KIIT POLYTECHNIC, BHUBANESWAR

LESSON PLAN
Session (2023-2024)- (W)

Discipline : Civil Engineering	**Semester:** 3rd, W/2023	**Name of the Faculty:** Dr. Sanjukta Sahoo (Asst.Professor) **Email:** sanjuktafce@kp.kiit.ac.in
Subject: Structural Mechanics	**No. of Days/week:** 05	**Start Date:** 16/08/2023 **End Date:** 11/12/2023

Week	Class Day	Theory Topics
1st	1st	Basic Principle of Mechanics: Force, Moment, support conditions, Conditions of equilibrium, C.G & MI, Free body diagram
	2nd	Review of CG and MI of different sections
	3rd	Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability
	4th	Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains
	5th	Problem Practice
2nd	1st	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain
	2nd	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	Review and Doubt Clearing
	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
	5th	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	Problem Practice
	2nd	Unit Test-1
	3rd	Major and minor principal stresses and their orientations, Mohr's Circle and its application to solve problems of complex stresses
	4th	Problem Practice
	5th	Problem Practice
4th	1st	Bending stress in beams – Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure– Flexural stress distribution
	2nd	Problem Practice
	3rd	Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
	4th	Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis
	5th	Problem Practice
5th	1st	Unit Test-2
	2nd	Concept of torsion, basic assumptions of pure torsion, torsion of solid and hollow circular sections
	3rd	Problem Practice
	4th	Quiz-1
	5th	polar moment of inertia, torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion
6th	1st	Problem Practice
	2nd	Unit Test-3
	3rd	Combination of stresses, Combined direct and bending stresses, Maximum and Minimum stresses in Sections, Conditions for no tension
	4th	Problem Practice
	5th	Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls
7th	1st	Problem Practice
	2nd	Problem Practice

	3rd	Unit Test-4
	4th	Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column
	5th	Euler's theory of long columns, Critical load for Columns with different end conditions
8th	1st	Problem Practice
	2nd	Problem Practice
	3rd	Unit Test-5
	4th	Doubt Clearing
	5th	Quiz-2
9th	1st	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports: Simple support, Roller support, Hinged support, Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction, Types of Beams based on support conditions
	2nd	Calculation of support reactions using equations of static equilibrium
	3rd	Problem Practice
	4th	Problem Practice
	5th	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
10th	1st	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	Unit Test-5
	5th	Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection
11th	1st	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	Doubt Clearing
	5th	Unit Test-5
12th	1st	Indeterminacy in beams, Principle of consistent deformation/compatibility
	2nd	Analysis of propped cantilever
	3rd	Problem Practice
	4th	Problem Practice
	5th	Quiz-3
13th	1st	fixed and two span continuous beams by principle of superposition
	2nd	fixed and two span continuous beams by principle of superposition
	3rd	Problem Practice
	4th	SF and BM diagrams (point load and udl covering full span)
	5th	Unit Test-6
14th	1st	Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses.
	2nd	Analytical method (Method of joints, method of Section)
	3rd	Problem Practice
	4th	Problem Practice
	5th	Unit Test-7
15th	1st	Quiz-4
	2nd	Previous years Q&A Discussion
	3rd	Doubt Clearing
	4th	Previous years Q&A Discussion
	5th	Doubt Clearing

Signature of the Concerned Teacher