ACADEMIC SESSION: WINTER-2022

Discipline :civil engg	**Semester:3rd**	**Name of the Teaching Faculty : SANJEEB MEHER**
Subject: structural mechanics	No. of Days / Week class allotted: 5	No. of Weeks : 15
Week	**Class day**	**Theory/Practical Topics:**
1st	1st	Basic Principle of Mechanics: Force, Moment, support conditions
	2nd	Conditions of equilibrium, C.G & MI
	3rd	Free body diagram
	4th	Review of CG and MI of different sections
	5th	Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity
2nd	1st	Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability.
	2nd	Creep, Fatigue, Tenacity, Durability
	3rd	Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains
	4th	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio, change in dimensions and volume etc,
	5th	Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants
3rd	1st	Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material
	2nd	Limit of proportionality, Elastic limit, Yield stress, Ultimate stress
	3rd	Breaking stress, Percentage elongation, Percentage reduction in area,
	4th	Significance of percentage elongation and reduction in area of cross section
	5th	Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self weight
4th	1st	Durga Puja Holiday
	2nd	
	3rd	
	4th	
	5th	
5th	1st	Principal stresses and strains: Occurrence of normal and tangential stresses,
	2nd	Concept of Principal stress and Principal Planes
	3rd	major and minor principal stresses and their orientations
	4th	Mohr's Circle and its application to solve problems of complex stresses
	5th	Problems
	1st	Stresses in beams due to bending: Bending stress in beams

6th	2nd	Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure– Flexural stress distribution – Curvature of beam
	3rd	Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
	4th	Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.
	5th	Stresses in shafts due to torsion: Concept of torsion, basic assumptions of pure torsion
7th	1st	torsion of solid and hollow circular sections, polar moment of inertia,
	2nd	torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion
	3rd	Combined bending and direct stresses: Combination of stresses, Combined direct and bending stresses
	4th	Maximum and Minimum stresses in Sections, Conditions for no tension,
	5th	Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls
8th	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)
9th	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: Calculation of support reactions using equations of static equilibrium
	4th	Shear Force and Bending Moment: Signs Convention for S.F. and B.M
	5th	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
	2nd	Simply supported beams and Over hanging beams
	3rd	Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M
	4th	problems
	5th	Slope and deflection Introduction: Shape and nature of elastic curve (deflection curve);
11th	1st	Relationship between slope, deflection and curvature (No derivation), 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	Problems
	4th	problems
	5th	Class test
12th	1st	Indeterminacy in beams
	2nd	Problems on indeterminacy
	3rd	Principle of consistent deformation/compatibility
	4th	Analysis of propped cantilever
	5th	problems
	1st	fixed and two span continuous beams by principle of superposition,

13th	2nd	problems
	3rd	SF and BM diagrams (point load and udl covering full span)
	4th	problems
	5th	Trusses Introduction: Types of trusses, statically determinate and indeterminate trusses
14th	1st	continue
	2nd	degree of indeterminacy
	3rd	Problems on degree of indeterminacy
	4th	stable and unstable trusses
	5th	advantages of trusses.
15th	1st	Analysis of trusses: Analytical method : Method of joints
	2nd	problems
	3rd	method of Section
	4th	problems
	5th	Previous year question discussion