	MOHAMED SATHAK A J COLLEGE OF ENGINEERING **Chennai 603103**	**Fromat no.**	**TLP 05**
		Rev.Date	**01/02/2021**
	LESSON PLAN - THEORY	**Rev. No.**	**0**

Department of Civil Engineering

Name of the Subject	Strength of Materials I	Name of the handling Faculty	Dr P.Satheeskumar
Subject Code	CE8301	Year / Sem	II / III

Course Objective

To learn the fundamental concepts of Stress, Strain and deformation of solids.

To know the mechanism of load transfer in beams, the induced stress resultants and deformations.

To understand the effect of torsion on shafts and springs

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Course Outcome

Understand the concepts of stress and strain, principal stresses and principal planes.

Determine Shear force and bending moment in beams and understand concept of theory of simple bending.

Calculate the deflection of beams by different methods and selection of method for determining slope or deflection.

Apply basic equation of torsion in design of circular shafts and helical springs.

Analyze the pin jointed plane and space trusses

Lesson Plan

Sl. No.	Topic(s)	T / R* Book	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO
UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS							
1	Simple Stresses and strains – Elastic constants	T2	1	BB	L1	CO1	PO1,PO2,PO3,PO4
2	Relationship between elastic constants – Stress Strain Diagram	T1	2	BB	L2	CO1	PO1,PO2,PO3,PO4
3	Ultimate Stress – Yield Stress	T1	1	NPTEL	L3	CO1	PO1,PO2,PO3,PO4
4	Deformation of axially loaded member - Composite Bars	T1	1	BB	L3	CO1	PO1,PO2,PO3,PO4
5	Thermal Stresses – State of Stress in two dimensions	T2	1	BB	L5	CO1	PO1,PO2,PO3,PO4
6	Stresses on inclined planes	T1	1	BB	L3	CO1	PO1,PO2,PO3,PO9
7	Principal Stresses and Principal Planes- Maximum shear stress	T1	1	BB	L5	CO1	PO1,PO2,PO3,PO4
8	Mohr's circle method	T2	1	PPT	L3	CO1	PO1,PO2,PO3,PO4
Suggested Activity: Case Study -Stresses on inclined beams							
Evaluation method : Paper base evaluation							
UNIT II TRANSFER OF LOADS AND STRESSES IN BEAMS							
9	Types of loads, supports, beams – concept of shearing force and bending	T1	1	BB	L4	CO2	PO1,PO2,PO3,PO4
10	Relationship between intensity of load, Shear Force and Bending moment	T1	2	BB	L4	CO2	PO1,PO2,PO3,PO4
11	Shear Force and Bending Moment Diagrams for Cantilever, simply	T2	2	BB	L4	CO2	PO1,PO2,PO3,PO4

12	uniformly distributed load, uniformly varying load and concentrated	T1	2	BB	L4	CO2	PO1,PO2,PO3,PO4
13	Theory of Simple Bending – Stress Distribution due to bending moment and shearing force	T1	1	PPT	L3	CO2	PO1,PO2,PO3,PO4
14	Flitched Beams - Leaf Springs.	T2	1	PPT	L4	CO2	PO1,PO2,PO3,PO4
Suggested Activity: Assignment - Shear force and bending moment							
Evaluation method :Paper base evaluation							
UNIT III DEFLECTION OF BEAMS							
15	Elastic curve	T1	1	PPT	L3	CO3	PO1,PO2,PO3,PO4
16	Governing differential equation - Double integration method	T1	2	BB	L4	CO3	PO1,PO2,PO3,PO4
17	Macaulay's method	T2	2	BB	L3	CO3	PO1,PO2,PO3,PO4
18	Area moment method	R4	2	BB	L4	CO3	PO1,PO2,PO3,PO4
19	conjugate beam method for computation of slope and deflection of determinant beams	R4	2	BB	L3	CO3	PO1,PO2,PO3,PO4
Suggested Activity: Assignment -Conjugate beam method for computation of slope and deflection of determinant beams							
Evaluation method :Paper base evaluation							
UNIT IV TORSION							
20	Theory of Torsion	R2	1	PPT	L3	CO4	PO1,PO2,PO3,PO4
21	Stresses and Deformations in Solid and Hollow Circular Shafts	R3	1	PPT	L5	CO4	PO1,PO2,PO3,PO4
22	combined bending moment and torsion of shafts	T2	2	PPT	L4	CO4	PO1,PO2,PO3,PO4
23	Power transmitted to shaft	T1	1	PPT	L2	CO4	PO1,PO2,PO3,PO4
24	Shaft in series and parallel	T2	1	PPT	L3	CO4	PO1,PO2,PO3,PO4
25	Closed and Open Coiled helical springs	T2	1	PPT	L3	CO4	PO1,PO2,PO3,PO4
26	Springs in series and parallel	T1	1	PPT	L3	CO4	PO1,PO2,PO3,PO4
27	Design of buffer springs.	T2	1	PPT	L3	CO4	PO1,PO2,PO3,PO4
Suggested Activity: Assignment - Design of buffer springs.							
Evaluation method : Paper based evaluation							
UNIT V ANALYSIS OF TRUSSES							
28	Determinate and indeterminate trusses	T1	2	PPT	L3	CO5	PO1,PO2,PO3,PO4
29	Analysis of pin jointed plane determinate trusses by method of	T2	2	PPT	L5	CO5	PO1,PO2,PO3,PO4
30	method of sections and tension coefficient	T1	2	PPT	L5	CO5	PO1,PO2,PO3,PO4
31	Analysis of Space trusses by tension coefficient method.	T2	2	PPT	L5	CO5	PO1,PO2,PO3,PO4
32	Analysis of Space trusses by tension coefficient method.	T1	1	PPT	L4	CO5	PO1,PO2,PO3,PO4
Suggested Activity: Presentation on Trusses							
Evaluation method :Powerpoint presentation base evaluation							
Content Beyond the Syllabus Planned							
1	**Simulation of beam deflection**						
2	**Distortion and deforming of solids under stresses**						
Text Books							

1	Rajput R.K. "Strength of Materials (Mechanics of Solids)", S.Chand & company Ltd., New Delhi, 2015.
2	Bansal. R.K. "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2010
Reference Books	
1	Timoshenko.S.B. and Gere.J.M, "Mechanics of Materials", Van Nos Reinbhold, New Delhi 1999.
2	Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi 2016.
3	Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.
4	Singh. D.K., " Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016
Website / URL References	
1	http://www.nptelvideos.in/2012/12/strength-of-materials.html

Blooms Level

Level 1 (L1) : Remembering	Lower Order Thinking	Fixed Hour Exams	Level 4 (L4) : Analysing	Higher Order Thinking	Projects / Mini Projects
Level 2 (L2) : Understanding			Level 5 (L5) : Evaluating		
Level 3 (L3) : Applying			Level 6 (L6) : Creating		

Mapping syllabus with Bloom's Taxonomy LOT and HOT

Unit No	Unit Name	L1	L2	L3	L4	L5	L6	LOT	HOT	Total
Unit 1	STRESS, STRAIN AND DEFORMATION OF SOLIDS	1	1	4	0	2	0	5	3	8
Unit 2	TRANSFER OF LOADS AND STRESSES IN BEAMS	0	0	1	5	2	0	6	0	6
Unit 3	DEFLECTION OF BEAMS	0	1	5	2	0	0	3	2	5
Unit 4	TORSION	0	1	5	1	5	0	6	2	8
Unit 5	ANALYSIS OF TRUSSES	0	0	1	1	3	0	3	2	5
Total		1	3	16	9	12	0	23	9	32
Total Percentage		3.125	9.375	50	28.125	37.5	0	71.875	28.125	100

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	0	0	0	0	1	0	0	0	1	2
CO2	3	2	2	1	0	0	0	0	0	0	0	0	1	2
CO3	3	2	2	1	0	0	0	0	0	0	0	0	1	2
CO4	3	2	2	1	0	0	0	0	0	0	0	0	1	2
CO5	3	2	2	1	0	0	0	0	0	0	0	0	1	2
Avg	**3**	**2**	**1.8**	**1**	**0**	**0**	**0**	**0**	**0.2**	**0**	**0**	**0**	**1**	**2**

Justification for CO-PO mapping

CO1	PO1 : Apply the knowledge of mathematics, science, engineering fundamentals to compute various elastic constantsand different types of stresses , PO2 : Problem analysis in stress and strain, principal stresses and principal planes,PO4 : lags in investigation of complex problem with applications to beams frames and trusses . PO9 : The students can be made to solve the problems during tutorial hours and thus Lags in individual and team work. PSO1 namely ability to design and analyze the structural components is achieved by making the students understand the concepts and implement it to get better outcome.
CO2	PO1: Knowledge on mechanism of load transfer in indeterminate beams helps in gaining strong engineering knowledge and fundamental over other methods. This will help in problem solving over different load transfer mechanism on different beams (PO2) and design and development of solution (PO3) and lags in investigation of complex problem like deformations in the beams (PO4).
CO3	PO1 : Knowledge in Calculate the deflection of beams by different methods and selection of method for determining slope or deflection, PO2 : Find the load carrying capacity of columns and stresses induced in columns and cylinders . PO3 : development of solution for compression members .PO4 : investigation of complex problem (PSO1) apply the engineering fundamentals helps in analyzing structural components

CO4	**PO1 : Knowledge in determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure , PO2 : Problem in determine principal stresses and planes for an element in three dimensional state of stress and study various theories of failure ,PO4 : investigation of complex problem**
CO5	**PO1 : Calculating stresses due to unsymmetrical bending helps in applying engineering fundamentals and provides engineering solutions for complex problems . PO2 : This will help in problem solving and in designing and analyzing of curved beams helps in design . PO3: development of solution,PO4: investigation of complex problems in unsymmetrical . PSO1 : Applying the engineering fundamentals to analyze and design the various structural components**

3	**High level**	**2**	**Moderate level**	**1**	Low level

*Kindly sign with date
Name & Sign of Faculty Incharge :
Name & Sign of Subject Expert :
Head of the Department :

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