Lesson Plan- CE1017- Structural Analysis
Academic year 2015-16
(Semester commencing in June 2015)

Instructional objectives (IO)	
1	Preparation of influence line diagrams for statically determinate structures.
2	Rolling loads on simply supported beams- uniformly distributed loads and system of wheel loads
3	Analysis of indeterminate structures (beams, frames and trusses) for internal forces, deflections etc.
4	Classical methods - slope deflection method - use in analyzing indeterminate beams and plane frames with and without sway
5	Moment distribution method - Iterative method often used in analyzing indeterminate structures

Student outcomes

Student outcome (SO)	
a	an ability to apply knowledge of mathematics, science, and engineering
e	an ability to identify, formulate, and solve engineering problems

Mapping of Instructional Objectives (IOs) with Student Outcomes (SOs)
CE1017- Structural Analysis

Instructional objectives	Student Outcomes	
	a	**e**
Preparation of influence line diagrams for statically determinate structures.	X	X
Rolling loads on simply supported beams- uniformly distributed loads and system of wheel loads	X	X
Analysis of indeterminate structures (beams, frames and trusses) for internal forces, deflections etc.	X	X
Classical methods - slope deflection method - use in analyzing indeterminate beams and plane frames with and without sway	X	X
Moment distribution method - Iterative method often used in analyzing indeterminate structures	X	X

CE1017	Structural Analysis	Lecture Hours (L)	Tutorial Hours (T)	Practical Hours (P)	Credits (C)
		3	2	0	4
		75 hours			

Lesson Plan – 2015-16 **Revision: 0 dated 29/06/2015**

Lecture No.	Topic	No. of hours	IOs	SO	Reference
1.	Introduction -brief recap of earlier courses Mechanics of Solids and Strength of Materials Overview of syllabus	**2**	1-5	a, e	1,2
	UNIT-I INFLUENCE LINE FOR STATICALLY DETERMINATE STRUCTURES				
2.	Concept of influence lines Difference between bending moment diagram (BMD) and influence line diagram (ILD) Demonstration of drawing ILD by first principles for reactions, bending moment (BM) and shear force (SF)	2	1	a	1, 2,5, 6, 8
3.	Muller Breslau principle – statement and proof	1	1	a	1, 2,5, 6, 8
4.	Drawing ILD for reactions / BM / SF for simply supported beam, cantilever	2	1	a	1, 2,5, 6, 8
5.	Drawing ILD for reactions / BM / SF for overhanging beams with single / double overhang(s)	2	1	a	1, 2,5, 6, 8
6.	Concept of focal length of simply supported beam	1	1	a	1, 2,5, 6, 8
7.	Drawing ILD for reactions / truss members for parallel chord trusses like Pratt truss and Warren girder	2	1	a	1, 2,5, 6, 8
8.	Reversal of stresses in truss members	1	1	a	1, 2,5, 6, 8
	UNIT-2 ROLLING LOADS				
9.	Introduction to rolling loads – IRC loads – Class AA and Class A loads.	1	2	a, e	1, 2,5, 6, 8
10.	Concept of Application of ILD to compute the Reactions / BM / SF due to rolling loads	1	2	a, e	1, 2,5, 6, 8
11.	Finding the maximum reaction and BM / SF at a section due to point loads for maximum 5 numbers in simply supported / overhanging beams	2	2	a, e	1, 2,5, 6, 8
12.	Finding the maximum reaction and BM / SF at a section due to udl shorter and longer than span in simply supported / overhanging beams	1	2	a, e	1, 2,5, 6, 8
13.	Finding absolute maximum bending moment in simply supported beams due to	2	2	a, e	1, 2,5, 6, 8

Lecture No.	Topic	No. of hours	IOs	SO	Reference
	point loads (Max. 4)				
14.	Finding absolute maximum bending moment in simply supported beams due to udl shorter and longer than span	1	2	a, e	1, 2,5, 6, 8
15.	Equivalent udl from BM considerations	1	2	a, e	1, 2,5, 6, 8
16.	Curves of maximum B.M.D. and S.F.D. - concept	1	2	a, e	1, 2,5, 6, 8
	Cycle Test –I	2	2	a, e	1, 2,5, 6, 8
	UNIT-2- STATICALLY INDETERMINATE STRUCTURES				
17.	Introduction to statically indeterminate structures and their examples – beams, frames, trusses Qualitative Comparison between determinate and indeterminate structures in terms of stresses, deflections, settlements	2	3	a, e	1,2,5,6,7,8,9
18.	Computation of static and kinematic indeterminacy – degrees of freedom for beams – beams with internal hinges and links	1	3	a, e	1,2,5,6,7,8,9
19.	Computation of static and kinematic indeterminacy – degrees of freedom for multistoried moment resistant frames with and without sway	1	3	a, e	1,2,5,6,7,8,9
20.	Computation of static and kinematic indeterminacy – degrees of freedom for pin jointed trusses	1	3	a, e	1,2,5,6,7,8,9
21.	Computation of static and kinematic indeterminacy – degrees of freedom for simple three dimensional single storey moment resistant frames and simple pin jointed trusses like tripods.	1	3	a, e	1,2,5,6,7,8,9
22.	Analysis of propped cantilever by Macaulay's method with and without overhangs and drawing BMD and SFD, finding support reactions	2	3	a, e	1,2,5,6,7,8,9
23.	Analysis of fixed beams by Macaulay's method and Area Moment method and drawing BMD and SFD including for uniformly varying loads (triangular), finding support reactions	3	3	a, e	1,2,5,6,7,8,9
24.	Analysis of continuous beams by Clapeyron's Three Moment Equation method and drawing BMD and SFD. finding support reactions including considering settlement of supports. (maximum 2 unknown support moments)	4	3	a, e	1,2,5,6,7,8,9

Lecture No.	Topic	No. of hours	IOs	SO	Reference
	Analysis of continuous beams with fixed supports				
25.	Introduction to Energy methods- Statement of Castiglione's theorems – and formulating unit load method	1	3	a, e	1,2,5,6,7,8,9
26.	Analysis of indeterminate trusses with internal degree of indeterminacy one using unit load method (no. of members in the truss not greater than 6)	2	3	a, e	1,2,5,6,7,8,9
27.	Analysis of indeterminate trusses with members with lack of fit	1	3	a, e	1,2,5,6,7,8,9
28.	Analysis of indeterminate trusses subjected to temperature stresses	1	3	a, e	1,2,5,6,7,8,9
	Cycle Test - II	2	3	a, e	1,2,3.4
	UNIT-IV SLOPE DEFLECTION METHOD				
29.	Comparison of Force and Displacement methods Introduction- derivation of slope deflection equation – sign convention	2	4	a, e	1,2,3,4,6,7
30.	Analysis of continuous beams including with support settlements with degrees of freedom less than or equal to two and drawing BMD, finding support reactions	4	4	a, e	1,2,3,4,6,7
31.	Qualitative treatment of beams with internal hinges	1		a, e	1,2,3,4,6,7
32.	Analysis of plane moment resistant single storey frames with degrees of freedom less than or equal to two without side sway and drawing BMD, finding support reactions (BMD plotted on tension side)	4	4	a, e	1,2,3,4,6,7
33.	Analysis of plane moment resistant single storey frames with degrees of freedom less than or equal to three with side sway and drawing BMD, finding support reactions	2	4	a, e	1,2,3,4,6,7
	UNIT-V MOMENT DISTRIBUTION METHOD				
34.	Introduction- development moment distribution method – sign convention	2	5	a, e	1,2,3,4,6,7
35.	Analysis of continuous beams drawing BMD, finding support reactions	1	5	a, e,	1,2,3,4,6,7
36.	Analysis of plane moment resistant single storey frames drawing BMD, finding support reactions (BMD plotted on tension side)	2	5	a, e	1,2,3,4,6,7
37.	Analysis of plane moment resistant single storey frames with side sway and drawing BMD, finding support reactions	3	5	a, e	1,2,3,4,6,7

Lecture No.	Topic	No. of hours	IOs	SO	Reference
38.	Introduction to Kani's method – principles- factors- comparison with moment distribution method	2	5	a, e	2
39.	Introduction to Column analogy method – solving fixed beam problem	2	5	a, e	1,2
	Model Examination	3	1-5	a, e	1,2,3,4
	Total hours	75			

Note:

1. The faculty members handling the course may conduct surprise test according to their convenience. However a question paper in hard copy as well as key shall be made available for the surprise test. The process shall be same as that of cycle tests.

2. The portion for the cycle tests / model examinations will be announced a week prior to commencement of such exam / tests.

TEXT BOOKS

1. Menon, D., "*Structural Analysis*", Alpha Science International, Limited, 2008.
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "*Theory of Structures*", Laxmi Publications, New Delhi, 12th Edition, 2004.

REFERENCE BOOKS

3. Bhavikatti .S.S., "*Structural Analysis Vol-1*", E-3, Vikas Publishing House Pvt Limited, 2009.
4. Vaidyanathan .R, **"***Comprehensive Structural Analysis*", *Volume 1***,** Laxmi Publications, New Delhi, 2005.
5. Pandit .G.S, "*Theory Of Structures*", Vol-I, McGraw-Hill Education (India) Pvt Limited, 1999.
6. Wang .C.K, "*Statically Indeterminate Structures*", McGraw Hill International Book Company, 1984.
7. Harry H.West., "*Analysis of Structures*", John Wiley &Sons.1980.
8. Charles Head Norris, John Benson Wilbur, Senol Utku, "*Elementry Structural Analysis*", 3rd Edn. McGraw Hill International Editions, Structures Series, 1987.
9. Timoshenko .S.P & Young .D.H, "*Theory of Structures*", 2 Edn. McGraw Hill Book Company, International Ed. 1965.

Prepared by

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29-06-2015

Faculty members handling the course

Sl. No.	Faculty Name
1.	**Prof. G. Augustine Maniraj Pandian**
2.	**Dr. P.R. Kannan Rajkumar**
3.	**Ms. S. Sindhu Nachiar**
4.	**Mr. S.A. Vengadesh Subramanian**
5.	**Ms. B. Geetha**
6.	**Mr.A. Joshua Daniel**
7.	**Ms.S. Karthiga**
8.	**Mr.S. Abdul Rahuman**