

Subject Code: 1ET4020304	Subject Title: Strength Of Material
Pre-Requisite	----

RATIONALE:

We have already studied the external effects due to action of force system in Engineering Mechanics in Second Semester. All Mechanical Engineering Components are subjected to different loadings and behave in a specific way. In this course, analysis of determinate structures / components under action of transverse loading, along with, analysis of members under direct and lateral along with shear loading & torsion is analyzed. This course will lay sound foundation to analysis & design of Machine Components.

COURSE OBJECTIVE:

The content should be taught and implemented with the aim to develop skills so that students are able to acquire following competencies:

- To understand the concept of Simple Stresses and Strains.
- To understand the concept of moment of inertia.
- To understand the concept of Theory of combined and bending stresses.
- To understand the concept of Torsion in Shafts and springs.
- To understand the concept of Mechanical property of material.

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	-	2	5	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 Calculate Numerical on Direct Stress & Linear Strain , Stress Strain curve of Mild Steel , Modulus of Elasticity ,Yield , Breaking & Ultimate Stress and F.O.S 1.3 Lateral Strain and Poisson's ratio 1.4 Temperature Stresses & Strain with & without yielding 1.5 Shear Stress , Shear Strain & Shear Modulus 1.6 Differentiate Sudden , Gradual & Impact Load Strain Energy & Proof Resilience for Sudden , Gradual & Impact Load with numerical problems	15	25%

2	Moment Of Inertia 2.1 Moment of Inertia & its Importance 2.2 Parallel & Perpendicular Axis Theorem 2.3 Parallel & Perpendicular Axis Theorem 2.4 Formula of Moment of Inertia of solid & Hollow sections like Rectangle, Triangle , Circle 2.5 Moment of Inertia about C.G for I section , H section ,Channel Section, Angle Section, T Section and Built up Section	10	18%
3	Bending Stresses In Beam 3.1 Bending Theory Equation Bending stress , Sectional Modulus , Neutral Axis 3.2 Application of Bending theory to Statically determinate beams elements like shaft , axle , spindle , pulley arm having rectangular or circular section to find out stresses	06	12%
4	Deflection Of Beams 4.1 Slope & Deflection 4.2 Formulae for Cantilever Beam subjected to Point Load at free end and with full UDL 4.3 Formulae for S.S Beam subjected to Point Load at MID SPAN and with full UDL 4.4 Numerical problems on Slope and Deflection for 4.2 & 4.3	06	12%
5	Combined Direct & Bending Stresses 5.1 Eccentricity 5.2 Formula for combined Direct & Bending Stresses 5.3 Limit of Eccentricity 5.4 Core section for Rectangular & Circular (Hollow & Solid) 5.5 Numerical on Combined Stresses for Rectangle & Circular Section	06	12%
6	Torsion 6.1 Torsion , Angle of Twist , Polar Moment of Inertia , Torsional Rigidity 6.2 Formula of Torsional Stress 6.3 Formula for Power Transmitted / Consumed for shaft , spindle and axle of solid and hollow sections subjected to Torsion 6.4 Numerical based on 6.2 & 6.3	08	15%
7	Mechanical Properties of Materials 7.1 Various Mechanical Engineering Materials 7.2 Specifications of materials in accordance to BIS , ASME 7.3 Test Mechanical Properties like HARDNESS and IMPACT	05	06%

COURSE OUTCOME:

At the end of the course, the student will be able to:

1. Compute stress and strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section and of composite section.
2. Define resilience, proof – resilience and modulus of resilience and obtain expressions for instantaneous stress developed in bodies subjected to different loads.
3. Compute moment of inertia for different cross-sectional area.
4. Analyses Machine Components subjected to Torsion for torsional stress.
5. Evaluate Mechanical Properties of Materials used.

LIST OF PRACTICAL:

SR. No.	Experiment
1	Draw Stress Strain Curve for Tension Test on Ductile Materials like Mild Steel , Aluminum
2	Determine Young's Modulus of wire of Given Material
3	Calculate Moment of Inertia of Fly Wheel
4	Calculate Impact Value of Mild Steel using IZOD Impact Test Apparatus
5	Calculate Impact Value of Mild Steel using Charpy Impact Test
6	Calculate Brinell Hardness Number of given material
7	Calculate Hardness of given material using Rockwell Hardness machine
8	Find out Compressive Strength of C.I , M.S using Compression Testing Machine

LIST OF MAJOR EQUIPMENT/MATERIALS / TRAINER BOARD:

1. Universal Testing Machine
2. SEARL'S Apparatus to find Young's Modulus
3. Working Model of End Conditions of Column
4. IZOD Impact Test Apparatus
5. CHARPY Test Apparatus
6. FLY WHEEL
7. Compression Testing Machine
8. Brinell Hardness Testing Machine
9. Rockwell Hardness Testing Machine

LIST OF REFERENCES:

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