LESSON PLAN: (STRUCTRUAL MECHANICS)		
Discipline :	**CIVIL ENGINEERING**	
Faculty :	**ASHIS RANJAN PATEL**	
Semester :	**3RD**	
Duration :	**14 WEEKS (15th September 2022 to 22nd December 2022)**	
Work Load :	**Lecture :**	**5 Lectures per week (50 minutes per Class)**
Week	**Week Day**	**Theory**
1st	1st	Basic Principle of Force, Moment
	2nd	Basic Principle of support conditions
	3rd	Conditions of equilibrium 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, Compressibility, Hardness, Toughness, Stiffness, Brittleness
2nd	6th	Ductility, Malleability, Creep, Fatigue, Tenacity, Durability, Types of stresses - Tensile, Compressive and Shear stresses, ,
	7th	Types of strains - Tensile, Compressive and Shear strains, Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear
	8th	Elongation and Contraction, Longitudinal and Lateral strains, Poisson's Ratio, Volumetric strain,
	9th	computation of stress, strain, Poisson's ratio, change in dimensions and volume
	10th	Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.
3rd	11th	Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material,
	12th	Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation,
	13th	Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section,
	14th	Deformation of prismatic bars due to uniaxial load
	15th	Deformation of prismatic bars due to its self weight.
4th	16th	Principal stresses and strains: Occurrence of normal and tangential stresses
	17th	Concept of Principal stress and Principal Planes
	18th	major and minor principal stresses and their orientations,
	19th	Mohr's Circle and its application to solve problems of complex stresses
	20th	**Stresses in beams due to bending:** Bending stress in beams –
5th	21st	Theory of simple bending – Assumptions
	22nd	Moment of resistance – Equation for Flexure– Flexural stress distribution – Curvature of beam
	23rd	Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus
	24th	**Shear stresses in beams:** Shear stress distribution in beams of rectangular
	25th	circular and standard sections symmetrical about vertical axis.
6th	26th	**Stresses in shafts due to torsion:** Concept of torsion, basic assumptions of pure torsion,
	27th	torsion of solid and hollow circular sections, polar moment of inertia, torsional shearing stresses, angle of twist, tensional rigidity, equation of torsion
	28th	**Combined bending and direct stresses:** Combination of stresses, Combined direct and bending stresses, Maximum and Minimum stresses in Sections

	29th	Conditions for no tension, Limit of eccentricity, Middle third/fourth rule,
	30th	Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls
7th	31st	Columns and Struts, Definition, Short and Long columns End conditions,
	32nd	Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column,
	33rd	Euler's theory of long columns
	34th	Critical load for Columns with different end conditions
	35th	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL),
8th	36th	Types of Supports: Simple support, Roller support,
	37th	Hinged support, Fixed support,
	38th	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction,
	39th	Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium.
	40th	Problem solving of static equilibrium
9th	41st	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,
	42nd	S.F and B.M diagrams for Cantilevers,
	43rd	Simply supported beams and Over hanging beams, Position of maximum BM,
	44th	Point of contra flexure
	45th	Relation between intensity of load, S.F and B.M.
10th	46th	Problem solving of S.F and B.M
	47th	Shape and nature of elastic curve (deflection curve);
	48th	Relationship between slope,
	49th	deflection and curvature (No derivation),
	50th	Importance of slope and deflection
11th	51st	Problem solving of slope and deflection
	52nd	Slope and deflection of cantilever
	53rd	Slope and deflection of simply supported beams under concentrated load
	54th	Slope and deflection of uniformly distributed load by Double Integration method
	55th	Slope and deflection of uniformly distributed load by Macaulay's method
12th	56th	Problem solving on UDL
	57th	Indeterminacy in beams
	58th	Principle of consistent deformation/compatibility
	59th	Analysis of propped cantilever
	60th	fixed and two span continuous beams by principle of superposition
13th	61st	Problems of propped cantilever
	62nd	Problems of fixed and two span continuous beams
	63rd	SF and BM diagrams (point load and udl covering full span)
	64th	Problems of SF and BM diagrams
	65th	**Trusses** : **Introduction**
14th	66th	Types of trusses
	67th	statically determinate and indeterminate trusses
	68th	degree of indeterminacy
	69th	stable and unstable trusses
	70th	advantages of trusses