SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN– THEORY

Department of Chemical Engineering	LP: CH22305 Rev. No: 00 Date: 24-07-2023
~~B.E~~/B.Tech/~~M.E/M.Tech~~ :Chemical Engineering Regulation: 2022 PG Specialisation: NA Sub. Code / Sub. Name: CH22305/ Mechanics of Solids for Chemical Engineering Unit :I	

Unit Syllabus: Stress and strain - tension, compression, reaction forces and shear stresses in simple and compound bars- Hooke's law –Thermal stresses - Relationship among elastic constants and Poisson's ratio – Stress strain diagrams for engineering materials – Factor of safety.

Objectives: Understand of the fundamental concepts of stress and strain in solids and structures. Understand mechanical properties of solids and relationships between them.

Session No *	Topics to be covered	Ref.	Teaching Aids
1	Stress, strain and Hooke's law in structures of varying cross section using principle of superposition.	T1 – Ch.1;Pg .1 - 6	PPT, Black board
2	Introduction to compound bars.	T1 – Ch.1;Pg .7 – 14	PPT, Black board
3	Problems related to compound bars.	T1 – Ch.1;Pg .14 –41	PPT, Black board
4	Introduction to thermal stresses in compound bars, problems in thermal Stresses	T1 – Ch.1;Pg .42 - 50	PPT, Black board
5	Introduction and relation between of Young's modulus, Poisson's ratio	T1 – Ch.2;Pg.59-60	PPT, Black board
6	Problems related to elastic constants.	T1 – Ch.2;Pg.61-73	PPT, Black board
7	Stress-strain diagrams for engineering materials	R1 – Ch.2;Pg.74-89	PPT, Black board
8	Factor of safety	T1 – Ch.1;Pg .6 - 7	PPT, Black board
9	Problem solved in factor of safety.	T1 – Ch.1;Pg .7 - 14	PPT, Black board
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

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Sub. Code / Sub. Name: CH22305/ Mechanics of Solids for Chemical Engineering

Unit : II

Unit Syllabus: Beams – support conditions – types of Beams - forces on solids and supports – transverse loading on beams - shear force and bending moment in beams - analysis of cantilevers, simply supported beams and over hanging beams with reaction force - relationships between loading, S.F. and B.M. In beams - S.F.& B.M. diagrams – Location of point of contraflexure and maximum B.M.

Objectives: Analyze determinate beams and determine shear forces, bending moments.

Session No *	Topics to be covered	Ref.	Teaching Aids
10	Introduction to beams, types of beams and forces, shear force diagram and bending moment diagram and its	T1 – Ch.6;Pg. 235 - 239	PPT, Black board
11	Relationships between loading, S.F. and B.M. in beams and their applications	T1 – Ch.6;Pg.289	PPT, Black board
12	Analysis of cantilever beam based on loading conditions	T1 - Ch.6;Pg.241-252	PPT, Black board
13	Problems in cantilever beam	T1 - Ch.6;Pg.241-252	PPT, Black board
14	Analysis of simply supported beam based on loading conditions	T1 - Ch.6;Pg.254-271	PPT, Black board
15	Problems in simply supported beam with maximum bending moment	T1 - Ch.6;Pg. 254-271	PPT, Black board
16	Analysis of overhanging beams based on loading conditions	T1- Ch.6;Pg.270-281	PPT, Black board
17	Problems in overhanging beams, point of contraflexure, maximum bending moment - position and value	T1- Ch.6;Pg.272-281	PPT, Black board
18	Problems in overhanging beams, point of contraflexure, maximum bending moment - position and value	T1- Ch.6;Pg.275-281	PPT, Black board
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

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Sub. Code / Sub. Name: CH22305/ Mechanics of Solids for Chemical Engineering

Unit : III

Unit Syllabus: Double integration method, Macaulay's method, Moment-Area theorems and conjugate beams method for computation of slopes and deflections in simply supported and cantilever beams.

Objective: Determine deflection in beams subjected to transverse loading.

Session No *	Topics to be covered	Ref.	Teaching Aids
19	Introduction to double integration method, problems related to double integration method(cantilever beam)	T1- Ch.12;Pg.515-530 T1- Ch.13;Pg.559-572	PPT, Black board
20	Double integration method problems(simply supported beams)	T1- Ch.13;Pg.559-560	PPT, Black board
21	Introduction to Macaulay's method, problems in Macaulay's method for simply supported beams	T1- Ch.12;Pg.531-540	PPT, Black board
22	Problems in Macaulay's method for simply supported beams (contd.)	T1- Ch.12;Pg.541-549	PPT, Black board
23	Introduction to moment area method.	T1- Ch.12;Pg.550-551	PPT, Black board
24	Problems in moment area method in simply supported beam with point load.	T1- Ch.12;Pg.550-551	PPT, Black board
25	Problems in moment area method in simply supported beam with multiple point loads and UDL.	T1- Ch.13;Pg.552-554	PPT, Black board
26	Introduction to conjugate beam method, problems for varying section in beams	T1- Ch.14;Pg.583-601	PPT, Black board
27	Problems for varying section in beams by conjugate beam method	T1- Ch.14;Pg.583-601	PPT, Black board
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

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Sub. Code / Sub. Name: CH22305/Mechanics of Solids for Chemical Engineering

Unit :IV

Unit Syllabus:Theory of simple bending – assumptions and derivation of bending equation - analysis of bending stresses in beams under transverse loading – loads carrying capacity of beams - proportioning beam sections - shear stress distribution in beams - determination of shear stress distribution in symmetrical and unsymmetrical sections.

Columns: Euler's theory of long columns and critical loads for columns with different end conditions.

Objective: Determine shear stresses and bending stresses in beams subjected to transverse loading.

Session No *	Topics to be covered	Ref.	Teaching Aids
28	Discussion of simple bending, theory of simple Bending	T1- Ch.7;Pg.292-294	PPT, Black board
29	Derivation of bending stresses for simple beam-bending equation.	T1- Ch.7;Pg.294-295	PPT, Black board
30	Analysis of bending stresses in beams under transverse loading	T1- Ch.7;Pg.296-297	PPT, Black board
31	Loads carrying capacity of beams - proportioning beam sections	T1- Ch.7;Pg.297-341	PPT, Black board
32	Shear stress distribution in beams	T1- Ch.7;Pg.342-346	PPT, Black board
33	Determination of shear stress distribution in symmetrical and unsymmetrical sections.	T1- Ch.7;Pg.348-370	PPT, Black board
34	Euler's theory of long columns	T1- 18;Pg.808-818	PPT, Black board
35	Critical loads for columns with different end conditions.	T1- h.18;Pg.808-818	PPT, Black board
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

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Sub. Code / Sub. Name:CH22305/ Mechanics of Solids for Chemical Engineering

Unit :V

Unit Syllabus: Codes & Standards, Vessels operating at low temperatures and elevated temperatures, design conditions and stress, design of shell and its components, supports, stress from local loads and thermal gradients, thermal stresses in cylindrical shell. Features of high pressure vessels – solid walled vessel, vessel closures, and jackets.

Objective: Analyze the forces and stresses on pressure vessel.

Session No *	Topics to be covered	Ref.	Teaching Aids
38	Codes & Standards	T5: Ch 6; P. no.114	PPT, Black board
39	Vessels operating at low temperatures and elevated	T5: Ch 6; P. no.120 - 123	PPT, Black board
40	Design conditions and stress	T5: Ch 6; P. no. 123 - 127	PPT, Black board
41	Design of shell and its components, supports.	T5: Ch 6; P. no.127 -140	PPT, Black board
42	Stress from local loads and thermal gradients.	T5: Ch 6; P. no. 178 -179	PPT, Black board
43	stresses in cylindrical shell.	T5: Ch 6; P. no. 179 - 181	PPT, Black board
44	Features of high pressure vessels – solid walled vessel.	T5: Ch 12; P. no.351 -363	PPT, Black board
45	Features of high pressure vessels –vessel closures, jackets.	T5: Ch 12; P. no.367 -377	PPT, Black board
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

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TEXT BOOKS:

1. R.K. Bansal, Strength of Materials, 5th Edition, Laxmi Publications, 2012.
2. R.C.Hibbeler, Mechanics of Materials, 6thEdition, Pearson Education, Inc., 2005.
3. E. P. Popov, Engineering Mechanics of Solids, Prentice Hall, 1998.
4. F.P. Beer, E. R. Johnston, J. T. Dewolf, D. F. Mazurek, Mechanics of Materials, 6th edition, McGraw Hill, 2012
5. M. V. Joshi, Process Equipment Design, Macmillan, 1976

REFERENCES:

1. S. H. Crandall, N. C. Dahl, and T. J. Lardner, An Introduction To The Mechanics Of Solid, 2nd Ed., Tata McGraw Hill, 2008.
2. S. P. Timoshenko, Strength of Materials, Vols. 1 & 2, CBS Publishers, 1986.

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Date	24.07.2023	31/07/2023.
Remarks *:		
Remarks *:		

Verified 31/7

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

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Verified 5/7