GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Civil Engineering

Semester: 3

Subject Code

Subject Name MECHANICS OF STRUCTURES – I

Sr. No.	Course content
1.	**INTRODUCTION :** 1.1 Define structure and structural member 1.2 Types of structures 1.2.1 RCC structures 1.2.2 Steel structures 1.3 Types of load and its effects 1.3.1 Tensile load 1.3.2 Compressive load 1.3.3 Shear load 1.3.4 Transverse load 1.3.5 Torsion load
2.	**DIRECT STRESS AND STRAIN :** 2.1 Direct stress 2.1.1 Internal resistance under axial load 2.1.2 Stress and its unit 2.1.3 Distinguish 2.2 Strain 2.2.1 Explain deformation 2.2.2 Define linear strain and lateral strain 2.2.3 Define Poisson's ratio 2.2.4 Problems on stress and strain 2.3 Modulus of elasticity 2.3.1 Explain Hooke's law 2.3.2 Define modulus of elasticity 2.3.3 Explain behaviour of ductile material under axial tension 2.3.4 Explain stress-strain curve for mild steel 2.3.5 Distinguish between ultimate stress, breaking stress, elastic limit and proportionality limit 2.3.6 Problems of stress and strain, modulus of elasticity 2.4 Factor of safety 2.4.1 Define working stress 2.4.2 Distinguish between working stress and ultimate stress 2.4.3 Define factor of safety 2.4.4 Problems on factor of safety 2.5 Shear stress, strain and modulus of rigidity 2.5.1 Define shear stress and shear strain 2.5.2 Define modulus of rigidity/shear modulus 2.5.3 Problems on shear stress and strain 2.6 Stresses in composite sections

	2.6.1 Explain composite section 2.6.2 Define modular ratio 2.6.3 Load shared and stress induced in each material 2.6.4 Problems on composite section 2.7 Volumetric strain and bulk modulus 2.7.1 Define volumetric strain and bulk modulus 2.7.2 Relation between elastic modulus, shear modulus and bulk modulus 2.8 Temperature stresses for uniform and homogeneous section 2.8.1 Explain the stresses induced due to variation in temperature 2.8.2 Effect of temperature stresses in analysis of structure 2.8.3 Problems on temperature stresses 2.9 Strain energy/resilience 2.9.1 Define strain energy, proof resilience and modulus of resilience 2.9.2 Stress induced due to gradual force 2.9.3 Stress induced due to impact force 2.9.4 Stress induced due to sudden force
3.	**MOMENT OF INERTIA (MI) :** 3.1 Define moment of inertia 3.2 Importance of MI in engineering applications 3.3 Define radius of gyration 3.4 Formula for MI of standard geometrical sections 3.5 Parallel axis theorem 3.6 Perpendicular axis theorem and explain polar MI
4.	**SHEAR FORCE AND BENDING MOMENT :** 4.1 Explain different types of beam and support with reaction 4.2 Define Shear Force (SF) at a section, its sign convention 4.3 Define Bending Moment (BM) at a section, its sign convention 4.4 Relation between SF and BM 4.5 SF and BM for cantilever, simply supported and overhang beam 4.6 Explain point of Contraflexure 4.7 Problems on SF, BM and drawing their diagrams with different loads
5.	**BENDING STRESS AND TRANSVERSE/SHEAR STRESS :** 5.1 Bending stress 5.1.1 Bending stress induced in the section due to BM 5.1.2 Assumptions made in theory of bending 5.1.3 Explain equation of bending: $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$ 5.1.4 Problems on bending stress in beam section 5.2 Transverse/Shear stress 5.2.1 Shear stress induced in the section due to SF 5.2.2 Explain equation of shear stress: $\tau = \frac{VA\overline{Y}}{bI}$ 5.2.3 Relation between average and maximum shear stress for rectangular and circular section 5.2.4 Problems on shear stress distribution at different levels for simple cross sections and draw their distribution curves

6.	**ANALYSIS OF SIMPLE TRUSS :** 6.1 Distinguish between beam and truss 6.2 Define prefect, deficient and redundant truss 6.3 Explain different components of truss 6.4 Calculation of force in each member of truss 6.4.1 By joint method 6.4.2 By graphical method

Note: Derivation of any formula in the study is not required.

Laboratory Experiments :

1. To determine Modulus of Elasticity for different wires made from copper and aluminum
2. Tension test on mild steel specimen
3. Tension test on cast iron specimen
4. Compression test on concrete cube, brick, mild steel, cast iron, aluminum, wood, etc.
5. Single shear and double shear test on material
6. Izod impact test on mild steel, cast iron, aluminum, etc.
7. Charpy impact test on mild steel, cast iron, aluminum, etc.
8. Bending on wood specimen of different size
9. To determine forces developed in the members of simple truss by Graphical Method

Reference Books :

1. Strength of Materials	R.S. Khurmi
2. Strength of Materials	S. Ramamrutham.
3. Materials of Structures	S.B. Junnarkar.
4. Mechanics of Structures	P.L.Arunachalam.
5. Strength of Materials (Part I)	Stephen Temoshenko.
6. Theory & Problems of Strength of Materials	William A. Nash
7. Strength of Materials & Mechanics of Structures	Dr.B.C.Punmia.
8. Mechanics of Structures Vol.I.	S.B. Junnarkar.