SCHEME OF COURSE WORK'

Course Details:

Course Title	**: EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**		
Course Code	**: 15CE2210**	**L P C**	**: 4 0 3**
Program:	**: M. Tech.**		
Specialization:	**: Structural Engineering**		
Semester	**: I**		
Prerequisites	**: R.C Structures, Strength of Materials, Structural Analysis.**		
Courses to which it is a prerequisite	**: None**		

Course Outcomes (COs):

At the end of the course, the student will be able to:

1	Summarise engineering seismology and discuss the causes and effects of earthquakes.
2	Analyze and detail the multi-storeyed structures using I.S Codes by seismic coefficient and response spectrum methods.
3	Design and detail shear walls using I.S:13920
4	Discuss various retrofitting techniques for R.C buildings
5	Design earthquake-resistant masonry buildings.

Program Outcomes (POs):

Post graduates will be able to:

1	Synthesize existing and new knowledge in various sub areas of structural engineering
2	Analyse complex engineering problems critically with adequate theoretical background for practical applications.
3	Evaluate a wide range of feasible and optimal solutions after considering safety and environmental factors.
4	Demonstate the ability to pursue research by conducting experiments and extract the relevant information through literature surveys.
5	Use state –of- the- art of modern tools for interpeting the behaviour and modeling of complex engineering structures.
6	Attain the capability to work in multi disciplinary teams to achieve common goals.
7	Demonstrate the knowledge to perform the projects efficiently in multi disciplinary environments after consideration of economical and financial matters.
8	Communicate effectively on complex engineering activities to prepare reports and make presentations.
9	Engage in life-long learning independently to improve knowledge.
10	Understand the responsibility of carrying out professional practices ethically for sustainable development of society.
11	Examine critically and independently one's actions and take corrective measures by learning from mistakes.

Course Outcome versus Program Outcomes:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	S	S	M	M								M
CO-2	S	S	M	M								M
CO-3	S	S	M	M								M
CO-4	S	S		M								M
CO-5	S	S	S	M	S							M

S - Strongly correlated, M - Moderately correlated, *Blank - No correlation*

Assessment Methods:	Assignment / Seminar / Mid-Test / End Exam

Teaching-Learning and Evaluation

Week No.	TOPIC / CONTENTS	CO	Sample questions	TEACHING-LEARNING STRATEGY	Assessment Method & Schedule
1	Introduction, causes and effects of earth quakes. Faults, structure of earth, plate tectonics, elastic rebound theory, Earthquake terminology-source, focus.	CO-1	Analyse the causes and effects of earthquakes Explain the elastic rebound theory	▫ Lecture/ Discussion	
2	Epicenter, hypocenter, earthquake size, magnitude and intensity, seismic waves, seismic zones, sesismic zoning map of India, seismo grams and accelerograms.	CO-1 CO-1	Differentiate between the epicenter and hypocenter of an earthquake Differentiate between the seismo-grams and accelero- grams in an earthquake engg.	▫ Lecture ▫ Discussion ▫ Lecture ▫ Discussion	
3	Review of latest Indian seismic code IS 1893-2002(part I) Provisions of buildings, earthquake Design philosophy	CO-2	Explain the earthquake Design philosophy	▫ Lecture ▫ Problem solving	
4	Assumptions, design of seismic coefficient and response spectrum methods, displacements and drift requirements. Analysis of multi-storied building using seismic co-efficient method.	CO-2 CO-2	Enumerate the assumptions in earthquake engg. Analyse the given multi-storied building using seismic- coefficient method	▫ Lecture ▫ Lecture ▫ Problem solving	Assignment
5	Review of latest Indian Seismic codes IS 4326 and IS 13920. Provision of ductile detailing of RC buildings.	CO-2	Explain the necessity of ductile detailing of RC buildings.	▫ Lecture ▫ Lecture ▫ Problem solving	
6	Provision of ductile detailing of Beams.	CO-2	Explain the provisions made in ductile detailing of RC beams. Design a 6mts s.s beam subjected to a udl of 20kN/m and do the ductile detailing also.	▫ Lecture ▫ Problem solving	
7	Provision of ductile detailing of RC columns and joints.	CO-2	Explain the provisions made in ductile detailing of RC columns. Design a column with an effective length of 4mts carries an axial load of 1000kN and bending moment of 50kN-m and do the ductile detailing also.	▫ Lecture ▫ Lecture ▫ Problem solving	Assignment

8	Plan configurations, torsion irregularities. Reentrant corners, non-parallel systems, diaphragm discontinuity, vertical discontinuity in load path. Irregularities in strength and stiffness, mass irregularities, Vertical geometric irregularity, Proximity of adjacent buildings.	CO-3 CO-3	Explain about the plan and torsion irregularities of the structure Explain about the mass and vertical irregularities of the structure Explain about the Proximity of buildings.	Lecture ▫ Lecture	
9	**MID TEST – I**			▫	
10	Introduction, types of shear walls, description of buildings.	CO-3	Differentiate between the squat and long shear walls Mention the probable locations of shear walls	▫ Lecture Problem solving	
11	Determination building, of lateralforces	CO-3	Calculate the lateral forces and storey shears of a 10storeyed structure for the given dead and live loads.	▫ Lecture ▫ Problem solving	Assignment
12	Design of shear walls as per IS code 13920. Detailing of reinforcement of shear walls.	CO-3	Design and detail the shear wall for the given loading Explain the detailing of coupled shear walls	▫ Lecture Problem solving	
13	Retrofitting techniques, introduction, consideration in retrofitting of structures, classification of retrofitting techniques.	CO-4	Mention the retrofitting techniques	▫ different	Lecture Problem solving
14	Retrofitting strategies of RC buildings like structural levels and member level.	CO-4	Differentiate between the member level and global level retrofitting techniques used in buildings	▫ Lecture ▫ Problem solving	
15	Masonry buildings, introduction, determination of design lateral load, determination of wall rigidities	CO-5	Briefly explain about the different bands used and their function in buildings. Determine the lateral forces for a given Masonry buildings with given dead and live loads.	▫ Lecture Problem solving	
16	Determination of torsional forces, determination of pier loads	CO-5	Calculate the centre of mass and centre of stiffness of a given Masonry building.	▫ Lecture Problem solving	Assignment
17	Moments and shear, design of shear walls for shear, structural details.	CO-5	Calculate the Moments and shear of a given Masonry building.	▫ Lecture Problem solving	
18	**MID TEST – II**			▫	
	END EXAM			▫	