ACADEMIC LESSION PLAN FOR WINTER 3RD SEMESTER 2022 .

Deptt. Of Civil Engg. , Govt. Polytechnic ,Balasore.

Name of the Faculty : FRANKAN KUMAR BASA

Structural Mechanics

Course Code : Th-1

Theory : 5 P/W
Total Period s: 75 P/ Sem
Examination : 3 Hours
Semester : 3rd

Class Test : 20 Marks
End Semester Exam : 80marks
TOTAL MARKS : 100 Marks
START- 15/09/2022

WEEK	PERIOD	TOPIC
1st	1st	Basic Principle of Mechanics: Force, Moment, support conditions,
	2nd	Conditions of equilibrium, C.G & MI, Free body diagram Review of CG
	3rd	Conditions of equilibrium, C.G & MI, Free body diagram Review of CG
	4th	MI of different sections
	5th	Introduction to stresses and strains: Mechanical properties of materials – Rigidity, Elasticity, Plasticity, Compressibility, Hardness, Toughness, Stiffness, Brittleness, Ductility, Malleability, Creep, Fatigue, Tenacity,
2nd	1st	Durability, Types of stresses -Tensile, Compressive and Shear stresses,
	2nd	Types of strains - Tensile, Compressive and Shear strains, Complimentary shear stress - Diagonal tensile / compressive Stresses due to shear, Elongation and Contraction, Longitudinal and Lateral
	3rd	strains, Poisson's Ratio, Volumetric strain, computation of stress, strain, Poisson's ratio, change in dimensions and volume etc,
	4th	Hooke's law - Elastic Constants, Derivation of relationship between the elastic constants.
	5th	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,
3rd	1st	Limit of proportionality, Elastic limit, Yield stress, Ultimate stress, Breaking stress,
	2nd	Percentage elongation, Percentage reduction in area, Significance of percentage elongation and reduction in area of cross section,
	3rd	Deformation of prismatic bars due to uniaxial load,
	4th	Deformation of prismatic bars due to its self weight.
	5th	Complex stress and strain
4th	1st	Principal stresses and strains: Occurrence of normal and tangential stresses,
	2nd	Concept of Principal stress and Principal Planes, major and minor principal stresses and their orientations,
	3rd	Mohr's Circle and its application
	4th	Mohr's Circle and its application to solve problems of complex stresses
	5th	Stresses in beams due to bending: Bending stress in beams
5th	1st	Theory of simple bending – Assumptions – Moment of resistance – Equation for Flexure Flexural stress distribution – Curvature of beam – Position of N.A.
	2nd	Centroidal Axis – Flexural rigidity – Significance of Section modulus

	3rd	Shear stresses in beams: Shear stress distribution in beams of rectangular,
	4th	Shear stresses in beams circular and standard sections symmetrical about vertical axis.
	5th	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,
6th	1st	Torsional shearing stresses, angle of twist, torsional rigidity, equation of torsion
	2nd	Combined bending and direct stresses: Combination of stresses, Combined direct and bending stresses, Maximum and Minimum stresses in Sections,
	3rd	Conditions for no tension, Limit of eccentricity, Middle third/fourth rule,
	4th	Core or Kern for square, rectangular and circular sections, chimneys, dams and retaining walls
	5th	Columns and Struts, Definition, Short and Long columns,
7th	1st	End conditions, Equivalent length / Effective length, Slenderness ratio,
	2nd	Axially loaded short and long column, Euler's theory of long columns,
	3rd	Critical load for Columns with different end conditions
	4th	Types of loads and beams:
	5th	Types of Loads: Concentrated (or) Point load, Uniformly Distributed load (UDL),
8th	1st	Types of Supports: Simple support, Roller support, Hinged support, Fixed support,
	2nd	Types of Reactions: Vertical reaction, Horizontal reaction, Moment reaction
	3rd	Types of Beams based on support conditions:
	4th	Calculation of support reactions using equations of static equilibrium.
	5th	Shear force and bending moment in beams:
9th	1st	Shear Force and Bending Moment: Signs Convention for S.F. and B.M, S.F
	2nd	B.M of general cases of determinate beams with concentrated loads and udl only, S.F and B.M diagrams for Cantilevers,
	3rd	Simply supported beams and Over hanging beams,
	4th	And Position of maximum BM, Point of contra flexure,
	5th	Relation between intensity of load S.F and B.M.
10th	1st	Introduction: Shape and nature of elastic curve (deflection curve);
	2nd	Relationship between slope, deflection
	3rd	Relationship between slope, deflection
	4th	Curvature (No derivation),
	5th	Importance of slope and deflection.
11th	1st	Slope and deflection.
	2nd	Slope and deflection of cantilever
	3rd	Slope and deflection of cantilever

	4th	Simply supported beams under concentrated
	5th	Uniformly distributed load (by Double Integration method, Macaulay's method).
12th	1st	Indeterminacy in beams
	2nd	Principle of consistent deformation
	3rd	Principle of consistent deformation, /compatibility,
	4th	Analysis of propped cantilever
	5th	Fixed and two span continuous beams by principle of superposition
13th	1st	Fixed and two span continuous beams by principle of superposition
	2nd	SF and BM diagrams (point load
	3rd	SF and BM diagrams (udl covering full span)
	4th	SF and BM diagrams (point load and udl covering full span)
	5th	SF and BM diagrams (point load and uvl covering full span)
14th	1st	Types of trusses,
	2nd	Statically determinate
	3rd	Indeterminate trusses,
	4th	Indeterminate trusses,
	5th	Degree of indeterminacy,
15th	1st	Degree of indeterminacy,
	2nd	Stable and unstable trusses
	3rd	Stable and unstable trusses
	4th	Advantages of trusses.
	5th	Disadvantages of trusses.