MINORS SUBJECTS

SOLID MECHANICS

Offering Branches	CE		
Course Category:	MINORS	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

Upon successful completion of the course, the student will be able to:

CO1	**Determine** the resultant of coplanar force system and **analyse** the force system which were involved Friction.	K4
CO2	**Find** out the center of gravity and moment of inertia and their applications	K3
CO3	**Evaluate** the behavior when a solid material is subjected to various types of forces and **estimate** stresses, corresponding strain developed.	K3
CO4	**Estimate** the forces developed and draw schematic diagram for shear forces, bending moments for simple beams with different types of support and are subjected to various types of loads .	K3
CO5	**Evaluate** the flexural stresses, section modulus for various sections and draw shear stress distribution for rectangular, circular, triangular, I, T and angle sections(L3)	K5

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	2	3						3	2	3
CO2	2	2	2	2	2	3						3	2	3
CO3	3	3	3	3	3	3						3	3	3
CO4	2	2	2	2	2	3						3	2	3
CO5	2	2	2	2	2	2						2	2	2
Avg.	2	2	2	2	2	3						3	2	3

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**ANALYSIS OF FORCE SYSTEMS** Concept of idealization, force, a system of forces, superposition, transmissibility, Resolution, and composition of forces, Law of Parallelogram of forces, polygonal law, Resultant of concurrent coplanar force system, coplanar non-concurrent force system, a moment of forces, couple, Varignons theorem, resultant of coplanar non-concurrent force system, free body diagram, Lamis theorem, equations of equilibrium, equilibrium of concurrent and non-concurrent coplanar force system **FRICTION** Types of friction, laws of friction, limiting friction, coefficient of friction concept of static and dynamic friction, numerical problems on impending motion on horizontal and inclined planes along with connected bodies,	**CO1**
UNIT-2	**CENTROID** Introduction, methods of determining the centroid, locating the centroid of simple figures from first principle, the centroid of composite and built-up sections. **MOMENT OF INERTIA** Introduction, method of determining the second moment of area of plane sections from first principles, parallel axis theorem and perpendicular axis theorem section modulus, the radius of gyration, moment of inertia of composite area and built-up sections, concept of product of inertia (No problem).	**CO2**
UNIT-3	**SIMPLE STRESSES AND ELASTIC CONSTANTS**	**CO3**

	Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity, types of stresses and strains, Hooke's law stress –strain diagram for mild steel working stress, factor of safety, Lateral strain, Poisson's ratio and volumetric strain –Elastic moduli and the relationship between them; Bars of varying section, composite bars, temperature stresses. Relationship between elastic constants. Strain Energy –Resilience, Gradual, sudden, impact and shock loadings, simple applications.	
UNIT-4	**BENDING MOMENT AND SHEAR FORCE DIAGRAMS** Relationship between moment, shear and load. Bending Moment (BM) and Shear Force (SF) diagrams. BM and SF diagrams for cantilevers, simply supported with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments	**CO4**
UNIT-5	**STRESSES IN BEAMS** Derivation of bending equation, Neutral axis, determination of bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections. Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.	**CO4**

Learning Resources

Text Books	1. A. K. Tayal, Engineering Mechanics (Statics and Dynamics), Umesh Publications, 14th Edition, 2011. 2. V.N Vazirani and M.M Ratwani, Analysis Of Structures Vol-I, Khanna Publishers, 2003. 3. S.Timoshenko, Strength Of Materials: Elementary Theory and Problems-Vol.I, 2004. 4. R.Subrahmanian, Strength of Materials, 3/e, Oxford University Press, 2016.
Reference Books	1. 1 S.S. Rattan, Strength of Materials, 2/e, Tata McGraw Hill Education, 2011. 2. Gere and Timoshenko, Mechanics of Materials, 4/e, CBS Publishers, 2006. 3. Stephen Timoshenko, Strength of Materials, 3/e, CBS Publisher, 2002. 4. R.K. Rajput, Strength of Materials, S. Chand Publications, 2007
e-Resources& other digital material	1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/