BHUBANANANDA ODISHA SCHOOL OF ENGINEERING, CUTTACK

 DEPARTMENT OF CIVIL ENGINEERING



LESSON PLAN

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| SUBJECT: STRUCTURAL MECHANICS(TH 1) | ACCADEMIC SESSION: 2021-22 |
| FACULTY: SANGEETA MOHANTY | SEMESTER: 3 RD  |
|  | SEC: B |

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| H O D (Civil Engg.) |

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| **Discipline:** **Civil Engineering**  | **Semester: 3rd** | **Name of the teaching faculty: Dr. Sangeeta Mohanty** |
| **Subject:** **Structural Mechanics**  | **No. of Days/ per week class allotted: 05 periods per week. (Monday-1 period, Tuesday-2 period,** **Wednessday-1 period, Thursday-1 period)**  | **Semester From Date: 01-10-2021 To Date: 08-012022** **No. of weeks: 13 weeks**  |
| **Week**  | **Class Day**  | **No of period available**  | **Theory Topics**  |
| 1ST  | 04/10/2021  | 1  | **1.0 Review Of Basic Concepts** **1.1** Basic Principle of Mechanics: Force, Moment, support conditions,  |
| 05/10/2021  | 2  | **1.1** Conditions of equilibrium, C.G & MI, Free body diagram  |
| 07/10/2021  | 1  | **1.2** Review of CG and MI of different sections  |
| 2ND  | 21/10/2021  | 1  | **2.0Simple And Complex Stress, Strain** **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,  |
| 3RD  | 25/10/2021  | 1  | 2.1 Types of stresses -Tensile, Compressive and Shear stresses, Types of strains - Tensile, Compressive and Shear strains,  |
| 26/10/2021  | 2  | 2.1 Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, 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,  |

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|  | 27/10/2021  | 1  | 2.1Hooke’s law - Elastic Constants, Derivation of relationship between the elastic constants.  |
| 28/10/2021  | 1  | Monthly Class Test  |
| 4TH  | 01/11/2021  | 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  |
| 02/11/2021  | 2  |  2.2 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  |
| 03/11/2021  | 1  | 2.2 Deformation of prismatic bars due to uniaxial load, Deformation of prismatic bars due to its self weight |
| 5TH  | 08/11/2021  | 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  |
| 09/11/2021  | 2  | 2.3 Mohr’s Circle and its application to solve problems of complex stresses  |
| 10/11/2021  | 1  | **3.0Stresses In Beams and Shafts** **3.1 Stresses in beams due to bending:** Bending stress in beams – Theory of simple bending – Assumptions  |
| 11/11/2021  | 1  | 3.1 Moment of resistance – Equation for Flexure– Flexural stress distribution –  |

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| 6TH  | 15/11/2021  | 1  | 3.1 Curvature of beam – Position of N.A. and Centroidal Axis – Flexural rigidity – Significance of Section modulus  |
| 16/11/2021  | 2  | **3.2 Shear stresses in beams:** Shear stress distribution in beams of rectangular, circular and standard sections symmetrical about vertical axis.  |
| 17/11/2021  | 1  | **3.3 Stresses in shafts due to torsion:** Concept of torsion, basic assumptions of pure torsion,  |
| 18/11/2021  | 1  | 3.3 torsion of solid and hollow circular sections, polar moment of inertia torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion  |
| 7TH  | 22/11/2021  | 1  | **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,  |
| 23/11/2021  | 2  | 3.4 Limit of eccentricity, Middle third/fourth rule, Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls  |
| 24/11/2021  | 1  | **4.0Columns and Struts** **4.1** Columns and Struts, Definition, Short and Long columns, End conditions, Equivalent length / Effective length, Slenderness ratio,  |
| 25/11/2021  | 1  | 4.1 Axially loaded short and long column, Euler’s theory of long columns, Critical load for Columns with different end conditions  |
| 8TH  | 29/11/2021  | 1  |  Monthly Class Test  |
| 30/11/2021  | 2  | **5.0 Shear Force and Bending Moment** **5.1 Types of loads and beams:** Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL), Types of  |

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|  |  |  | Supports: Simple support, Roller support, Hinged support, Fixed support,  |
| 01/12/2021  | 1  | Internal Assessment  |
| 02/12/2021  | 1  | Internal Assessment  |
| 9TH  | 06/12/2021  | 1  | 5.1Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction  |
| 07/12/2021  | 2  | 5.1Types of Beams based on support conditions: Calculation of support reactions using equations of static equilibrium.  |
| 08/12/2021  | 1  | 5.1 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  |
| 09/12/2021  | 1  | 5.1 S.F and B.M diagrams for Cantilevers, Simply supported beams and Over hanging beams, Position of maximum BM  |
| 10TH  | 13/12/2021  | 1  | 5.1 Point of contra flexure, Relation between intensity of load, S.F and B.M.  |
| 14/12/2021  | 2  | **6.0Slope and Deflection** **6.1 Introduction:** Shape and nature of elastic curve (deflection curve);  |
| 15/12/2021  | 1  | 6.1Relationship between slope deflection and curvature (No derivation), Importance of slope and deflection.  |
| 16/12/2021  | 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).  |
| 11TH  | 20/12/2021  | 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).  |
| 21/12/2021  | 2  | **7.0Indeterminate Beams** **7.1** Indeterminacy in beams, Principle of consistent deformation/compatibility  |
| 22/12/2021  | 1  | 7.1 Analysis of propped cantilever, fixed and two span continuous beams by principle of superposition  |
| 23/12/2021  | 1  | 7.1 SF and BM diagrams (point load and udl covering full span)  |
| 12TH  | 27/12/2021  | 1  | **8.0Trusses** **8.1 Introduction:** Types of trusses, statically determinate and indeterminate trusses  |
| 28/12/2021  | 2  | **8.2 Analysis of trusses:** Analytical method ( Method of joints, method of Section)  |
| 29/12/2021  | 1  | 8.2 degree of indeterminacy, stable and unstable trusses, advantages of trusses.  |
| 30/12/2021  | 1  | Monthly Class Test  |
| 13TH  | 03/01/2022  | 1  | Revision  |
| 04/01/2022  | 2  | Revision  |
| 05/01/2022  | 1  | Revision  |
| 06/01/2022  | 1  | Previous Year Questions Discussion  |