LESSON PLAN

Discipline: Civil Engg.	**Semester:** Third (3rd)	Name of the Faculty: Er Bapuji Nayak
Subject: Structural Mechanics	**No. of days per week class allotted:** Four (4)	Semester from Date: 15.09.22 to Date: 22.12.22 No. of Weeks: 15
WEEK	**CLASS DAY**	THEORY TOPICS
1st	1st	Basic principle of mechanics ; force, moment , support conditions, conditions of equilibrium
	2nd	C.G and MI free body diagram
	3rd	Review of CG and MI of different sections Review class
	4th	Introduction to stresses and strains: mechanical properties of materials- Rigidity ,Elasticity, Plasticity , Compressibility
2nd	1st	Hardness ,Toughness , Stiffness , Brittleness , Ductility, Malleability, Creep, Fatigue, Tenacity, Durability
	2nd	Types of stresses -Tensile, Compressive and Shear stresses,
	3rd	Types of strains - Tensile, Compressive and Shear strains, complimentary shear stress diagonal tensile / comp.
	4th	Stresses due to shear elongation and contraction longitudinal and lateral strain, poison ratio, volumetric strain ,computation of stress strain poison ratio,change in dimensions and volume etc Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants
3rd	1st	Application of simple stress and strain in engineering field: Behavior 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, Breaking stress, Percentage elongation, Percentage reduction in area,
	3rd	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	Complex stress and strains -Principal stresses and strains: Occurrence of normal and tangential stresses, Concept of Principal stress and Principal Planes,
4th	1st	major and minor principal stresses and their orientations, Mohr's Circle and its application to solve problems of complex stresses

	2nd	Problems for practice
	3rd	Stresses in beams due to bending: Bending stress in beams – Theory of simple bending – Assumptions – Moment of resistance , Review class
	4th	**Monthly test**
5th	1st	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
	2nd	Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.
	3rd	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, 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.
6th	1st	Limit of eccentricity, Middle third/fourth rule,
	2nd	Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls
	3rd	**Review class**
	4th	Columns and Struts Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio
7th	1st	Axially loaded short and long column, Euler's theory of long columns, Critical load for Columns with different end conditions
	2nd	**Review class**
	3rd	Types of loads Concentrated (or) Point load, Uniformly Distributed load (UDL),
	4th	Types of Supports: Simple support, Roller support, Hinged support, Fixed support.
8th	1st	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction.

	2nd	Types of Beams based on support conditions:
	3rd	Calculation of support reactions using equations of static equilibrium Shear force and bending moment in beams:
	4th	Shear Force and Bending Moment: Signs Convention for S.F. and B.M
9th	1st	S.F and B.M of general cases of determinate beams with concentrated loads and udl only
	2nd	S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams,
	3rd	**Monthly test**
	4th	Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M
10th	1st	**Review class**
	2nd	Introduction -Shape and nature of elastic curve (deflection curve);
	3rd	Relationship between slope, deflection and curvature (No derivation)
	4th	Importance of slope and deflection.
11th	1st	Slope and deflection of cantilever
	2nd	Slope and deflection of simply supported beams under concentrated and uniformly distributed load
	3rd	Double Integration method, Macaulay's method).
	4th	Problems for practice
12th	1st	**Review class**
	2nd	Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever,

	3rd	Fixed and two span continuous beams by principle of superposition,
	4th	**Monthly test**
13th	1st	SF and BM diagrams (point load and udl covering full span
	2nd	Problems for practice
	3rd	Problems for practice
	4th	**Review class**
14th	1st	Introduction -Types of trusses, statically determinate and indeterminate trusses
	2nd	Degree of indeterminacy
	3rd	Stable and unstable trusses, advantages of trusses.
	4th	Analysis of trusses
15th	1st	Analytical method (Method of joints, method of Section)
	2nd	**Monthly test**
	3rd	Problems for analysis
	4th	Problems for analysis Review class