



C.U.SHAH UNIVERSITY – Wadhwan City

FACULTY OF: -Technology and Engineering (Diploma Engineering)

DEPARTMENT OF: - Civil Engineering

SEMESTER: - IV **CODE:** -2TE04SOM1

NAME – Strength of Materials

Teaching & Evaluation Scheme:-

Subject Code	Subject Name	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
		Th	Tu	Pr	To		Theory				Practical (Marks)			Total
							Sessional Exam		University Exam		Internal		University	
							Marks	Hours	Marks	Hours	Pr	TW	Pr	
2TE04SOM1	Strength of Materials	04	02	00	06	05	30	1.5	70	03	30	20	---	150

Objectives: To understand advanced concepts of strength of materials by theory lectures.

Pre-requisite: Basic knowledge of concepts of statics and dynamics and applied mechanics,

Course Outlines:-

Sr. No.	Course Contents	Teaching Hours
1	Bending Moment and Shear Force: Concept of a beam, and supports (Hinged, Roller and Fixed). Types of Beams: Simply supported, cantilever, fixed, overhang and continuous beams. Types of loads (distributed and point). Concept of Bending Moment & Shear Force. Sign conventions. Bending moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to uniformly distributed and concentrated loads. Relationship between load, shear force and bending moment. Point of maximum B.M. and contra flexure.	10
2	Bending and Shear Stresses: Assumptions of theory of simple bending. Derivation of the equation. $M/I = F/Y = E/R$. Concept of centroid and second moment of area, Radius of gyration, Theorems of parallel and perpendicular axes, Second Moment of area for sections: rectangle, triangle, circle, trapezium, angle, Tee, I, Channel and compound sections. Moment of resistance, section modulus and permissible bending stresses, Bending stresses in circular rectangular, I,T and L section. Comparison of strength of the above sections. Concept of shear stresses in beams, Shear stress distribution in rectangular, I and T section.	10
3	Combined Direct & Bending Stresses and strain Energy Concentric and eccentric loads, eccentricity, effect of eccentric load on the section, middle third rule; stresses due to eccentric loads. Examples in the case of short columns, chimneys and dams. Meaning of strain energy and resilience. Derivation of formula for resilience of a uniform bar in tension.	10

4	Slopes and Deflections of Beams: Definition of slope and deflection, sign convention. Circular bending. Calculation of maximum slope and deflection for the following standard cases by moment area method. (1) Cantilever having point load at the free end., Cantilever having point load at any point of the span., Cantilever with uniformly distributed load over the entire span., Cantilever having U.D.L. over part of the span from free end Cantilever having U.D.L. over a part of span from fixed end (2) Simply supported beam with point load at centre of the span. Simply supported beam with U.D. load over entire span. NOTE: All examples will be for constant moment of inertia without derivation of formula.	10
5	Columns & Struts: Definition of long column, short column and strut, slenderness ratio, equivalent length, critical load, collapse Load, End conditions of column. Application of Euler's and Rankine's formula (no derivation), simple numerical problems based on Euler's and Rankine's formulae.	10
6	Torsion Definition of torque and angle of twist. Derivation of torsion equation. Polar moment of inertia. Strength of hollow and solid shaft, advantage of a hollow shaft over a solid shaft. Comparison of weights of solid and hollow shafts for same strength. Horse Power transmitted. Calculation of shaft diameter for a given Horse Power.	10

Learning outcomes: Gain the ability to use modern principles of applied mechanics to practical situations..

Books Recommended:-

- Strength of Materials, **Rajput R. K.**, S.Chand & Co. Ltd., Delhi.
- Strength of Materials, **Kapoor J.K.**, Asian Publication, Muzaffarnagar.
- Strength of Materials, **Punmia B.C.**, Laxmi Publication, Delhi.
- Strength of Materials, **Ramamarutham S** ,Dhanpat Rai & Sons, Delhi.