SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Automobile Engineering	
B.E/B.Tech/M.E/M.Tech : B.E **Automobile Engineering** Regulation: **2022** PG Specialisation : NA Sub. Code / Sub. Name : **AE22409 / MECHANICS OF SOLIDS: THEORY AND PRACTICES** Unit : **I**	LP: **AE22409** Rev. No: **00** Date: **24.01.2024**

Unit Syllabus:

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9+6

Elementary definition of stress and strain - Tension, Compression, Shearing stress and Strain - stress-strain relationship - Hooke‟s law - Deformation of simple and compound bars - Composite bars - Thermal stresses - Poisson‟s ratio - Elastic constants.

Practical - Tension test and Hardness test on metals

Objective: To develop the relationship between the loads applied to a non-rigid body and the internal stresses and deformations induced in the body along with testing of metals.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Elementary definition of stress and strain	1 - Ch.1; Pg. 1 - 6	PPT & BB
2	Tension, Compression, Shearing stress and Strain	1 - Ch.1; Pg. 7 - 14	PPT & BB
3	Stress - strain relationship - Hooke‟s law	2 - Ch.2; Pg. 134 - 136	PPT & BB
4	Deformation of simple and compound bars	1 - Ch.1; Pg. 42 - 54	PPT & BB
5	Composite bars	1 - Ch.1; Pg. 30 - 35	PPT & BB
6	Compound bars & Composite bars - Problems	1 - Ch.1; Pg. 42 - 54 1 - Ch.1; Pg. 30 - 35	PPT & BB
7	Thermal stresses	1 - Ch.1; Pg. 59 - 73	PPT & BB
8	Poisson’s ratio	1 - Ch.1; Pg. 59 - 73	PPT & BB
9	Elastic constants	1 - Ch.2; Pg. 60 - 67	PPT & BB
10	Tension test		
11	Hardness test on metals		
12	Tension test		
13	Hardness test on metals		
14	Tension test		
15	Hardness test on metals		
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

Sub. Code / Sub. Name : **AE22409 / MECHANICS OF SOLIDS: THEORY AND PRACTICES**

Unit **: II**

Unit Syllabus:

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9+6

Beams - types transverse loading on beams, Shear force, and bending moment in beams. Construction of Shear force and Bending moment diagrams for different types of static loading on the cantilever, simple supported and overhanging beams.
Theory of simple bending, bending stresses, section modulus, bending stress, and shear stress distribution in beams.

Practical - Double shear test on mild steel and aluminum rods.

Objective: To demonstrate to the student in calculating shear force bending stresses and bending moment diagrams.

Session No *	Topics to be covered	Ref	Teaching Aids
16	Beams - types transverse loading on beams	1 - Ch.6; Pg. 235 - 238	PPT & BB
17	Shear force and bending moment in beams	1 - Ch.6; Pg. 235 - 238	PPT & BB
18	Construction of Shear force and Bending moment diagrams - Cantilever	1 - Ch.6; Pg. 239 - 270	PPT & BB
19	Construction of Shear force and Bending moment diagrams – simply supported	1 - Ch.6; Pg. 239 - 270	PPT & BB
20	Construction of Shear force and Bending moment diagrams- overhanging	1 - Ch.6; Pg. 239 - 270	PPT & BB
21	Theory of simple bending	1 - Ch.7; Pg. 290 - 297	PPT & BB
22	Bending stresses and section modulus	1 - Ch.7; Pg. 297 - 312	PPT & BB
23	Bending stress	1 - Ch.8; Pg. 342 - 348	PPT & BB
24	Shear stress distribution in beams	1 - Ch.8; Pg. 342 - 348	PPT & BB
25	Double shear test on mild steel		
26	Double shear test on aluminum rods		
27	Double shear test on mild steel		
28	Double shear test on aluminum rods		
29	Double shear test on mild steel		
30	Double shear test on aluminum rods		
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

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Unit **: III**

Unit Syllabus :

UNIT III **DEFLECTION OF BEAMS** **9+6**

Governing differential equation – Macaulay's method – Area moment method for computation of slopes and deflections in beams - Conjugate beam method.

Practical - Deflection test on the cantilever and simply supported beams.

Objective: To make the students learn Deflection and slopes in various types of beams for different loading conditions.

Session No *	Topics to be covered	Ref	Teaching Aids
31	Governing differential equation	1 - Ch.12; Pg. 511 - 512	PPT & BB
32	Introduction to Macaulay's method	1 - Ch.13; Pg. 554 - 558	PPT & BB
33	Problems in Macaulay's method	1 - Ch.13; Pg. 558 - 560 1 - Ch.12; Pg. 531 - 545	PPT & BB
34	Problems in Macaulay's method	1 - Ch.13; Pg. 558 - 560 1 - Ch.12; Pg. 531 - 545	PPT & BB
35	Introduction to Area moment method	1 - Ch.12; Pg. 546 - 551	PPT & BB
36	Problems in Area moment method	1 - Ch.13; Pg. 571 - 575	PPT & BB
37	Problems in Area moment method	1 - Ch.13; Pg. 571 - 575	PPT & BB
38	Conjugate Beam Method	1 - Ch.14; Pg. 578 - 592	PPT & BB
39	Problems in Conjugate Beam Method	1 - Ch.14; Pg. 578 - 592	PPT & BB
40	Deflection test on the cantilever		
41	Deflection test on the simply supported beams		
42	Deflection test on the cantilever		
43	Deflection test on the simply supported beams		
44	Deflection test on the cantilever		
45	Deflection test on the simply supported beams		
Content beyond syllabus covered (if any):			

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Unit **: IV**

Unit Syllabus:

UNIT IV TORSION OF SHAFTS AND SPRINGS 9+6

Torsion formulation stresses and deformation in circular and hollow shafts - Stepped shafts - Deflection in shafts fixed at both ends - Stresses in helical springs - Deflection of helical springs subjected to tension only, Leaf springs.

Practical - Compression test on helical springs and Torsion test on the mild steel rod.

Objective: To solve practical problems related to springs and shafts.

Session No *	Topics to be covered	Ref	Teaching Aids
46	Introduction to Torsion, Derivation of Torsion with stresses and deformation	1 - Ch.16; Pg. 670 - 677	PPT & BB
47	Problems in Torsion for solid and hollow shafts	1 - Ch.16; Pg. 675 - 680	PPT & BB
48	Problems in Torsion for solid and hollow shafts	1 - Ch.16; Pg. 675 - 680	PPT & BB
49	Problems in Torsion for Stepped shafts - Tutorial	1 - Ch.16; Pg. 687 - 690	PPT & BB
50	Deflection in shafts fixed at both ends	1 - Ch.16; Pg. 691 - 694	PPT & BB
51	Introduction to springs, Types of springs, derivation of stresses in helical springs	3 - Ch.11; Pg. 372 - 375	PPT & BB
52	Derivation of stresses in open coiled helical springs, Problems	1 - Ch.16; Pg. 721 - 724	PPT & BB
53	Derivation of stresses in leaf springs, Problems - Tutorial	1 - Ch.16; Pg. 730 - 745	PPT & BB
54	Problems in Springs	1 - Ch.16;Pg. 687 - 690	PPT & BB
55	Compression test on helical springs		
56	Compression test on torsion test on the mild steel rod		
57	Compression test on helical springs		
58	Compression test on torsion test on the mild steel rod		
59	Compression test on helical springs		
60	Compression test on torsion test on the mild steel rod		

Content beyond syllabus covered (if any):

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Unit **: V**

Unit Syllabus:

UNIT V ANALYSIS OF STRESSES IN TWO DIMENSIONS 9+6

Biaxial state of stress - Stress at a point - stresses on inclined planes - Principal stresses and Principal strains and Mohr's circle of stress.
Stresses in thin cylindrical shells due to internal pressure - circumferential and longitudinal stresses - Deformation in Thin cylinders and Thin spherical shells.

Practical - Impact test on metals.

Objective: To do the analysis of stresses in two dimensions.

Session No *	Topics to be covered	Ref	Teaching Aids
61	Biaxial state of stress	1 - Ch.2; Pg. 74 - 82 1 - Ch.3; Pg.85 - 128	PPT & BB
62	Stress at a point - stresses on inclined planes	1 - Ch.3; Pg.85 - 128	PPT & BB
63	Principal stresses and Principal strain	1 - Ch.3; Pg.128 - 139	PPT & BB
64	Mohr's circle of stress	1 - Ch.3; Pg.128 - 139	PPT & BB
65	Introduction to Pressure vessels, Explanation of Thin and Thick cylinders	1 - Ch.17; Pg. 740	PPT & BB
66	Derivation of Stresses in thin cylindrical shells , deformation of Thin cylinders in loading condition	1 - Ch.17; Pg.741 - 742	PPT & BB
67	Problems in Thin cylinders to identify Stresses, deformation based on loading condition	1 - Ch.17; Pg.750 - 769	PPT & BB
68	Derivation of Spherical shells	1 - Ch.17; Pg.770 - 771	PPT & BB
69	Problems in Spherical shells	1 - Ch.17; Pg.771 - 775	PPT & BB
70	Impact test on metals		
71	Impact test on metals		
72	Impact test on metals		
73	Revision		
74	Revision		
75	Revision		
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

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TEXTBOOKS:

1. Bansal, R.K., "A Textbook of Strength of Materials", Laxmi Publications (P) Ltd., 2017
2. R S Khurmi Strength of Materials, KHANNA Publications New-Delhi 2014.
3. Jindal U.C., "Strength of Materials", Pearson Education, 2012.

REFERENCES:

1. Rattan, "Strength of Materials", McGraw Hill Education, 3rdEdition, 2017.
2. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, 10thEdition, 2016.
3. Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi 2014.
4. Ferdinand P. Beer, Russell Johnson, J.r. and John J. Dewole "Mechanics of Materials", McGraw Hill Education, 2005.
5. Ramamrutham S and Narayan R, "Strength of Materials", Dhanpat Rai and Sons, New Delhi, 1997.

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Designation	Assistant Professor	Professor & Head
Date	2/1/24	02/01/2024
Remarks *:		
Remarks *:		
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD