

Subject Code: 1ET4010301	Subject Title: Mechanics Of Structure-I
Pre-Requisite	----

RATIONALE:

The Engineering Mechanics in Second Semester was taught to study the external effects on the body due to action of force system. The behavior of structure under different loading conditions is needed to understand so that design can do by the engineer. In this course, analysis of determinate structures under action of transverse loading, along with analysis of members under direct loading is to be studied. Analysis of Industrial Trusses is also incorporated to give an idea of typical structure to the students. The Mechanics of Structure-I, will enable the student to analyses Steel & Concrete Structures used in Civil Engineering construction.

COURSE OBJECTIVE:

Following are the objectives of this course:

- To learn properties of area and structural material properties.
- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements.
- Analyses of statically determinate trusses.
- To understand the concept of buckling loads for short and long columns.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)			
Lecture	Tutorial	Practical	Credit	Theory		Practical	
				University Assessment	Continuous Assessment	University Assessment	Continuous assessment
4	1	2	6	60	40	20	30

DETAILS OF COURSE CONTENTS:

Sr. NO.	TOPIC	Total Hrs.	WEIGHTAGE
1	Direct Stress & Strain 1.1 Different types of Structures and Loads 1.2 Direct Stress , linear Strain , Hook's Law 1.3 Numerical Problems on Direct Stress & Linear Strain. 1.4 Stress Strain curve of Mild Steel. 1.5 Modulus of Elasticity. Yield , Breaking & Ultimate Stress and factor of Safety along with numerical problems 1.6 Lateral Strain and Poisson's ratio with numerical problems 1.7 Basics Concepts of Shear Stress , Shear Strain & Shear Modulus, Bulk Modulus , volumetric Strain along with numerical Problems 1.8 Differentiate between Sudden , Gradual & Impact Loads with numerical problems 1.9 Define Strain Energy, Proof Resilience with numerical problems	12	20%

2	Moment Of Inertia 2.1 Moment of Inertia & its Importance 2.2 Parallel & Perpendicular Axis Theorem 2.3 Formula of Moment of Inertia of solid & Hollow sections like Rectangle, Triangle, Circle 2.4 Moment of Inertia about C.G for I section, H section, Channel Section, Angle Section, T Section and Built up Section	08	16%
3	S.F & B.M In Beam 3.1 Statically Determinate Beam Like Cantilever, Simply Supported & Over Hang Beam 3.2 Shear Force and Bending Moment and its relationship 3.3 Sagging & Hogging Bending Moment and its importance 3.4 Point of Contra-flexure & its importance 3.5 S.F & B.M Diagram for Cantilever, Simply Supported & Over Hang Beam subjected to Point Load and/or U.D.L	12	20%
4	Bending & Shear Stresses In Beam 4.1 Bending Theory Equation 4.2 Bending stress, Sectional Modulus, Neutral Axis 4.3 Apply Bending theory to Statically determinate beams having rectangular or circular section 4.4 Shear Stress equation 4.5 Shear Stress Distribution Diagram for Solid & Hollow Rectangular And Circular Section 4.6 Apply shear Stress Equation & Draw Shear Stress Distribution Diagram for I, H, T, Channel & Angle Section	10	18%
5	Analysis Of Truss 5.1 Perfect & Imperfect Truss 5.2 Various trusses for different spans and application 5.3 Analysis of Triangle, Howe, North Light & Fan trusses under Panel Point Loads using Graphical & Method of Joint	08	16%
6	Column & Strut 6.1 Column & Strut 6.2 Short & Long Column 6.3 End Condition of Column and effective Length of Column & Modes of Failure in column 6.4 Radius of Gyration, Slenderness Ratio & Euler's Crippling Load 6.5 Rankin's load / Buckling Load of Column	06	10%

COURSE OUTCOME:

After completing this course, student will be able to:

1. Articulate practical applications of moment of inertia of symmetrical and unsymmetrical Structural sections.
2. Analyse structural behaviour of materials under various loading conditions.
3. Interpret shear force and bending moment diagrams for various types of beams and loading Conditions.
4. Determine the bending and shear stresses in beams under different loading conditions.
5. Analyse the column for various loading and end conditions.

LIST OF PRACTICAL:

SR. No.	Experiment
1	Conduct Tension test on a given sample of mild steel and draw Stress Strain Curve
2	Determine Young's Modulus of wire of given material
3	Calculate impact value of mild steel using IZOD impact test apparatus
4	Calculate impact value of mild steel using Charpy impact test apparatus
5	Solve at least six problems pertaining to unit-1
6	Solve at least six Problems of unit-2
7	Solve at least Eight Problems of unit-3
8	Solve at Least Eight numerical Problems of unit-4
9	Analyses Truss using Graphical Method (At least Three Trusses) and verify using analytical method of unit-5
10	Demonstrate End Conditions of Column using suitable model/example
11	Solve Least Six numerical Problems pertaining unit-6

LIST OF REFERENCES:

Sr.no.	Title	Author
1	Strength of Material & Mechanics of Structures	B C Punamia
2	Strength of Material	SRamamurthan
3	Strength of Material	Timo Shanku
4	Theory of Structures	R S Khurmi