INSTITUTE OF ENGINEERING AND MANAGEMENT

GOURAHARI VIHAR, PO: RANIPUT, JEYPORE – 764 005

LESSON PLAN

Name of the Subject: Stuructural Mechanics
Name of the Faculty: Bhupendra Pratap Dongri
Semester: Third Semester **Branch:** Civil Engineering
Semester From: July to December **No. of Weeks:** 15 Weeks

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
	4th	Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity
	5th	Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility
	6th	Malleability, Creep, Fatigue, Tenacity, Durability
2nd	1st	Types of stresses -Tensile, Compressive and Shear stresses
	2nd	Types of strains - Tensile, Compressive and Shear strains
	3rd	Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction
	4th	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	2.2 Application of simple stress in engineering field
	2nd	Application of simple strain in engineering field
	3rd	Behaviour of ductile and brittle materials under direct loads
	4th	Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area
	5th	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.
4th	1st	2.3 Complex stress and strain 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, Mohr's Circle and its application to solve problems of complex stresses

	4th	Stresses In Beams and Shafts
	5th	3.1 Stresses in beams due to bending: Bending stress in beams – Theory of simple bending
5th	1st	Assumptions
	2nd	Moment of resistance
	3rd	Equation for Flexure
	4th	Flexural stress distribution
	5th	Curvature of beam
	6th	Position of N.A.
6th	1st	Stresses in shafts due to torsion: Concept of torsion, basic assumptions of pure torsion
	2nd	Torsion of solid and hollow circular sections, polar moment of inertia
	3rd	Torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion
	4th	Combined bending and direct stresses: Combination of stresses, Combined direct and bending stresses, Maximum and Minimum stresses in Sections, Conditions for no tension
	5th	Limit of eccentricity, Middle third/fourth rule, Core or Kern for square
	6th	Rectangular and circular sections, chimneys, dams and retaining walls
7th	1st	4.1 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, Critical load for Columns with different end conditions Shear Force and Bending Moment
	4th	5.1 Types of loads and beams: Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL)
	5th	Types of Supports: Simple support, Roller support, Hinged support, Fixed support
8th	1st	Types of Reactions: Vertical reaction
	2nd	Horizontal reaction
	3rd	Moment reaction
	4th	Types of Beams based on support conditions
	5th	Calculation of support reactions using equations of static equilibrium.
9th	1st	5.2 Shear force and bending moment in beams: Shear Force and Bending Moment: Signs Convention for S.F
	2nd	Signs Convention for B.M, S.F and B.M of general cases of determinate beams with concentrated loads and udl only
	3rd	S.F and B.M diagrams for Cantilevers
	4th	S.F and B.M diagrams forSimply supported beamsand Over hanging beams
	5th	Position of maximum BM, Point of contra flexure, Relation betweenintensity of load, S.F and B.M
10th	1st	Slope and Deflection 6.1 Introduction: Shape and nature of elastic curve (deflection curve)
	2nd	Relationship between slope, deflection and curvature (No derivation)
	3rd	Importance of slope and deflection

	4th	Slope and deflection of cantileverbeams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method)
	5th	Slope and deflection ofsimply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method)
11th	1st	7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility
	2nd	Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition
	3rd	SF and BM diagrams (point load and udl covering full span)
	4th	Trusses 8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses
	5th	Degree of indeterminacy, stable and unstable trusses, advantages of trusses
12th	1st	8.2 Analysis of trusses: Analytical method (Method of joints, method of Section)
	2nd	PREVIOUS YEAR QUESTIONS DISCUSSIONS
	3rd	REVISION
	4th	
	5th	