



Department of Civil Engineering		LP: CE18703 Rev. No: 0D Date: 27/07/2022
B.E/B.Tech/M.E/M.Tech : B.E.	Regulation: R2018	
PG Specialisation : Not Applicable		
Sub. Code / Sub. Name : CE18703 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGG.		
Unit : I		

Unit syllabus: THEORY OF VIBRATIONS

Difference between static loading and dynamic loading – Degree of freedom – idealisation of structure as single degree of freedom system – Formulation of Equations of motion of SDOF system - D'Alemberts principles – effect of damping – free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.

Objective: To introduce dynamic loading and dynamic performance of a structure with idealization of structure as single degree of freedom.

Session No *	Topics to be covered	Ref	Teaching Aids
01	An overview of the course – Basic concepts of vibration- Difference between static loading and dynamic loading	4 – Ch.1; Pg.1 to 4	PPT
02	Degree of freedom – Idealisation of structure as single degree of freedom system	2- ch.6; pg.112-114 3-ch.1; pg.4&5 4-Ch.1; Pg.7 to 9 Ch.2;16, 17,18	PPT
03	Formulation of Equations of motion of SDOF system - D'Alemberts principles	3- Ch.1; pg. 10-12 4 – Ch.2; Pg.18-23	PPT & BB
04	Undamped free vibration of SDOF structures	3 – Ch.1;pg.3-23 4 – Ch.2; Pg.23-40	PPT & BB
05	Effect of damping – free vibration of damped structures	2- ch.7; pg.116-120 3 – Ch.2;pg.31-45 4 – Ch.3; Pg.42-64	PPT & BB
06			
07	Response to Harmonic forces	2-ch.7; pg.120-122 3 – Ch.3;pg.49-96 4 – Ch.4; Pg.65-97	PPT & BB
08			
09	Response to periodic forces.	4 – Ch.5; Pg.98-108	PPT & BB
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 minutes



Sub. Code / Sub. Name: CE18703 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING
Unit : II

Unit Syllabus: MULTIPLE DEGREE OF FREEDOM SYSTEM

Two degree of freedom system – modes of vibrations – formulation of equations of motion of multi degree of freedom (MDOF) system - Eigen values and Eigen vectors – Response to free and forced vibrations - damped and undamped MDOF system – Modal superposition methods.

Objective: To impart the knowledge on multiple degree of freedom system and to determine the response to free and forced vibrations.

Session No *	Topics to be covered	Ref	Teaching Aids
10	Two degree of freedom system - modes of vibrations – Free vibration of undamped system - Eigen values and Eigen vectors	2-ch.11; pg.159-161 4 – Ch.7; Pg.126 – 131, 137-154	PPT & BB
11			
12	Response to free vibration of damped system	1- Ch.9: pg.381-393 4 – Ch.7; Pg.132 – 134,	PPT & BB
13	Response to forced vibration of undamped and damped	1- Ch.9: pg. 393-406 4 – Ch.7; Pg.134 – 137, 154-157	PPT & BB
14			
15	Formulation of equations of motion of multi degree of freedom (MDOF) system – Free vibration analysis- undamped and damped	1-Ch.18; pg.725-775 2-ch.11; pg.162-169 4 – Ch.8; Pg.158 – 163	PPT & BB
16			
17	Modal superposition - Formulation of equations of motion of multi degree of freedom (MDOF) system – Forced vibration analysis	2-ch.11,pg.169-177 4 – Ch.8; Pg.163 – 174	PPT & BB
18			
Content beyond syllabus covered (if any): Nil			

* Session duration: 50 mins



Sub. Code / Sub. Name: **CE18703 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING**

Unit : **III**

Unit Syllabus : UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING

Elements of Engineering Seismology - Causes of Earthquake – Plate Tectonic theory – Elastic rebound Theory – Characteristic of earthquake – Estimation of earthquake parameters - Magnitude and intensity of earthquakes – Spectral Acceleration.

Objective: To study the elements of engineering seismology and theories pertaining to earthquake

Session No *	Topics to be covered	Ref	Teaching Aids
19	Elements of Engineering Seismology - Causes of Earthquake – Plate Tectonic theory - Elastic rebound Theory	2 - Ch.1; pg.3-9 4 – Ch.9; Pg.175 – 181	PPT
20			
21			
22	Characteristic of earthquake – Estimation of earthquake parameters	2- Ch.5; pg.88-107 4 – Ch.9; Pg.184 – 188	PPT
23			
24			
25	Magnitude of intensity of earthquakes – Spectral Acceleration	4 – Ch.9; Pg.188 – 198	PPT
26			
27			

Content beyond syllabus covered (if any): Nil

* Session duration: 50 mins



Sub. Code / Sub. Name: **CE18703 - STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING**
Unit : IV

Unit Syllabus : RESPONSE OF STRUCTURES TO EARTHQUAKE

Effect of earthquake on different type of structures – Behaviour of Reinforced Cement Concrete, Steel and Prestressed Concrete Structure under earthquake loading – Pinching effect – Bouchinger Effects – Liquefaction of soil - Evaluation of earthquake forces as per IS:1893 – 2016 - Response Spectra – Lessons learnt from past earthquakes.

Objective: To impart knowledge on effect of earthquake loading to different type of structures like RCC, Steel and Prestressed.

Session No*	Topics to be covered	Ref	Teaching Method
28	Effect of earthquake on different type of structures - Behaviour of steel under earthquake loading	5-Ch.10; 337-367	PPT & BB
29	Behaviour of Reinforced Cement Concrete under earthquake loading - Pinching effect – Bouchinger Effects	5-Ch.10; 367-399	PPT & BB
30			
31	Behaviour of Prestressed Concrete Structure under earthquake loading	5-Ch.10; 410-416	PPT & BB
32	Liquefaction of soil	5- Ch:5;pg.147-149 5-Ch:6; pg: 241-242 4- Ch.12; pg.216-223	PPT & BB
33	Evaluation of earthquake forces as per IS:1893 – 2016	2-ch.16; pg.251-280 4 – Ch.14; Pg.234 – 252	PPT & BB
34			
35	Response Spectra – Lessons learnt from past earthquakes	1 - Ch.6; pg.233-281 4 – Ch.10; Pg.199 – 210 4 – Ch.9; Pg.195 – 198	PPT & BB
36			
Content beyond syllabus covered (if any): NIL			

* Session duration: 50 mins



Sub. Code / Sub. Name: CE18703-STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING
Unit : V

Unit Syllabus: CONCEPTS OF EARTHQUAKE RESISTANT DESIGN

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 2013 – Guidelines for Earthquake resistant design – Earthquake resistant design for masonry and Reinforced Cement Concrete buildings – Later load analysis – Design and detailing as per IS:13920 – 2016.

Objective: To impart knowledge on Aseismic design methodology for masonry and concrete structures.

Session No *	Topics to be covered	Ref	Teaching Method
37	Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 2013	2-ch.15;pg.239-248	PPT & BB
38		4 – Ch.13; Pg.224 – 233	
39	Guidelines for Earthquake resistant design – Earthquake resistant design for masonry buildings	2 – Ch.24; Pg.427 – 460	PPT & BB
40			
41	Earthquake resistant design for Reinforced Cement Concrete buildings	2-ch.12; pg.191-205 2-ch.13; pg.207 -224 2-ch.20;pg.341-370 4 – Ch.15; Pg.253 – 302	PPT & BB
42			
43			
44	Lateral load analysis – Design and detailing as per IS:13920 – 2016	2 – Ch.26; Pg.463 – 485	PPT & BB
45			
Content beyond syllabus covered (if any): Earthquake Dynamics of Base-Isolated buildings		1 – Ch.20; pg.777-801	PPT & BB


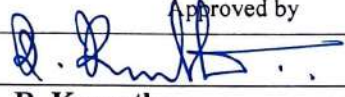
* Session duration: 50 mins



Sub Code / Sub Name: CE 18703- STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

REFERENCES:

1. **Chopra, A.K.**, "Dynamics of Structures – Theory and Applications to Earthquake Engineering", 4th Edition, Pearson Education, 2011.
2. **Agarwal. P and Shrikhande. M.**, "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd. 2010
3. **Paz, M. and Leigh.W.** "Structural Dynamics – Theory & Computation", 5th Edition, Springer (India) Private Ltd., New Delhi, 2004.
4. **Damodarasamy, S.R. and Kavitha, S.** "Basics of Structural dynamics and Aseismic design", PHI Learning Pvt. Ltd., 2012
5. **Dowrick, D.J.**, "Earthquake resistant design", 2nd edition, John Wiley & sons, London, 2009

	Prepared by	Approved by
Signature		
Name	Dr. P. Venkateswara Rao	Dr. R. Kumutha
Designation	Professor / Civil	Professor & HOD / Civil
Date	27 / 07 / 2022	
Remarks *:	<i>Same lesson plan is followed</i>	
Remarks *:	<i>Instead of online classes, PPT & BB will be used as teaching aids</i>	

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