



DEPARTMENT OF CIVIL ENGINEERING	
B.E/B.Tech/M.E/M.Tech : Civil Engineering Regulation:2018	LP: CE 18604
PG Specialisation : NA	Rev. No: 00
Sub. Code / Sub. Name : CE 18604/ Advanced structural analysis	Date: 28.02.2022
Unit : I/ PLASTIC ANALYSIS OF STRUCTURES	

Unit Syllabus:

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems

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

Session No *	Topics to be covered	Ref	Teaching Aids
1	Statically indeterminate axial problem	T2-Ch-2, Pg.101-102	BB/PPT
2	Beams in pure bending	T2-Ch-2, Pg.101-102	BB/PPT
3	Plastic moment of resistance	T2-Ch-2, Pg.101-102	BB/PPT
4	Plastic modulus	T2-Ch-2, Pg.105	BB/PPT
5	Shape factor	T2-Ch-2, Pg.107-110	BB/PPT
6	Load factor	T2-Ch-2, Pg.116-118	BB/PPT
7	Plastic hinge and mechanism	T2-Ch-2, Pg.111-114	BB/PPT
8	Plastic analysis of indeterminate beams	T2-Ch-2, Pg.122-125	BB/PPT
11	Upper bound theorem	T2-Ch-2, Pg.108-110	BB/PPT
12	Lower bound theorem	T2-Ch-2, Pg.115-122	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 minutes

**Sub. Code / Sub. Name: CE 18604/ Advanced structural analysis****Unit : II / FINITE ELEMENT**

Unit Syllabus: Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – One dimensional elements

Objective: Analyze the structure using finite element method

Session No *	Topics to be covered	Ref	Teaching Aids
13	Introduction	T2-Ch-11, Pg.452-453	PPT
14	Discretisation of a structure	T2-Ch-11, Pg.454-470	PPT
15	Problems	T2-Ch-11, Pg.454-470	PPT
16	Problems	T2-Ch-11, Pg.454-470	PPT
17	Displacement functions	T2-Ch-11, Pg.472-484	PPT
18	Problems	T2-Ch-11, Pg.472-484	BB/PPT
19	Problems	T2-Ch-11, Pg.472-484	BB/PPT
20	Truss element	T2-Ch-11, Pg.486-490	PPT
21	Beam element	T2-Ch-11, Pg.491-492	PPT
22	Problems	T2-Ch-11, Pg.491-492	BB/PPT
23	One dimensional elements	T2-Ch-11, Pg.492-496	PPT
24	Problems	T2-Ch-11, Pg.492-496	BB/PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins



Sub. Code / Sub. Name: CE 18604/ Advanced structural analysis

Unit : III/ MOVING LOADS AND INFLUENCE LINES

Unit Syllabus: Influence lines for reactions in statically determinate structures – influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads. Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames – Indirect model analysis for influence lines of indeterminate structures – Beggs deformeter

Objective: Understand the concept of influence lines for structures due to moving loads

Session No *	Topics to be covered	Ref	Teaching Aids
25	Influence lines for reactions in statically determinate structures	T2-Ch-7, Pg.256-264	PPT
26	Influence lines for reactions in statically determinate structures	T2-Ch-7, Pg.256-264	BB/PPT
27	Influence lines for member forces in pin-jointed frames	T2-Ch-7, Pg.323-333	BB/PPT
28	Influence lines for shear force and bending moment in beam sections	T2-Ch-7, Pg.264	BB/PPT
29	Influence lines for shear force and bending moment in beam sections	T2-Ch-7, Pg.264	BB/PPT
30	Calculation of critical stress resultants due to concentrated	T2-Ch-7, Pg.295-323	PPT
31	Calculation of critical stress resultants due to distributed moving loads	T2-Ch-7, Pg.266-291	PPT
32	Muller Breslau's principle	T2-Ch-7, Pg.102-103	PPT
33	Influence lines for continuous beams	T2-Ch-7, Pg.119-121	PPT
34	Influence lines for continuous beams	T2-Ch-7, Pg.119-121	PPT
35	Indirect model analysis for influence lines of indeterminate structures	T2-Ch-7, Pg.119-121	PPT
36	Beggs deformeter	T2-Ch-7, Pg.144-145	PPT

Content beyond syllabus covered (if any):

* Session duration: 50 mins

**Sub. Code / Sub. Name: CE 18604/ Advanced structural analysis****Unit : IV/ ARCHES**

Unit Syllabus: Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged and two hinged, parabolic and circular arches – Settlement and temperature effects

Objective: Analyze arches for given loading

Session No *	Topics to be covered	Ref	Teaching Aids
37	Arches as structural forms	T1-Ch-5, Pg.123-124	PPT
38	Examples of arch structures	T1-Ch-5, Pg.125-127	PPT
39	Problems	T1-Ch-5, Pg.125-127	BB/PPT
40	Analysis of two hinged parabolic arch	T1-Ch-5, Pg.153-158	PPT
41	Problems	T1-Ch-5, Pg.153-158	BB/PPT
42	Analysis of two hinged circular arch	T1-Ch-5, Pg.172-178	PPT
43	Problems	T1-Ch-5, Pg.172-178	BB/PPT
44	Analysis of three hinged circular arch	T1-Ch-5, Pg.127-136	PPT
45	Problems	T1-Ch-5, Pg.127-136	BB/PPT
46	Settlement	T1-Ch-5, Pg.168-172	PPT
48	Temperature effects	T1-Ch-5, Pg.168-172	PPT
Content beyond syllabus covered (if any):			

* Session duration: 50 mins

**Sub. Code / Sub. name: CE18604/ Advanced Structural Analysis****Unit : V / SPACE FRAMES AND CABLE STRUCTURES****Unit Syllabus:**

Analysis of Space trusses using method of tension coefficients – Beams curved in plan
Suspension cables suspension bridges with two and three hinged stiffening girders

Objective: Analyze the space frames and cable structures

Session No *	Topics to be covered	Ref	Teaching Aids
49	Analysis of Space trusses using method of tension coefficients	T-2,Ch10, Pg.272-299	BB/PPT
50			
51			
52	Beams curved in plan Suspension cables	T-2,Ch10, Pg.253-270	BB/PPT
53			
54			
55	Suspension bridges with two hinged stiffening girders	T-2,Ch10, Pg. 245-251	BB/PPT
56			
57			
58	Suspension bridges with three hinged stiffening girders	T-2,Ch10, Pg. 238-244	BB/PPT
59			
60			

Content beyond syllabus covered (if any): *Rapid and Approximate Analysis of Building Frames.*



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TEXTBOOKS:

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.

REFERENCES:

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.
4. Vazrani.V.N And Ratwani,M.M, Analysis of Structures, Vol.II, Khanna Publishers,2015.

	Prepared by	Approved by
Signature		
Name	Dr.R.Sathia	Dr.R.Kumutha
Designation	Associate Professor	Professor & Head of the Department
Date	28.02.2022	1/03/2022
Remarks *: Same lesson plan is followed as in AY 2020-2021		
Remarks *:		