SWARNANDHRA
COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)

Accredited by National Board of Accreditation, AICTE, New Delhi, Accredited by NAAC with "A" Grade – 3.32 CGPA, Recognized under 2(f) & 12(B) of UGC Act 1956, Approved by AICTE, New Delhi, Permanent Affiliation to JNTUK, Kakinada
Seetharampuram, W.G.DT., Narsapur-534280, (Andhra Pradesh)

DEPARTMENT OF ROBOTICS

TEACHING PLAN

Course Code	Course Title	Semester	Branches	Contact Periods /Week	Academic Year	Date of commencement of Semester
23ME3T01	Mechanics of Solids	III	ROBOTICS	06	2024-25	14-07-2025

COURSE OUTCOMES

1	Calculate stresses and strains in structural members subjected to various types of loadings.[K3]
2	Analyze beams and draw correct and complete shear and bending moment diagrams for beams.[K4]
3	Apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, and moments.[K3]
4	Determine and sketch the stress distribution in section of the beam subjected to Bending and Shear loads.[K3]
5	Determine the Shear stresses in shafts and slope &deflection in beams.[K3]
6	Analyze stresses in thin and thick cylinders.[K4]

UNIT	Outcomes / Bloom's Level	Topics No.	Topics/Activity	Text Book / Reference	Contact Hour	Delivery Method
			SIMPLE STRESSES AND STRAINS			
I	Calculate stresses and strains in structural members subjected to various types of loadings.[K3]	1.1	Elasticity and plasticity	T3, R1	1	Chalk gjws4esy ghytgjhf & Talk PPT (Active Learning Activity)
		1.2	Types of Stresses and strains, Hooke's law	T3, R1	1	
		1.3	Stress – Strain diagram for mild steel	T3, R1	1	
		1.4	Working stress – Factor of safety	T3, R1	1	
		1.5	Lateral strain, Poisson's ratio	T3, R1	1	
		1.6	Volumetric strain	T3, R1	1	
		1.7	Bars of varying section	T3, R1	1	
		1.8	Composite bars	T3, R1		
		1.9	Temperature stresses	T3, R1	1	
		1.10	Complex Stresses	T3, R1	1	

		1.11	Stresses on an inclined plane under different uniaxial and biaxial stress conditions	T3, R1	1	
		1.12	Principal planes and principal stresses	T3, R1	1	
		1.13	Mohr's circle	T3, R1	1	
		1.14	Relation between elastic constants	T3, R1	1	
		1.15	Strain energy – Resilience – Gradual, sudden,	T3, R1	1	
		1.16	Impact and shock loadings.	T3, R1	1	
		CBS	Saint Venant's principle	T3	1	
				Total	**17**	
SHEAR FORCE AND BENDING MOMENT						
II	Analyze beams and draw correct and complete shear and bending moment diagrams for beams.[K4]	2.1	Definition of beam – Types of beams – Concept of shear force and bending moment	T3,R1	1	Chalk & Talk PPT
		2.2	S.F and B.M diagrams for cantilever - point loads, u.d.l	T3,R1	1	
		2.3	S.F and B.M diagrams for cantilever - uniformly varying loads and combination of these loads	T3,R1	2	
		2.4	Simply supported - point loads, u.d.l	T3,R1	1	
		2.5	Simply supported - uniformly varying loads and combination of these loads	T3,R1	2	
		2.6	Overhanging beams - point loads, u.d.l,	T3,R1	1	
		2.7	Over hanging beams - uniformly varying loads and combination of these loads	T3,R1	2	
		2.8	Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of abeam.	T3,R1	1	
		CBS	Fixed and Continuous Beams	T3	1	
				TOTAL	**12**	
FLEXURAL STRESSES						
III		3.1.1	Theory of simple bending	T3,R1	1	

	Apply the concept of stress and strain to analyze and design structural members and machine parts under axial, shear and bending loads, and moments.[K3] Determine and sketch the stress distribution in section of the beam subjected to Bending and Shear loads.[K3]	3.1.2	Derivation of bending equation	T3,R1	1	Chalk & Talk, PPT (Active Learning Activity)
		3.1.3	Determination of bending stresses	T3,R1	1	
		3.1.4	Section modulus of rectangular, circular, I and T sections	T3,R1	1	
		3.1.5	Design of simple beam sections	T3,R1	1	
			SHEAR STRESSES			
		3.2.1	Derivation of formula	T3,R1	1	
		3.2.2	Shear stress distribution across various beams sections like rectangular	T3,R1	1	
		3.2.3	Circular Section	T3,R1	1	
		3.2.4	Triangular Section	T3,R1	1	
		3.2.5	I Section	T3,R1	1	
		3.2.6	T Sections	T3,R1	1	
		CBS	Bending Stress-Walls and Pillars subjected to wind pressure	T3	1	
				Total	**12**	
			DEFLECTION OF BEAMS			
IV	Determine the Shear stresses in shafts and slope &deflection in beams.[K3]	4.1	Bending into a circular arc – slope, deflection and radius of curvature	T3,R1	1	Chalk & Talk, PPT
		4.2	Differential equation for the elastic line of a beam	T3,R1	1	
		4.3	Double integration method	T3,R1	1	
		4.4	Macaulay's method	T3,R1	1	
		4.5	Determination of slope and deflection for cantilever- point loads, UDL and UVL	T3,R1	1	
		4.6	Determination of slope and deflection for simply supported beams - point loads, UDL and UVL	T3,R1	1	
		4.7	Mohr's theorem	T3,R1	1	
		4.8	Moment area method	T3,R1	1	
		4.9	Application to simple cases	T3,R1	1	
			TORSION			
		4.2.1	Introduction-Derivation	T3,R1	1	
		4.2.2	Torsion of Circular shafts	T3,R1	1	
		4.2.3	Pure Shear	T3,R1	1	
		4.2.4	Transmission of power by circular shafts	T3,R1	1	
		4.2.5	Shafts in series	T3,R1	1	
		4.2.6	Shafts in parallel.	T3,R1	1	

		CBS	Torsion of a tapering shaft	T3	1	
				Total	**16**	
V	Analyze stresses in thin and thick cylinders.[K4]		**THIN AND THICK CYLINDERS**			Chalk & Talk, PPT (Active Learning Activity)
		5.1.1	Thin seamless cylindrical shells	T3,R1	1	
		5.1.2	Derivation of formula for longitudinal and circumferential stresses	T3,R1	1	
		5.1.3	hoop, longitudinal and volumetric strains	T3,R1	1	
		5.1.4	Changes in dia, and volume of thin cylinders	T3,R1	1	
		5.1.5	Thin spherical shells	T3,R1	1	
		5.1.6	Wire wound thin cylinders	T3,R1	1	
		5.1.7	Lame's equation	T3,R1	1	
		5.1.8	Cylinders subjected to inside & outside pressures	T3,R1	1	
		5.1.9	Compound cylinders	T3,R1	1	
			COLUMNS	T3,R1		
		5.2.1	Buckling and Stability, Columns with Pinned ends	T3,R1	1	
		5.2.2	Columns with other support Conditions	T3,R1	1	
		5.2.3	Limitations of Euler's Formula	T3,R1	1	
		5.2.4	Rankine's Formula	T3,R1	1	
		CBS	Struts- Laterally loaded struts	T3	1	
				Total	**14**	
CUMULATIVE PROPOSED PERIODS					**72**	

Text Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
T1	GH Ryder, Strength of materials, Palgrave Macmillan publishers India Ltd, 1961.
T2	B.C. Punmia, Strength of materials,10/e, Lakshmi publications Pvt. Ltd, New Delhi, 2018.
T3	S. Ramamrutham & R. Narayanan Strength of materials, 20/e Dhanpat rai publications Pvt. Ltd, New Delhi, 2020.

Reference Books:

S.No.	AUTHORS, BOOK TITLE, EDITION, PUBLISHER, YEAR OF PUBLICATION
R1	R.K.Bansal, A Text Book of Strength of Materials: Mechanics of Solids, 6 th Edition, Laxmi Publications, 2018.
R2	Gere & Timoshenko, Mechanics of materials, 2/e, CBS publications, 2004.
R3	U.C.Jindal, Strength of Materials, 2/e, Pearson Education, 2017.
R4	Timoshenko, Strength of Materials Part – I& II, 3/e, CBS Publishers, 2004.
R5	Andrew Pytel and Ferdinand L. Singer, Strength of Materials,4/e, Longman Publications, 1990.
R6	Popov, Mechanics of Solids, 2/e, New Pearson Education, 2015.
Web Details	
1	https://onlinecourses.nptel.ac.in/noc19_ce18/preview
2	https://youtube/iY_ypychVNY?si=310htc4ksTQJ8Fv6
3	https://www.youtube.com/watch?v=WEy939Rkd_M&t=2s
4	https://www.classcentral.com/course/swayam-strength-of-materials-iitm-184204
5	https://www.coursera.org/learn/mechanics-1
6	https://www.edx.org/learn/engineering/massachusetts-institute-of-technology-mechanical-behavior-of-materials-part-1-linear-elastic-behavior
7	https://archive.nptel.ac.in/courses/112/107/112107146/

SNO	Details	Name	Signature
i.	Course Coordinator	Dr. A. Gopichand	
ii.	Module Coordinator	Dr. Francis Luther King M	
iii.	Programme Coordinator	Dr. Francis Luther King M	

Principal