Subject		Contact hours per week				Evaluation Scheme			
Course No.	**Course Title**	**Lecture L**	**Practical P**	**Tutorial T**	**Credits**	**Internals**	**Mid-Sem. Exam.**	**End-Sem. Exam.**	**Total**
CE-603	Finite Element Analysis	3	0	1	4	30	20	50	100
CE-604	Structural Dynamics	3	0	1	4	30	20	50	100
CE-691-S	Lab/Project	0	4	0	4	20	-	30	50
CE---	Elective-III	3	0	1	4	30	20	50	100
CE---	Elective-IV	3	0	1	4	30	20	50	100
	Total	**12**	**4**	**4**	**20**				**450**

Course No.	**CourseTitle**	**Course Type**	**Credits**	**Contact Hours**		
				L	**P**	**T**
CE-603	Finite Element Analysis	DC	4	3	0	1

Unit 1 Introduction

Finite element method and other classical methods, historical background, advantages & disadvantages, finite element modeling – discretisation, nodes, elements types and shapes. Basic equations in elasticity – stress and strain vectors, Hooke's law, strain-displacement relationship, equilibrium equations, generalized compatibility equations.

Unit 2 Finite element analysis of one dimensional problem

Generation of stiffness matrix by displacement and energy method, energy and variational approaches (Rayleigh-Ritz method), numerical solutions.

Unit 3 Iso-parametric elements and shape functions

Co-ordinate systems, Element shapes, Strain displacement matrix, Higher order elements: 1D, 2D and 3D.

Unit 4 Finite element analysis of two dimensional problems

Symmetry, Plane stress and plane strain problems, Bending of thin plates, Introduction to Nonlinear FE analysis.

Text Books and Reference Materials

1. David Hutton. Fundamentals of Finite Element Analysis. Tata McGraw - Hill Publishing Company, 2005.
2. Robert D. Cook, Concepts and Applications of Finite Element Analysis, Wiley, John & Sons, 1999.
3. Chandrupatla & Belagundu, Finite Elements in Engineering, Prentice Hall of India Private Ltd., 1997.
4. C. S. Krishnamoorthy, Finite Element Analysis – Theory and Programming, Tata McGraw Hill, 1995.
5. K. J. Bathe, Finite Elements Procedures in Engineering analysis, Prentice Hall Inc.,1995.
6. J. N. Reddy, An Introduction to the Finite Element Method, McGraw Hill, International Edition, 1993.
7. O. C. Zienkiewicz, and R. L. Taylor, The Finite Elements Methods, McGraw Hill,1987.
8. Timoshenko, S., Theory of Elasticity and Plasticity, McGraw Hill Bookcompany.

Course No.	CourseTitle	Course Type	Credits	Contact Hours		
				L	P	T
CE 604	Structural Dynamics	DC	4	3	0	1

Unit 1

Types of Vibration and Ground motions, Undammed and Damped Single Degree of Freedom System, Response of SDOF System to Harmonic Loading.

Unit 2

Response to General Dynamic and Impulsive Loading, Duhamel's Integration, Fourier Analysis and Response in the Frequency Domain.

Unit 3

Free Vibration of Lumped Multi Degree of Freedom System. Approximate Methods For Obtaining Natural Frequencies and Mode Shapes. Frequency Domain Analysis Of Lumped Multi Degree Of Freedom System Using Normal Mode Theory, Time Domain Analysis Using Numerical Integration Scheme.

Unit 4

Principle of Virtual Work, Rayleigh's and Modified Rayleigh's Method, Dynamic Analysis of Systems with Distributed Properties.

Text Books and Reference Materials

1. Structural Dynamics: Theory and Computation byMario Paz, Kluwer Academic Publisher Group, Netherland.
2. Dynamics of Structures: Theory and Application to Earthquake Engineering by A. K. Chopra, Pearson Education,Inc.
3. Elements of Earthquake Engineering and Structural Dynamics by Andre Filiatrault, Presses Inter Polytechnic.
4. Structural Dynamics: Vibrations and Systems by MadhujitMukhopadhaya, Ane Book PrivateLimited.
5. Fundamentals of Structural Dynamics by Roy R. Craig, Andrew J. Kurdila, John WileyPublications.
6. Web links to e-learning:*nptel*
7. Web based learning, Journal Papers,etc.

Course No.	CourseTitle	Course Type	Credits	Contact Hours		
				L	P	T
CE 691S	Lab/Project	DC	3	3	0	0

1. To calculate the depth of the vertical crack in a beam with the help of Portable Ultra Sonic Non-destructive Testing Indicator(PUNDIT).
2. To calculate the length of the inclined crack in a beam with the help of Portable Ultra Sonic Non-destructive Testing Indicator(PUNDIT).
3. To calculate the strength of the cube by testing under destruction and non-destructive testing byPUNDIT.
4. To calculate the Poison's ratio and modulus of elasticity of the concrete.
5. To study the behavior of timber section under pure bending.
6. To calculate stiffness, damping and logarithmic decrement of the spring system both in series and parallel.
7. Analyze a three span continuous beam (i) By moment redistribution method (ii) Analytically with the help of software. Also compare the results.
8. Analyse a multi- storey building considering earthquake and windalso.

Text Books and Reference Materials

1. Labmanual.

Web based learning