LESSON PLAN OF STRUCTURAL MECHANICS 3RD SEM SEC A			
DISCIPLINE : CIVIL ENGG.	**Semester : 3rd sem (sec. A)**	**Name of the Teaching faculty: DEBASHIS BEHERA**	
Subject :- Structural Mechanics	**No.of Days/ week class allotted : 03 DAYS (05 PERIODS)**	**Semester from date: 15/09/2022 to 22/12/2022** **No. of Weeks :15** **Topics to be covered:-**	
Week	**Class Day**	**Topics**	**Remarks**
		1 Review Of Basic Concepts(04 PERIODS)	
1st Week (15 th Sept- 17 th Sept)	1	1.1 Basic Principle of Mechanics: Force, Moment, support conditions, Conditions of equilibrium, C.G & MI, Free body diagram	
	1	1.2 Review of CG and MI of different sections	
	2	1.2 Review of CG and MI of different sections	
		2 Simple And Complex Stress, Strain(15 PERIODS)	
2ND WEEK 19 SEPT to 24th sept)	2	2.1 Simple Stresses and Strains Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability, Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains, 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, Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.	
2ND WEEK 19 SEPT to 24th sept)	3	2.1 Simple Stresses and Strains Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability, Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains, 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, Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.	

3RD WEEK 26th sept to 1st ct)	1	2.1 Simple Stresses and Strains Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity, Durability, Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains, 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, Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.	
	2	2.2 Application of simple stress and strain in engineering field: Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area, 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	
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4TH WEEK	**DURGA PUJA**		
5TH WEEK 10th oct to 15th oct)	1	2.2 Application of simple stress and strain in engineering field: Behaviour of ductile and brittle materials under direct loads, Stress Strain curve of a ductile material, Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress, Percentage elongation, Percentage reduction in area, 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	
	2	2.3 Complex stress and strain Principal stresses and strains: Occurrence of normal and tangential stresses, Concept of Principal stress and Principal Planes, major and minor principal stresses and their orientations, Mohr's Circle and its application to solve problems of complex stresses	
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6TH WEEK 17th oct to 22nd oct)	1	2.3 Complex stress and strain Principal stresses and strains: Occurrence of normal and tangential stresses, Concept of Principal stress and Principal Planes, major and minor principal stresses and their orientations, Mohr's Circle and its application to solve problems of complex stresses	
6TH WEEK 17th oct to 22nd oct)		**3 Stresses In Beams and Shafts(10 PERIODS)**	
	2	3.1 Stresses in beams due to bending: Bending stress in beams – Theory of simple bending – Assumptions – 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	
	3	3.1 Stresses in beams due to bending: Bending stress in beams – Theory of simple bending – Assumptions – 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	
7TH WEEK 24th oct to 29th oct	2	3.2 Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis	
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8TH WEEK 31st oct to 5th nov	1	3.3 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	
8TH WEEK 31st oct to 5th nov	2	3.4 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, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining wall	
		4. Columns and Struts(04)	
	3	4.1 Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column, Euler's theory of long columns, Critical load for Columns with different end conditions	
9TH WEEK 7th nov to 12th nov	1	4.1 Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio, Axially loaded short and long column, Euler's theory of long columns, Critical load for Columns with different end conditions	

		5. Shear Force and Bending Moment (12)	
9TH WEEK 7th nov to 12th nov	3	5.1 Types of loads and beams: Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports: Simple support, Roller support, Hinged support, Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction, Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium. 5.2 Shear force and bending moment in beams: 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, S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M	
10TH WEEK 14th nov to 19th nov	1	5.1 Types of loads and beams: Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of Supports: Simple support, Roller support, Hinged support, Fixed support, Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction, Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium. 5.2 Shear force and bending moment in beams: 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, S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M	
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11TH WEEK 21st nov to 26th nov	1	5.2 Shear force and bending moment in beams: 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, S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.	
	2	5.2 Shear force and bending moment in beams: 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, S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.	
	3	5.2 Shear force and bending moment in beams: 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, S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM, Point of contra flexure, Relation between intensity of load, S.F and B.M.	
12TH WEEK 28th nov to 3rd dec		**6. Slope and Deflection(10)**	
	1	6.1 Introduction: Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.	
	2	6.1 Introduction: Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.	
	3	6.1 Introduction: Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection.	
13TH WEEK 5th dec to 10th dec	1	6.2 Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).	
	2	6.2 Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).	

13TH WEEK 5th dec to 10th dec	3	6.2 Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method).	
14TH WEEK 12th dec to 17th dec		**7. Indeterminate Beams(10)**	
	1	7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)	
	2	7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)	
	3	7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)	
15TH WEEK 19th dec to 22nd dec	1	7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)	
	2	7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)	
	3	7.1 Indeterminacy in beams, Principle of consistent deformation/compatibility, Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition, SF and BM diagrams (point load and udl covering full span)	
		8. Trusses(10)	
EXTRA CLASSES	1	8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses	
	2	8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses	
	3	8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses	
	1	8.2 Analysis of trusses: Analytical method (Method of joints, method of Section)	
	2	8.2 Analysis of trusses: Analytical method (Method of joints, method of Section)	
	3	8.2 Analysis of trusses: Analytical method (Method of joints, method of Section)	

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