	MOHAMED SATHAK A J COLLEGE OF ENGINEERING Chennai 603103	Format no.	TLP 07
		Rev.Date	15/03/2022
	LESSON PLAN - THEORY	Rev. No.	0

Department of Civil Engineering			
Name of the Subject	Structural Analysis II	Name of the handling Faculty	R.EMILREYAN
Subject Code	CE8602	Year / Sem	III / VI

Course Objective

To learn the method of drawing influence lines and its uses in various applications like beams and plane trusses

To analyse the arches, suspension bridges and space trusses and learn Plastic analysis of beams and rigid frames.

Course Outcome

Draw influence lines for statically determinate structures and calculate critical stress resultants

Understand Muller Breslau principle and draw the influence lines for statically indeterminate beams.

Analyse of three hinged, two hinged and fixed arches

Analyse the suspension bridges with stiffening girders

Understand the concept of Plastic analysis and the method of analyzing beams and rigid frames.

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 INFLUENCE LINES FOR DETERMINATE BEAMS							
1	Influence lines for reactions in statically determinate beams	T2	1	BB	L1	CO1	PO1-PO4
2	Influence lines for shear force and bending moment	T1	2	BB	L2	CO1	PO1-PO4
3	Calculation of critical stress resultants due to concentrated and distributed moving loads	T1	3	NPTEL	L3	CO1	PO1-PO4
4	absolute maximum bending moment	T1	2	BB	L3	CO1	PO1-PO4
5	influence lines for member forces in pin jointed plane frames.	T2	1	BB	L5	CO1	PO1-PO4

Suggested Activity: Case Study - Application of influence lines for finding maximum bending moment in determinate beams

Evaluation method : Paper base evaluation

UNIT II INFLUENCE LINES FOR INDETERMINATE BEAMS							
5	Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components	T1	2	BB	L4	CO2	PO1-PO4
6	Propped cantilever beams	T1	2	BB	L4	CO2	PO1-PO4
7	Analysis of continuous beams, shear force and bending moment diagrams.	T2	4	BB	L4	CO2	PO1-PO4
8	Fixed beam	T1	1	BB	L4	CO2	PO1-PO4
Suggested Activity: Case Study - Application of influence lines for finding maximum bending moment in indeterminate beams							
Evaluation method :Paper base evaluation							
UNIT III ARCHES							
9	Arches - Types of arches	T1	2	PPT	L3	CO3	PO1-PO4
10	Analysis of three hinged, two hinged and fixed arches	T1	5	BB	L4	CO3	PO1-PO4
11	Parabolic and circular arches	T2	1	BB	L3	CO3	PO1-PO4
12	Settlement and temperature effects	R1	1	BB	L4	CO3	PO1-PO4
Suggested Activity: Assignment -three hinged arch							
Evaluation method :Paper base evaluation							
UNIT IV CABLES AND SUSPENSION BRIDGES							
20	Equilibrium of cable and length of cable	R2	1	PPT	L3	CO4	PO1-PO4
21	anchorage of suspension cables	R2	4	PPT	L5	CO1	PO1-PO4
22	cables with three hinged stiffening girders	T2	3	PPT	L4	CO4	PO1-PO4
23	Influence lines for three hinged stiffening girders	T1	1	PPT	L2	CO4	PO1-PO4
Suggested Activity: Tutorial **Problems on cables** **Problems on suspension bridges**							
Evaluation method : Powerpoint presentation base evaluation							

UNIT-V PLASTIC ANALYSIS							
24	Plastic theory ,Statically indeterminate structures and Plastic moment of resistance	T1	1	PPT	L3	CO5	PO1-PO4
25	Plastic modulus ,Shape factor and Load factor	T2	3	PPT	L5	CO5	PO1-PO4
26	Plastic hinge and mechanism ,collapse load ,Static and kinematic methods	T1	1	PPT	L5	CO5	PO1-PO4
27	Upper and lower bound theorems	T2	1	PPT	L5	CO5	PO1-PO4
28	Plastic analysis of indeterminate beams and frames.	T1	3	PPT	L4	CO5	PO1-PO4

Suggested Activity:Tutorial
Problems on shape factor
Problems on solving indeterminate beams

Evaluation method :Powerpoint presentation base evaluation

Content Beyond the Syllabus Planned

1	**Finite element method**
2	**structural dynamics**

Text Books

1	**Bhavikatti,S.S, Structural Analysis,Vol.1 & 2, Vikas Publishing House Pvt.Ltd., NewDelhi-4, 2014.**
2	**Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, Theory of structures, Laxmi, Publications,2004.**

Reference Books

1	**Negi.L.S and Jangid R.S., Structural Analysis, Tata McGraw-Hill Publishers, 2004.**
2	**Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Co.Ltd.2002.**
3	**Gambhir.M.L., Fundamentals of Structural Mechanics and Analysis, PHIL earning Pvt. Ltd.,2011.**

Website / URL References

1	http://www.nptelvideos.in/2012/12/structural-analysis.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	**INFLUENCE LINES FOR DETERMINATE BEAMS**	1	1	4	0	2	0	5	3	8
Unit 2	**INFLUENCE LINES FOR INDETERMINATE BEAMS**	0	0	1	5	2	0	6	0	6
Unit 3	**ARCHES**	0	1	5	2	0	0	3	2	5
Unit 4	**CABLES AND SUSPENSION BRIDGES**	0	1	5	1	5	0	6	2	8
Unit 5	**PLASTIC ANALYSIS**	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	0	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**	**0**	**0**	**0**	**1**	**2**

Justification for CO-PO mapping

CO1	**PO1 : Influence lines for reactions in statically determinate beams , PO2 : Influence lines for shear force and bending moment,PO4 : Calculation of critical stress resultants due to concentrated and distributed moving loads . PSO1 absolute maximum bending moment - influence lines for member forces in pin jointed plane frames.**
CO2	**PO1: Muller Breslau's principle– Influence line for Shearing force, Bending Moment and support reaction components of propped cantilever, continuous beams (Redundancy restricted to one), and fixed beams.**
CO3	**PO1 : Arches - Types of arches PO2 : Analysis of three hinged, two hinged and fixed arches . PO3 : Parabolic and circular arches .PO4 : Settlement and temperature effects.**
CO4	**PO1 : Equilibrium of cable – length of cable - anchorage of suspension cables , PO2 : stiffening girders - cables with three hinged stiffening girders.PO4 : Influence lines for three hinged stiffening girders**
CO5	**PO1 : Plastic theory - Statically indeterminate structures – Plastic moment of resistance . PO2 : Plastic modulus – Shape factor – Load factor PO3: development of solution,PO4:Plastic hinge and mechanism – collapse load - Static and kinematic methods – Upper and lower bound theorems - Plastic analysis of indeterminate beams and frames.**

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

*Kindly sign with date

Name & Sign of Faculty Incharge : Mr R Emilreyan

Name & Sign of Subject Expert : Mr C Navaneetha Krishnan

Head of the Department :