**	
		8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses	
		8.2 Analysis of trusses: Analytical method (Method of joints, method of Section	
		Simple numerical problem	

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