

SRI VIDYA COLLEGE OF ENGINEERING & TECHNOLOGY COURSE PLAN (THEORY)



	ACADE	MIC YEAR:	2018-2	019		
Subject Code	CE6701		l.	P	T	C
Subject Title	Structural Dynamics and Earthquake Er	Lincering	3	0	0	3
Year / Dept / Sem	แบวเงน.งาเ	Regulation	Year	2013		-
Faculty Name / Desg / Dept	Ms.S.NAGAJOTHI /AP/CIVIL					op. or an annual section of
Course Prerequisite	Theory of vibrations Multiple Degree of Freedom System Elements of seismology, Response of structures to Earthquake Design methodology					

CE6701 STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

LTPC

COURSE OBJECTIVES:

The main objective of the course is to introduce dynamic loading and the dynamic performance of the structures to the students. Different types of dynamic loading also to be discussed. The detailed study on the performance of structures under earthquake loading is also one of the focuses of the course.

UNIT I THEORY OF VIBRATIONS

9

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.

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM

9

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

UNIT III ELEMENTS OF SEISMOLOGY

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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.

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE

4

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 – Evaluation of earthquake forces as per IS:1893 – 2002 - Response Spectra – Lessons learnt from past earthquakes.

UNIT V DESIGN METHODOLOGY

3

Causes of damage – Planning considerations / Architectural concepts as per IS:4326 – 1993 – 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 – 1993.

TOTAL: 45 PERIODS

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OUTCOMES:

The students will be able to get a basic knowledge to analyse structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions

TEXT BOOKS:

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. 2007

REFERENCES:

- 1. Anil K.Chopra, Dynamics of Structures, Pearson Education, 2007.
- 2. Leonard Meirovitch, Elements of Vibration Analysis, McGraw Hill 1986, IOS Press, 2006.
- 3. Mario Paz, Structural Dynamics Theory and Computation, Kluwer Academic Publishers, 2004.
- 4. Roy R.Craig, Jr, Andrew J. Kurdila, Fundamentals of Structural Dynamics, John Wiley & Sons, 2011.

Course Objectives (CO)	CO1: To analyse structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions. CO2: Students will be in a position to assess the behavior of columns, beams and failure of materials.
•	At the end of the course, the students should be able to:
Expected Course Outcomes (ECO)	ECO1: The student will have the knowledge to analyze structures subjected to dynamic loading and to design the structures for seismic loading as per code provisions. ECO2: The student will able to Understand the difference between static and dynamic analysis of structure ECO3: The student will able to carry out the dynamic analysis of various types of structures. ECO4: The student will able to Use of random vibration concept to understand the behavior of structures under earthquake loads ECO5: The student will able to apply the concepts of dynamic systems. ECO6 The student will able to identify, formulate and solve dynamic response of SDOF & MDOF.

Mapping of CO & PO(Specify the PO's) - (Fill the cols with the legend given below)

Programme Outcomes of Civil Engineering

- a. Graduates of Civil Engineering program will be able to apply the fundamental knowledge of mathematics, science and engineering to solve problems pertaining to Civil Engineering.
- b. Graduates of Civil Engineering program will be able to identify, analyze, formulate, and solve civil Engineering problems in accordance with Indian Standard codes of practice.
- c. Graduates of Civil Engineering program will be able to design a system component, or process to meet desired needs within realistic constraint such as economic, environmental, social, political, ethical, health safety, manufacturability, and sustainability.
- d. Graduates of Civil Engineering program will able be to design and conduct experiments, as well as to analyze and interpret data.
- e. Graduates of Civil Engineering will be able to use the techniques, skills, and modern civil engineering tools, necessary for engineering practice.
- Graduates of Civil Engineering program will be able to incorporate specific contemporary issues

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- into the identification, formulation, and solution of specific civil engineering problems.
- g. Graduates of Civil Engineering program will be able to work on the basis of broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- In. Graduates of Civil Engineering program will be able to understand the role of Civil Engineers and ethical responsibility.
- i. Graduates of Civil Engineering program will be able to function on multidisciplinary teams.
- Graduates of Civil Engineering program will be able to deliver effective verbal, written, and graphical communications.
- k. Graduates of Civil Engineering program will be able to recognize the need for, and an ability to engage in life-long learning.
- Chaduates of Civil Engineering program will be able to perform economic analysis, quality checks, time labour management and cost estimates related to design, construction, operations and maintenance of systems in the civil technical specialties.

	PO1	PO2	PO3	PO4	P05	P06	PO7	FO8	P09	PO10	PO11	PO12
001	-	2	2	1	-	-	-	-	-	-	-	-
002	3	-	-	-	1	-	2		-	-	-	-
COS	1	3	1	1	-	-	-		-	-	-	1
- CO4	1	2	1	-	-	-	-	-	-	-	-	2
C05	2	1	-	-	-	-	2		-	-	-	-
00%	1	3	1	-	-	-	1	-	-	-	-	1
Additional Topics beyond syllabus/Seminars/Assign ments 1. Tsunami 2. Earthquake Resistance Structures												
Related We	boine Ui	wlintps://how.dv.tamu.edu/Inside/HR2504/PDFs/SYL_201411 W2: http://texts/vides.nptel.iitm.ac.im/vides.php?csurseId=105101										
Related Vi Materials (s	V2: <u>h</u> V3: <u>h</u> V4: <u>h</u>	ntips://w ntips://w ntips://w ntips://w	enenesyon enenesyon	utube.co utube.co utube.co	urn/weto urn/weto urn/weto	ch?v=bC ch?v=R7 ch?v=ev	EvEhlXn Fz8aOlG 9XyuLwi	<u>Sk</u> So jul	4			

S.No	Topic Name	Book Page no	Mode of delivery	No of hrs	Cumulative hrs
	UNIT I THEOR	Y OF VIBI	RATIONS		W
1	Introduction to vibrations, Difference between static loading and dynamic loading		Brain storming	2	2
2	Degree of freedom – idealisation of structure as single degree of freedom system	Own notes	Class room teaching	2	4
3	Formulation of Equations of motion of SDOF system	Own notes	Class room teaching	1	5
4	D"Alemberts principles - effect of	Own	Class room	2	7

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	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	14			
	damping – free and forced vibration of damped and undamped structures	notes	teaching		a = 27
5	Response to harmonic and periodic	0	Classian	1	9
	forces.		Class room	2	9
		notes	teaching		
	UNIT II MIII TIDY TO THE				
1	UNIT II MULTIPLE DEG	REE OF F	REEDOM SYST	EM	
	freedom system	-	Brain storming	1	10
2	Two degree of freedom system – modes			1 1	
	of vibrations	Own	Class room	2	12
3		notes	teaching	1000	
	formulation of equations of motion of	Own	Class room	2	14
4	multi degree of freedom (MDOF) system	notes	teaching	-	14
7	Light values and Figen vectors	Own	Class room	2	16
_	Response to free and forced vibrations	notes	teaching	2	16
5	Damped and undamped MDOE australia	Own	Class room	-	10
	– Modal superposition methods.	notes	2	2	18
	UNIT III EL EMEN		teaching		
1	UNIT III ELEMEN Introduction to Elements of seismology	118 OF SE	ISMOLOGY		
2	Causes of Earthquake – Plate Tectonic	•	Brain storming	1	19
	theory	0wn	Class room	2	21
3		notes	teaching		
	Elastic rebound Theory – Characteristic of earthquake	Own	Class room	2	23
4	Estimation of the	notes	teaching,		
4	Estimation of earthquake parameters	Own	Class room	2	25
-	14	notes	teaching	6 - 1	-5
5	Magnitude and intensity of earthquakes	Own	Class room	2	27
	- Spectral Acceleration.	notes	teaching		27
	UNIT IV RESPONSE OF ST	RUCTURE	S TO EARTHOU	AICE	-
1	introduction to Response of structures to	-	Brain storming	· 1	10
Mai	Earthquake		Diam storning	1	28
2	Effect of earthquake on different type of	Own	Class room	2	20
	structures - Behaviour of Reinforced	notes	teaching	2	30
	Cement Concrete, Steel and Prestressed	notes	tedening	. 4	
			- No.		
	Concrete Structure under earthquake	-			
	loading	3.1			
3	Pinching effect – Bouchinger Effects	Own	Class room	2	32
	X	notes	teaching	-	34
4	Evaluation of earthquake forces as per	Own	Class room	2	24
	IS:1893 – 2002 - Response Spectra	notes	teaching	4	34
5	Lessons learnt from past earthquakes.	Own	Class room		
_		notes	teaching	2	36
	UNIT V DESIGN				
1	Introduction to Design methodology	, METHOI			M
T	introduction to Design methodology	-	Brain storming	1	37
2	Course of domests Dist	0	01		
2	Causes of damage - Planning	Own	Class room	2	39
	considerations / Architectural concepts	notes	teaching		
	as per IS:4326 – 1993.				
3		Own	Class room		
5	Guidelines for Earthquake resistant		,	2	41
	design -Earthquake resistant design for	notes	teaching		
	masonry and Reinforced Cement		-		

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	Concrete buildings -				
4	Later load analysis	Own notes	Class room teaching	2	43
5	Design and detailing as per IS:13920 – 1993.	Own notes	Class room teaching	2	45

	Prepared by	Approved by		
Signature	DK:	1 36 lev 11/2		
Name	Ms.S.NAGAJOTHI	Mr.P.SURESHKUMAR		
_Designation	Assistant Professor / Civil	ASP & HOD (Civil)		
Signed date	26.06-2018	26.06.18		

LEGEND:

METHODOLOGY TO MAP OBJECTIVE WITH OUTCOME

Course outcomes are achieved through

- a. Suitable Analogies.
- b. Class room teaching.
- c. Assignments.
- d. Tutorials
- e. Weekly, monthly and model exams.
- f. Brain storming.
- g. Group discussion and role play.
- h. Seminars/Workshops.
- i. Expert lectures.

Endonned &