BHUBANANANDA ODISHA SCHOOL OF ENGINEERING, CUTTACK
DEPARTMENT OF CIVIL ENGINEERING

LESSON PLAN

SUBJECT: STRUCTURAL MACHANICS (TH 1)

FACULTY: SRI ADITYA RANJAN PATRA

ACCADEMIC SESSION: 2024-25

SEMESTER: 3RD

SEC: A

Sd/-
H O D (Civil Engg.)

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Discipline: Civil Engineering	**Semester: 3rd A**		**Name of the teaching faculty: Sri Aditya Ranjan Patra**
Subject: Structural Mechanics	**No. of Days/ per week class allotted: 05 periods per week Mon-1 period, Wed-1, period, Thu-1 period, Fri-2 period)**		**Semester From Date: 01-07-2024 To Date: 08-11-2024 No. of weeks: 18 weeks**
Week	**Class Day**	**No of period available**	**Theory Topics**
1ST	01/07/2024	1	**1.0 Review of Basic Concepts** 1.1 Basic Principle of Mechanics: Force, Moment, support conditions,
	03/07/2024	1	**1.1** Basic Principle of Mechanics: Force, Moment, support conditions **1.1** Conditions of equilibrium, C.G & MI, Free body diagram
	04/07/2024	1	**1.2** Review of CG of different sections
	05/07/2024	2	**1.2** Review of MI of different sections
2ND	08/07/2024	1	**2.0Simple And Complex Stress, Strain** **2.1 Simple Stresses and Strains** Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability,
	10/07/2024	1	**2.0Simple And Complex Stress, Strain** **2.1 Simple Stresses and Strains** Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability,
	11/07/2024	1	2.1 Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains,
	12/07/2024	2	2.1 Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction,
3RD	15/07/2024	1	2.1Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio, change in dimensions and volume etc

	18/07/2024	1	2.1Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants
	19/07/2024	2	**2.2 Application of simple stress and strain in engineering field:** Behavior of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material
4TH	22/07/2024	1	2.2 Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section
	24/07/2024	1	2.2 Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section
	25/07/2024	1	2.2 Deformation of prismatic bars due to uniaxial load,
	26/07/2024	2	2.2. Deformation of prismatic bars due to its self-weight
5TH	29/07/2024	1	**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
	31/07/2024	1	2.3 Mohr's Circle and its application to solve problems of complex stresses
	01/08/2024	1	2.3 Mohr's Circle and its application to solve problems of complex stresses
	02/08/2024	2	**3.0Stresses In Beams and Shafts** **3.1 Stresses in beams due to bending:** Bending stress in beams – Theory of simple bending – Assumptions 3.1 Moment of resistance – Equation for Flexure– Flexural stress distribution –
6TH	05/08/2024	1	3.1 Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
	07/08/2024	1	**3.2 Shear stresses in beams:** Shear stress distribution in beams of rectangular, circular, and standard sections symmetrical about vertical axis.
	08/08/2024	1	**3.3 Stresses in shafts due to torsion:** Concept of torsion, basic assumptions of pure torsion,
	09/08/2024	2	3.3 torsion of solid and hollow circular sections, polar moment of inertia torsion shearing stresses, angle of twist, torsion rigidity, equation of torsion
7TH	12/08/2024	1	**Monthly Class Test 1**

	14/08/2024	1	**3.4 Combined bending and direct stresses:** Combination of stresses, combined direct and bending stresses, Maximum and Minimum stresses in Sections, Conditions for no tension,
	16/08/2024	2	**3.4 Combined bending and direct stresses:** Combination of stresses, combined direct and bending stresses, Maximum and Minimum stresses in Sections, Conditions for no tension
8TH	21/08/2024	1	3.4 Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular, and circular sections, chimneys, dams and retaining walls
	22/08/2024	1	**4.0Columns and Struts** **4.1** Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio,
	23/08/2024	2	4.1 Axially loaded short and long column, Euler's theory of long columns,
9TH	28/08/2024	1	4.1 Critical load for Columns with different end conditions
	29/08/2024	1	4.1 Critical load for Columns with different end conditions
	30/08/2024	2	**5.0 Shear Force and Bending Moment** **5.1 Types of loads and beams:**
10TH	02/09/2024	1	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL),
	04/09/2024	1	5.1 Types of Supports: Simple support, Roller support, Hinged support, Fixed support,
	05/09/2024	1	5.1Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction
	06/09/2024	2	5.1Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction
11TH	09/09/2024	1	5.1Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium.
	11/09/2024	1	5.1Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium.
	12/09/2024	1	**Internal Assessment**
	13/09/2024	2	**Internal Assessment**
12TH	18/09/2024	1	5.1 Shear Force and Bending Moment: Signs Convention for S.F. and B.M, S.F and B.M of general cases of determinate beams with concentrated loads and Udl only
	19/09/2024	1	5.1 S. F and B.M diagrams for Cantilevers, simply supported beams and over hanging beams, Position of maximum BM
	20/09/2024	2	5.1 S. F and B.M diagrams for Cantilevers, simply supported beams and over hanging beams, Position of maximum BM

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13TH	23/09/2024	1	5.1 Point of contra flexure, Relation between intensity of load, S.F and B.M.
	25/09/2024	1	**6.0Slope and Deflection** **6.1 Introduction:** Shape and nature of elastic curve (deflection curve);
	26/09/2024	1	6.1Relationship between slope deflection and curvature (No derivation), Importance of slope and deflection
	27/09/2024	2	**6.2** Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).
14TH	30/09/2024	1	**6.2** Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).
	03/10/2024	1	**7.0Indeterminate Beams** **7.1**Indeterminacy in beams, Principle of consistent deformation/compatibility
	04/10/2024	2	7.1 Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition
15TH	14/10/2024	1	7.1 SF and BM diagrams (point load and udl covering full span)
	18/10/2024	2	**8.0Trusses** **8.1 Introduction:** Types of trusses, statically determinate and indeterminate trusses
16TH	21/10/2024	1	**8.2 Analysis of trusses:** Analytical method (Method of joints)
	23/10/2024	1	Analytical method (Method of joints)
	24/10/2024	1	Analytical method (method of Section)
	25/10/2024	2	Analytical method (method of Section)
17TH	28/10/2024	1	**Monthly Class Test 2**
	30/10/2024	1	Revision
	01/11/2024	2	Revision
18TH	04/11/2024	1	Revision
	06/11/2024	1	Revision
	07/11/2024	1	Previous Year Questions Discussion
	08/11/2024	2	Previous Year Questions Discussion

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