LESSON PLAN OF 3RD SEMESTER(2022-23) CIVIL ENGINEERING

Discipline :- CIVIL	Semester:-3RD	Name of the Teaching Faculty KAPILENDRA KUMAR SETHY
Subject:- STRENGTH OF MATERIAL	No of Days/per Week Class Allotted :-04	Semester From:- **15/09/2022** To:- **22/12/2022** No of Weeks:- **15**

Week	**Class Day**	**Theory/ Practical Topics**
1st	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	**2.1 Simple Stresses and Strains** Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity,
	4th	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, Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains
	2nd	Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio, change in dimensions and volume etc, Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants
	3rd	**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, Limit of proportionality
	4th	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, Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self weight
3rd	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 and its application to solve problems of complex stresses
	2nd	**Stresses In Beams and Shafts** **3.1 Stresses in beams due to bending:** Bending stress in beams – Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure– Flexural stress distribution – Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
	3rd	**3.2 Shear stresses in beams:** Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.
	4th	**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,
4th	1st	angle of twist, torsional rigidity, equation of torsion
	2nd	**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,
	3rd	Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls

	4th	**4.1** Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column,
5th	1st	Euler's theory of long columns, Critical load for Columns with different end conditions
	2nd	**5.1 Types of loads and beams:** Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports: Simple support
	3rd	Problem practice
	4th	Problem practice
6th	1st	5.1 Roller support, Hinged support, Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction,
	2nd	Problem practice
	3rd	5.1 Moment reaction, Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium
	4th	Problem practice
7th	1st	**5.2 Shear force and bending moment in beams:** Shear Force and Bending Moment: Signs Convention for S.F. and B.M,
	2nd	5.2 S.F and B.M of general cases of determinate beams with concentrated loads and udl only,
	3rd	Problem practice
	4th	Problem practice
8th	1st	5.2 S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.
	2nd	Problem practice
	3rd	Problem practice
	4th	Problem practice
9th	1st	**6.1 Introduction:** Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection
	2nd	Problem practice
	3rd	Problem practice
	4th	Problem practice
10th	1st	**6.2** Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).
	2nd	Problem practice
	3rd	Problem practice
	4th	Problem practice
11th	1st	**7.1** Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever
	2nd	fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)
	3rd	Problem practice
	4th	Problem practice
12th	1st	**8.1 Introduction:** Types of trusses, statically determinate and indeterminate trusses
	2nd	Problem Practice
	3rd	Problem Practice
	4th	Problem Practice
13th	1st	8.1 degree of indeterminacy.
	2nd	Problem Practice

	3rd	Problem Practice
	4th	Problem Practice
14th	1st	8.2 stable and unstable trusses, advantages of trusses
	2nd	Problem Practice
	3rd	Problem Practice
	4th	Problem Practice
15th	1st	8.2 Detailed explanation of advantages
	2nd	8.2 Detailed explanation of Disadvantages
	3rd	PREVIOUS YEAR QUESTION DISCUSSION
	4th	REVISION