LESSON PLAN OF Th1. STRUCTURAL MECHANICS FOR THE SESSION 2022-23(WINTER-2022) BATCH-2021-24, GOVT. POLYTECHNIC,KANDHAMAL

Discipline: civil engineering	Semester: 3rd	Name of the Teaching Faculty: RUPELI KUMARI PATRO, PTGF in Civil Engg.
Subject: Th1. STRUCTURAL MECHANICS	No. of days/ per week class allotted: 5	Semester From Date : 15/09/2022 to Date: 22/12/2022 No. of Weeks: 15
Week	**Class Day**	**Theory/ Practical Topics**
		1.0 Review Of Basic Concepts
1st	1st	1.1 Basic Principle of Mechanics: Force, Moment, support conditions
	2nd	Conditions of equilibrium, C.G & MI, Free body diagram
	3rd	1.2 Review of CG of different sections
	4th	Review of MI of different sections
		2.0 Simple And Complex Stress, Strain
	5th	2.1 Simple Stresses and StrainsIntroduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability,
2nd	1st	Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains
	2nd	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain
	3rd	computation of stress, strain, Poisson's ratio, change in dimensions and volume etc,
	4th	Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.
	5th	2.2 Application of simple stress and strain in engineering field:Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material
3rd	1st	Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area,
	2nd	Significance of percentage elongation and reduction in area of cross section,
	3rd	Deformation of prismatic bars due to uniaxial load
	4th	Deformation of prismatic bars due to its self weight
	5th	2.3 Complex stress and strainPrincipal stresses and strains: Occurrence of normal and tangential stresses
4th	1st	Concept of Principal stress and Principal Planes,
	2nd	major and minor principal stresses and their orientations,
	3rd	Mohr's Circle and its application

	4th	application to solve problems of complex stresses Using Mohr's Circle
		3.0 Stresses In Beams and Shafts
	5th	3.1 Stresses in beams due to bending: Bending stress in beams – Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure
5th	1st	Flexural stress distribution – Curvature of beam – Position of N.A. and Centroidal Axis
	2nd	Flexural rigidity – Significance of Section modulus 3.2 Shear stresses in beams: Shear stress distribution in beams of rectangular
	3rd	Shear stress distribution in beams of circular section
	4th	Shear stress distribution in beams of circular section and standard sections symmetrical about vertical axis. 3.3 Stresses in shafts due to torsion: Concept of torsion, basic assumptions of pure torsion,
	5th	torsion of solid and hollow circular sections, polar moment of inertia, torsional shearing stresses, angle of twist
6th	1st	torsional rigidity, equation of torsion 3.4 Combined bending and direct stresses: Combination of stresses, Combined direct and bending stresses,
	2nd	Maximum and Minimum stresses in Sections, Conditions for no tension,
	3rd	Limit of eccentricity, Middle third/fourth rule, Core or Kern for square
	4th	rectangular and circular sections, chimneys, dams and retaining walls
		4.0 Columns and Struts
	5th	4.1 Columns and Struts, Definition, Short and Long columns,
7th	1st	End conditions, Equivalent length / Effective length, Slenderness ratio,
	2nd	Axially loaded short and long column, Euler's theory of long columns,
	3rd	Critical load for Columns with different end conditions
		5.0 Shear Force and Bending Moment
	4th	5.1 Types of loads and beams: Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL)
	5th	Types of Supports: Simple support, Roller support, Hinged support, Fixed support
8th	1st	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction
	2nd	Types of Beams based on support conditions:
	3rd	Calculation of support reactions using equations of static equilibrium.
	4th	Calculation of support reactions using equations of static equilibrium.
	5th	5.2 Shear force and bending moment in beams:Shear Force and Bending Moment: Signs Convention for S.F. and B.M,
9th	1st	S.F and B.M of general cases of determinate beams with concentrated loads and udl only
	2nd	S.F and B.M diagrams for Cantilevers, Simply supported beams and
	3rd	S.F and B.M diagrams for Over hanging beams
	4th	Position of maximum BM, Point of contra flexure
	5th	Relation between intensity of load, S.F and B.M.
		6.0 Slope and Deflection
10th	1st	6.1 Introduction: Shape and nature of elastic curve (deflection curve);

	2nd	Relationship between slope, deflection and curvature (No derivation),
	3rd	Relationship between slope, deflection and curvature (No derivation),
	4th	Importance of slope and deflection
	5th	6.2 Slope and deflection of cantilever
11th	1st	and simply supported beams under concentrated and uniformly distributed load
	2nd	Double Integration method
	3rd	Double Integration method
	4th	Macaulay's method
		7.0 Indeterminate Beams
	5th	7.1 Indeterminacy in beams,
12th	1st	Principle of consistent deformation/compatibility
	2nd	Principle of consistent deformation/compatibility
	3rd	Principle of consistent deformation/compatibility
	4th	Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition
	5th	Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition
13th	1st	Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition
	2nd	SF and BM diagrams (point load and udl covering full span)
	3rd	SF and BM diagrams (point load and udl covering full span)
	4th	SF and BM diagrams (point load and udl covering full span)
		8.0 Trusses
	5th	8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses
	1st	statically determinate and indeterminate trusses
14th	2nd	statically determinate and indeterminate trusses
	3rd	degree of indeterminacy, stable and unstable trusses, advantages of trusses.
	4th	degree of indeterminacy, stable and unstable trusses, advantages of trusses.
	5th	8.2 Analysis of trusses: Analytical method
	1st	Method of joints
15th	2nd	Method of joints
	3rd	method of Section
	4th	method of Section
	5th	problem solving

15/9/2022
HOD.

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Dt-15/09/22

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