

| DISCIPLINE CIVIL | SEMESTER:3RD | NAME OF THE TEACHING FACULTY: ASUTOSH MOHAPATRA |
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| SUBJECT NAME: STRUCTURAL MECHANICS | No. of Days per Week Class Allotted: 4days | Semester From Date: 15/09/2022 To Date: 22/12/2022 No of Weeks :15 |
| Week | Class Day | Theory Topics |
| September 3rd week | 3rd week- (1st,2nd,3rd,4th day) | Review Of Basic Concepts 1.1 Basic Principle of Mechanics: Force, Moment, support conditions, Conditions of equilibrium, C.G & MI, Free body diagram 1.2 Review of CG and MI of different sections |
| September 4th week October 1st week October 2nd week | 4th week- 1st day,2nd,3rd,4th day) 5th week - 1st,2nd day,3rd,4th day October- 1st week- 1,2,3,4th day 2nd week- 1,2nd day | <p>2.1 Simple Stresses and Strains</p> <p>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</p> <p>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 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.2.3 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</p> |

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| | | <p>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</p> <p>3.2 Shear stresses in beams: Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.</p> <p>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</p> <p>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 walls</p> |
| October 2nd week 3rd week 4th week | 2nd week- 3,4th day 3rd week - 1,2,3,4th day 4th week - (1st 2nd 3rd 4th day) | <p>Columns and Struts</p> <p>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</p> |
| October 5th week | 5th week- 1st, 2,3,4th day | <p>Class Test</p> |
| October 5th week | 5th week-4th day | <p>Shear Force and Bending Moment</p> <p>5.1 Types of loads and beams:</p> <p>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.</p> <p>5.2 Shear force and bending moment in beams:</p> <p>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</p> |
| November - 1st week 2nd week 3rd week | 1st week-1st, 2nd, 3rd 4th day 2nd week- 1,2,3,4th day 3rd week- 1,2,3day | |
| November - 3rd week | 3rd week - Day 4 | <p>Internal Assessment</p> |

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| November- 4th week 5th week | November 4th week -1,2,3,4th day 5th week- 1,2,3,4th day | Slope and Deflection 6.1 Introduction: Shape and nature of elastic curve (deflection curve); Relationship between slope, deflection and curvature (No derivation), Importance of slope and deflection. 6.2 Slope and deflection of cantilever and simply supported beams under concentrated and uniformly distributed load (by Double Integration method, Macaulay's method) |
| December 1st week 2nd week | 1st week- 1,2,3,4th day 2nd week- 1,2,3,4th day | Indeterminate Beams 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) |
| December- 2nd week 3rd week | 2nd week- 1,2,3,4th day 3rd week- 1,2,3,4th day | 8 Trusses 8.1 Introduction: Types of trusses, statically determinate and indeterminate trusses, degree of indeterminacy, stable and unstable trusses, advantages of trusses 8.2 Analysis of trusses: Analytical method (Method of joints, method of Section) |
| December- 3rd week | 3rd week- 4th Day | Class Test |

A. Mahapatra

29/01/22

Ashutosh Mahapatra
(PT of civil)