GOVERNMENT POLYTECHNIC JAJPUR

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DEPARTMENT OF CIVIL ENGINEERING

LESSON PLAN

Discipline: Civil Engg	**Semester: 3rd**	**Name of the Teaching faculty: Rajashree Nayak**
Subject: Structural Mechanics Th-1	**No of Days/Week class alloted: 5 days**	**Semester from Date: 01.08.2023 To Date: 30.11.2023** **No of weeks:17**
Week	**Class Day**	**Topics**
1st	1st	Basic Principle of Mechanics
	2nd	Force, Moment, support conditions, Conditions of equilibrium
	3rd	C.G & MI, Free body diagram
	4th	Review of CG and MI of different sections
	5th	Review of CG and MI of different sections
2nd	1st	Introduction to stresses and strains
	2nd	Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness,
	3rd	Ductility, Malleability, Creep, Fatigue, Tenacity, Durability
	4th	Types of stresses -Tensile, Compressive and Shear stresses
	5th	Types of strains - Tensile, Compressive and Shear strains
3rd	1st	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear
	2nd	Elongation and Contraction, Longitudinal and Lateral strains
	3rd	Poisson's Ratio, Volumetric strain, computation of stress, strain
	4th	change in dimensions and volume etc.
	5th	Numerical
4th	1st	Hooke's law - Elastic Constants
	2nd	Derivation of relationship between the elastic constants
	3rd	Application of simple stress and strain in engineering field
	4th	Behavior of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material
	5th	Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area
5th	1st	Significance of percentage elongation and reduction in area of cross section
	2nd	Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self-weight.
	3rd	Complex stress and strain
	4th	Principal stresses and strains: Occurrence of normal and tangential stresses
	5th	Concept of Principal stress and Principal Planes
6th	1st	major and minor principal stresses and their orientations

	2nd	Mohr's Circle and its application to solve problems of complex stresses
	3rd	Stresses in beams due to bending: Bending stress in beams – Theory of simple bending – Assumptions
	4th	Moment of resistance – Equation for Flexure– Flexural stress distribution
	5th	Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
7th	1st	Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.
	2nd	Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.
	3rd	Concept of torsion, basic assumptions of pure torsion
	4th	torsion of solid and hollow circular sections, polar moment of inertia
	5th	torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion
8th	1st	Combined bending and direct stresses: Combination of stresses, combined direct and bending stresses
	2nd	Maximum and Minimum stresses in Sections, Conditions for no tension, Limit of eccentricity
	3rd	Middle third/fourth rule, Core or Kern for square
	4th	rectangular and circular sections, chimneys, dams and retaining walls
	5th	Numerical
9th	1st	Columns and Struts, Definition, Short and Long columns
	2nd	End conditions, Equivalent length / Effective length, Slenderness ratio
	3rd	Axially loaded short and long column, Euler's theory of long columns
	4th	Critical load for Columns with different end conditions
	5th	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL)
10th	1st	Types of Supports: Simple support, Roller support, Hinged support, Fixed support
	2nd	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction
	3rd	Types of Beams based on support conditions
	4th	Calculation of support reactions using equations of static equilibrium
		Shear Force and Bending Moment: Signs Convention for S.F. and B.M
11th	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
	3rd	Simply supported beams and over hanging beams
	4th	Position of maximum BM, Point of contra flexure
	5th	Relation between intensity of load, S.F and B.M.
12th	1st	Numerical
	2nd	Introduction: Shape and nature of elastic curve (deflection curve)
	3rd	Introduction: Shape and nature of elastic curve (deflection curve)
	4th	Relationship between slope, deflection and curvature (No derivation)
	5th	Relationship between slope, deflection and curvature (No derivation)

13th	1st	Importance of slope and deflection
	2nd	Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method)
	3rd	Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method)
	4th	Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method)
	5th	Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method)
14th	1st	Indeterminacy in beams
	2nd	Principle of consistent deformation/compatibility
	3rd	Analysis of propped cantilever
	4th	Analysis of propped cantilever
	5th	Analysis of propped cantilever
15th	1st	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)
	5th	SF and BM diagrams (point load and udl covering full span)
16th	1st	Introduction: Types of trusses
	2nd	statically determinate and indeterminate trusses
	3rd	statically determinate and indeterminate trusses
	4th	degree of indeterminacy
	5th	stable and unstable trusses
17th	1st	advantages of trusses.
	2nd	Analysis of trusses: Analytical method (Method of joints, method of Section)
	3rd	Analysis of trusses: Analytical method (Method of joints, method of Section)
	4th	Analysis of trusses: Analytical method (Method of joints, method of Section)
	5th	Analysis of trusses: Analytical method (Method of joints, method of Section)
18th	1st	CLASS TEST 3, PREVIOUS YEAR QUESTIONS, QUIZ

LearningResources:

Sl No.	Author Name	Name of the Book
1	R.Subramanian Strength of Materials	R.Subramanian Strength of Materials
2	S.Rammrutham	Theory of structure
3	V.N.Vazirani&M.M. Rathwani	Analysis of Structures Vol.I&

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