Discipline: **CIVIL ENGINEERING**	Semester: 3rd	Name of the Teaching Faculty: **JYOTI PRAKASH BEHERA**
Subject: **STRUCTURAL MECHANICS**	No. of Days/per week class allotted: 05	Semester From Date: **01-08-2023**To Date: **30-11-2023** No. of Weeks : **15**
Week	**Class Day**	**Theory Topics**
1st	01	1.Review of Basic Concepts Basic Principle of Mechanics: Force, Moment, support conditions
	02	Conditions of equilibrium,
	03	C.G & MI, Free body diagram
	04	Review of CG and MI of different sections
	05	2. Simple and Complex Stress, Strain Simple Stresses and Strains Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness
2nd	01	Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability, Types of stresses -Tensile, Compressive and Shear stresses
	02	Types of strains - Tensile, Compressive and Shear strains, Complimentary shear stress
	03	Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain
	04	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.
	05	**Application of simple stress and strain in engineering field:** Behaviour of ductile and brittle materials under direct loads
3rd	01	Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress,
	02	Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area,
	03	Significance of percentage elongation and reduction in area of cross section, Deformation of prismatic bars due to uniaxial load
	04	Deformation of prismatic bars due to its self weight

	05	**Complex stress and strain** Principal stresses and strains
4th	01	Occurrence of normal and tangential stresses, Concept of Principal stress and Principal Planes
	02	major and minor principal stresses
	03	major and minor principal stresses and their orientations,
	04	Mohr's Circle and its application to solve problems of complex stresses
	05	**Stresses In Beams and Shafts** **Stresses in beams due to bending:** Bending stress in beams – Theory of simple bending – Assumptions
5th	01	Moment of resistance – Equation for Flexure– Flexural stress distribution – Curvature of beam
	02	Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
	03	**Shear stresses in beams:** Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.
	04	**Stresses in shafts due to torsion:** Concept of torsion
	05	basic assumptions of pure torsion, torsion of solid and hollow circular sections
6th	01	polar moment of inertia, torsional shearing stresses
	02	angle of twist, torsional rigidity, equation of torsion
	03	**Combined bending and direct stresses:** Combination of stresses, Combined direct and bending stresses, Maximum and Minimum stresses in Sections, Conditions for no tension, Limit of eccentricity,
	04	Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls
	05	**Columns and Struts** Columns and Struts, Definition, Short and Long columns
7th	01	End conditions, Equivalent length / Effective length,
	02	Slenderness ratio, Axially loaded short and long column, Euler's theory of long columns,
	03	Critical load for Columns with different end conditions
	04	**Shear Force and Bending Moment** Types of loads and beams: Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL),
	05	Types of Supports: Simple support, Roller support, Hinged support,

		Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction,
8th	01	Types of Beams based on support conditions:
	02	Calculation of support reactions using equations of static equilibrium
	03	Shear force and bending moment in beams
	04	Shear Force and Bending Moment: Signs Convention for S.F. and B.M,
	05	S.F and B.M of general cases of determinate beams with concentrated loads and udl only
9th	01	S.F and B.M diagrams for Cantilevers
	02	S.F and B.M diagrams for Simply supported beams
	03	S.F and B.M diagrams for Over hanging beams
	04	Position of maximum BM, Point of contra flexure
	05	Relation between intensity of load, S.F and B.M.
10th	01	**Slope and Deflection** Introduction
	02	Shape and nature of elastic curve (deflection curve)
	03	Relationship between slope, deflection and curvature
	04	Importance of slope and deflection
	05	Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).
11th	01	Slope and deflection of cantilever beams under concentrated and uniformly distributed load (by Double Integration method,).
	02	Slope and deflection of simply supported beams under concentrated and uniformly distributed load (by Double Integration method).
	03	Slope and deflection ofcantilever beams under concentrated and uniformly distributed load (by Macaulay's method).
	04	Slope and deflection of simply supported beams under concentrated load (by Macaulay's method).
	05	Slope and deflection of simply supported beams under uniformly distributed load (by Macaulay's method).
12th	01	**Indeterminate Beams** Indeterminacy in beams
	02	Principle of consistent deformation/compatibility

	03	Analysis of propped cantilever beams by principle of superposition(point load)
	04	Analysis of fixed beamsby principle of superposition (point load)
	05	Analysis of two span continuous beams by principle of superposition (point load)
13th	01	Analysis of propped cantilever beams by principle of superposition(udl)
	02	Analysis of fixed beamsby principle of superposition (udl)
	03	Analysis of two span continuous beams by principle of superposition (udl)
	04	SF and BM diagrams of propped cantilever beam
	05	SF and BM diagrams of fixed and continuous beams
14th	01	**Trusses** Introduction
	02	Types of trusses
	03	statically determinate and indeterminate trusses
	04	degree of indeterminacy,
	05	stable and unstable trusses, advantages of trusses
15th	01	Analysis of trusses
	02	Analytical method (Method of joints)
	03	Analytical method (Method of joints)
	04	Analytical method (method of Section)
	05	Analytical method (method of Section)