Regulation: R20	

CIVIL ENGINEERING (Honors)

SCHEME OF INSTRUCTION & EXAMINATION
(With effect from 2020-21 admitted Batch onwards)

Course Code	Course Name	Year/ Sem	Cr	L	T	P	Int. Marks	Ext. Marks	Total Marks
B20CEH101	Advanced Concrete Technology	II-II	4	3	1	0	30	70	100
B20CEH201	Structural Dynamics	III-I	4	3	1	0	30	70	100
B20CEH301	Matrix Methods of Structures	III-II	4	3	1	0	30	70	100
B20CEH401	Earthquake Engineering	IV-I	4	3	1	0	30	70	100
B20CEH501	*MOOCS-I	II-II to IV-II	2	--	--	--	--	--	100
B20CEH601	*MOOCS-II	II-II to IV-II	2	--	--	--	--	--	100
		TOTAL	**20**	**12**	**4**	**0**	**120**	**280**	**600**

*Two MOOCS courses of any CIVIL ENGINEERING related Program Core Courses from NPTEL/SWAYAM with a minimum duration of 8 weeks (2 Credits) courses other than the courses offered need to be takenby prior information to the concern. These courses should be completed between II Year II Semester to IV Year II Semester

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CEH101	**Honors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

ADVANCED CONCRETE TECHNOLOGY

(Honors Degree course in CE)

Course Objectives:

1.	This course mainly aims to recognize the effects of the rheology and early age properties of concrete on its long-term behavior
2.	To develop an advanced knowledge of durability and performance of cement concrete and how it can be controlled
3.	To understand the importance of various mix designs and quality control of concrete

Course Outcomes: At the end of the course, Student will be able to

S.No	Course Outcomes	Knowledge Level
1.	Describe Elasticity, Creep and Shrinkage properties of concrete	K2
2.	Explain the importance of durability of concrete in various environments	K2
3.	Design and develop a concrete mix design for international codes.	K3
4.	Determine the application and use of various special concrete and form work	K2

SYLLABUS

UNIT-I (10Hrs)	**ELASTICITY, CREEP & SHRINKAGE** – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage.
UNIT-II (8Hrs)	**DURABILITY OF CONCRETE**: Definitions, Deterioration processes – Physical, Chemical, Environmental & Biological; Measures for ensuring durability, Corrosion of reinforcing steel, protective measures. Durability issues in concretes –carbonation – sulphate attack – chloride attack – permeability, Acid attack – Seawater attack etc.
UNIT-III (10Hrs)	**MIX DESIGN & QUALITY CONTROL**: ACI method of mix design and British DoE method of mix design of mix design, Acceptance criteria for compressive strength and flexural strength. Factors causing variation in the quality of concrete-Advantages of quality control
UNIT-IV (10Hrs)	**SPECIAL CONCRETES**: Light weight aggregate concrete – Cellular concrete – No fines concrete– High Strength concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C, Polymer concrete – Types of Polymer concrete – Properties of polymer concrete, High performance concrete,Self-Compacting concrete

UNIT-V (10 Hrs)	**FORMWORK AND SHORING**: Form work – materials – structural requests – form work systems – connections – specifications – shores – removal for forms - shores – reshoring –failure of form work.

Text Books:	
1.	Properties of Concrete by A.M.Neville, ELBS publications
2.	Concrete Technology by M.S.Shetty, S.Chand&Co.
3.	Concrete Technology byA.R.Santhakumar,2ndEdition,OxfordUniversityPress.
4.	Concrete Technology by M.L.Gambhir.–TataMc.GrawHillPublishers, New Delhi
Reference Books:	
1.	Concrete:MicroStructure,PropertiesandMaterialsbyP.K.MehtaandP.J.Monteiro,.Mc.Graw-HillPublishingCompanyLtd.NewDelhi
2.	DesignofConcreteMixesbyN.KrishnaRaju,CBSPublications,2000.
3.	SpecialStructuralconcretesbyRafatSiddique,GalgotiaPublications2000.

			Course Code: B20CEH101		
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R 20**
		II B. Tech. II Semester MODEL QUESTION PAPER			
		ADVANCED CONCRETE TECHNOLOGY			
		(Honors Degree course in CE)			
Time: 3 Hrs.					**Max. Marks:70**
		Answer ONE Question from EACH UNIT			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1	**a).**	Explain the elastic properties of concrete.	1	2	7
	b).	Explain the shrinkage of concrete. How it is classified? Explain any one of them.	1	2	7
		OR			
2	**a).**	What is creep? Explain factors influencing creep.	1	2	7
	b).	Explain phenomenon of creep in concrete. Explain measurement of creep with loading diagram.	1	2	7
		UNIT-II			
3	**a).**	Explain the reaction of concrete with seawater?	2	2	7
	b).	What is carbonation and Explain the mechanism involved in deterioration of concrete?	2	2	7
		OR			
4	**a).**	What is corrosion and explain the measures to control it.	2	2	7
	b).	Explain Sulphate attack Chloride attack	2	2	7
		UNIT-III			
5		Design a concrete mix for construction of an elevated water tank. The specified design strength of concrete is 30 Mpa at 28 days measured on standard cylinders. Standard deviation can be taken as 4 Mpa. The specific gravity of FA and CA are 2.65 and 2.7 respectively. The dry rodded bulk density of C.A is 1600 kg/m3 and fineness modulus of F.A. is 2.80 .Ordinary Portland cement (Type I) will be used .A Slump of 50mm is necessary. C.A. is found to be absorptive to the extent of 1% and free surface moisture in sand is found to be 2 percent. Assume any other essential data.	3	3	14
		OR			
6		Design a concrete mix for a reinforced concrete work which will be exposed to the moderate condition. The concrete is to be designed for	3	3	14

		a mean compressive strength of 30Mpa at the age of 28 days .A requirement of 25 mm cover is prescribed .Maximum size of aggregate is 20mm uncrushed aggregate will be used. Sieve analysis shows that 50% passes through 600Sieve.The bulk specific gravity of aggregate is found to be 2.65.			
		UNIT-IV			
7	**a).**	Explain about High Performance Concrete	4	2	7
	b).	Explain about fiber reinforced concrete.	4	2	7
		OR			
8	**a).**	Explain about Polymer concrete.	4	2	7
	b).	Explain about High Strength Concrete.	4	2	7
		UNIT-V			
9	**a).**	What is a form work? Explain its importance in construction?	4	2	7
	b).	List out various connections in form work and explain with neat sketches?	4	2	7
		OR			
10	**a).**	State and explain different form works?	4	2	7
	b).	What is a shore? Explain different types of shores?	4	2	7

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CEH201	**Honors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

STRUCTURAL DYNAMICS

(Honors Degree course in CE)

Course Objectives:

1.	Introduces to the Concept of vibration of SDOF System
2.	Introduces to Damped and Undamped systems
3.	Introduces to Free and forced Vibration systems
4.	Introduces to Free and Forced vibration Of MDOF System

Course Outcomes: At the end of the course, Student will be able to

S.No	Outcome	Knowledge Level
1.	Understand and Analyze the Concepts of vibrations	K4
2.	Understand and Analyze the concepts of Undamped Free vibration of SDOF	K4
3.	Understand and Analyze the concepts of damped Free vibration of SDOF	K4
4.	Understand and Analyze the concepts of Two Degree of Freedom System	K4
5.	Understand and Analyze the concepts of Multiple Degree of Freedom System	K4

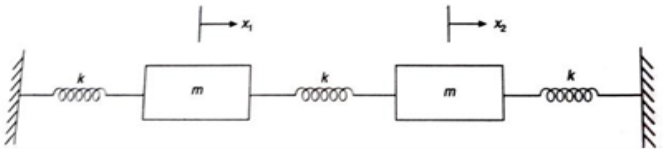
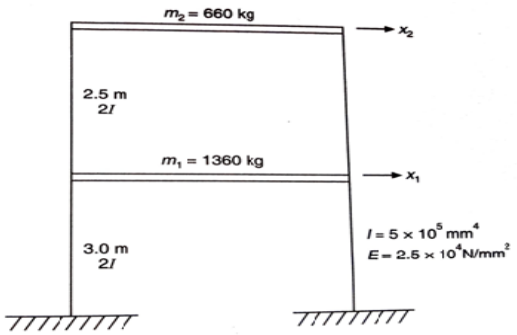
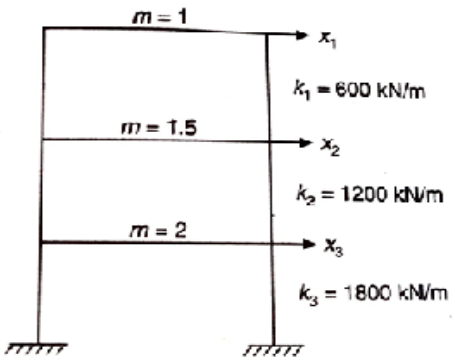
SYLLABUS

UNIT-I (8 Hrs)	**Elements of vibrations:** Introduction – Basic Concepts of vibration –Dynamic Loading- Comparison of Static Loading and Dynamic Loading – Causes of Dynamic Effects – Basic Definitions- Types Of Vibrations- Response OF the System- Degrees Of Freedom- Simple Harmonic Motion- Consequences of Vibration-Vibration controls in the Design of Structure
UNIT-II (8 Hrs)	**Undamped Free Vibration of SDOF System:** Introduction- Vibration Analysis – Free Vibration of Undamped SDOF system –Derivation of equation of Motion- Solution of the equation of Motion – equivalent Stiffness of Spring Combinations- Natural Frequency and Time Period – Influence of Gravitational force
UNIT-III (8 Hrs)	**Damped Free Vibration of SDOF System:** Introduction- Types of Damping- Viscous Damping- Coulomb damping- Structural Damping-Active Damping or Negative Damping- passive Damping- Measurement of Damping- Logarithmic Decrement method- Half Power Bandwidth Method
UNIT-IV (8Hrs)	**Two Degrees of Freedom system:** Introduction – Concept of shear building- Free Vibrations of Undamped System-Damped Free Vibration- Forced Vibration Of Undamped System- Forced Vibration Of Damped System

UNIT-V (8 Hrs)	**Multiple Degrees of Freedom Systems: Introduction –** Free Vibration Analysis- Undamped system- Natural Frequencies and Normal Modes- Orthogonality and Normality Principles- Damped Systems- Decoupling of Equations/concept of modal Superposition Method.

Text Books:	
1.	Structural Dynamics Anil K Chopra, 4edition, Prentice HallPublishers
2.	Structural Dynamics Theory & Computation – Mario Paz, CBS Publishes and Distributors
3.	Structural Dynamics and Aseismic design – S.R.Damodarasamy and S.Kavitha, PHI Learning private limited
Reference Book:	
1.	Dynamics of Structures by Clough &Penzien 3e, Computers & Structures Inc.
2.	Structural Dynamics of Earthquake Engineering - Theory and Application using Mathematical and Mat lab- S.Rajasekharan

			Course Code: B20CEH201		
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B. Tech. I Semester MODEL QUESTION PAPER			
		STRUCTURAL DYNAMICS			
		(Honors Degree course in CE)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a).**	Explain Vibration and Types of Vibration?	1	2	7
	b).	A Harmonic motion has a Maximum Velocity of 6 m/s and it has a frequency of 12 cps. Determine its amplitude, its period and its Maximum acceleration.	1	3	7
		OR			
2.	**a).**	Define i) Natural Frequency ii) Amplitude ii) Degree of Freedom	1	2	7
	b).	Compare Static Loading and Dynamic Loading?	1	2	7
		UNIT-II			
3.		Derive expression for response of SDOF system subjected to Undamped free vibration	2	3	14
		OR			
4.	**a).**	Derive the equation of motion of a vibratory system using Simple Harmonic Motion	2	3	7
	b).	A vertical Cable 3m long has a cross sectional area of 4 cm^2 Supports a weight of 50 kN. What will be the natural period and natural Frequency of the System? E=2.1x 10^6 kg/cm^2	2	3	7
		UNIT-III			
5.		Derive expression for response of SDOF system subjected to damped free vibration	3	3	14
		OR			
6.	**a).**	Explain Damping and Various Types of Damping?	3	2	7
	b).	Explain Logarithmic Decrement Method for Measuring damping of a vibration System?	3	2	7
		UNIT-IV			

7.		Determine the Natural Frequencies and mode Shape of the given System. **Figure 01** 	4	3	14
		OR			
8.		Determine the natural Frequencies and mode shape for the structure as shown in Figure 02  Figure 02	4	3	14
		UNIT-V			
9.		Derive the equation of motion of Multi Degree freedom systems (MDOF)	5	4	14
		OR			
10.		Determine the Natural Frequencies and the mode Shapes for the Shear building as shown in Figure 03  **Figure 03**	5	4	14

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CEH301	**Honors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

MATRIX METHODS OF STRUCTURES

(Honors Degree course in CE)

Course Objectives:

1.	To prepare the students to have a basic knowledge in the matrix methods such as flexible matrix method and Stiffness matrix method.
2.	To prepare the students to analyze the beams and portal frame problems by matrix methods.

Course Outcomes: At the end of the course, Student will be able to

S.No	Outcome	Knowledge Level
1.	Understand the basic concepts involved in the analysis of structural elements using matrix methods.	K2
2.	Analyze the beams by using flexibility matrix method.	K4
3.	Analyze the portal frames by using flexibility matrix method.	K4
4.	Analyze the beams by using Stiffness matrix method.	K4
5.	Analyze the portal frames by using Stiffness matrix method.	K4

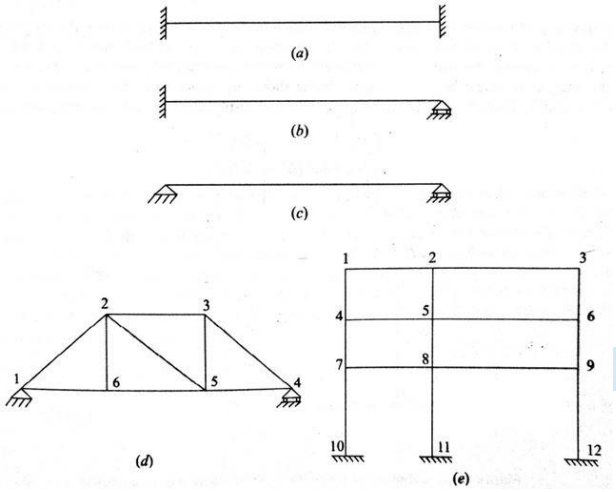
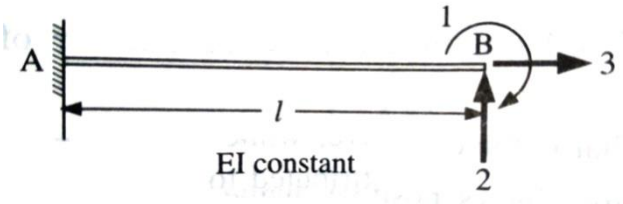
SYLLABUS

UNIT-I (8 Hrs)	**Introduction**: Matrix methods of analysis–Static and kinematic indeterminacy–Degree of static and kinematic indeterminacy –Structure idealization – flexibility and stiffness methods.
UNIT-II (10 Hrs)	**Flexibility Matrix Method (Beams)**: Analysis of continuous beams without sinking of supports (up to maximum degree of three)
UNIT-III (10 Hrs)	**Flexibility Matrix Method (Portal Frames)**: Analysis of portal frames without sway condition (up to maximum degree of three).
UNIT-IV (10 Hrs)	**Stiffness Matrix Method (Beams)**: Analysis of continuous beams without sinking of supports (up to maximum degree of three)
UNIT-V (10 Hrs)	**Stiffness Matrix Method (Portal Frames)**: Analysis of portal frames without sway condition (up to maximum degree of three).

Text Books:

1.	Matrix analysis of structures,Robert E Sennet-Prentice Hall-Englewood cliffs-New Jercy
2.	Advanced structural analysis, P. Dayaratnam -Tata McGrawhill publishing company limited.

3.	Structural Analysis Matrix Approach –Pandit and Gupta ,McGraw Hil Education
Reference Books:	
1.	Indeterminate Structural analysis, C K Wang, Amazon Publications.
2.	Matrix Analysis of Frame dVan Nostrand Reinhold, New york Structures 3e-William We aver,Jr,James M.Gere,
3.	Foundation Analysis and design,J.E.Bowls,5e, Amazon Publications.

					Course Code: B20CEH301
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		III B. Tech. II Semester MODEL QUESTION PAPER			
		MATRIX METHODS OF STRUCURES			
		(Honors Degree course in CE)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT-I			
1.	**a)**	Explain degree of static indeterminacy and kinematic Indeterminacy of a structure.	1	2	4
	b)	Calculate degree of Static and Kinematic indeterminacy of the following structures (**Fig. 1**)  **Fig. 1**	1	3	10
		OR			
2.	**a)**	Explain relation between flexibility matrix method and stiffness matrix method.	1	2	4
	b)	Develop stiffness matrix for the beam shown in **Fig. 2** with reference to the co-ordinates shown.  **Fig. 2**	1	3	10
		UNIT-II			

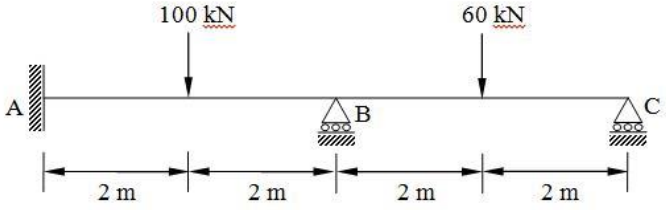
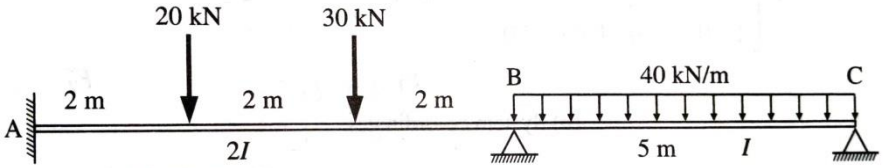
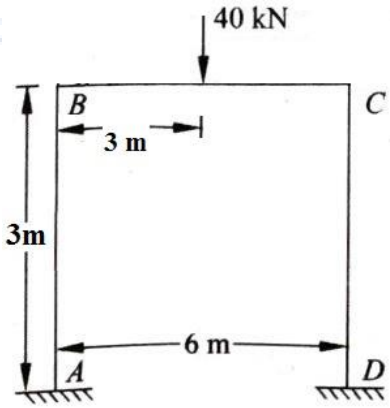
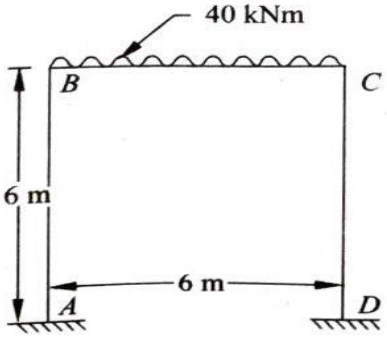
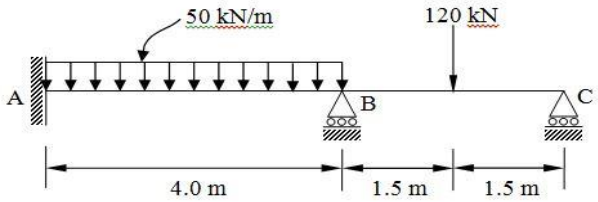
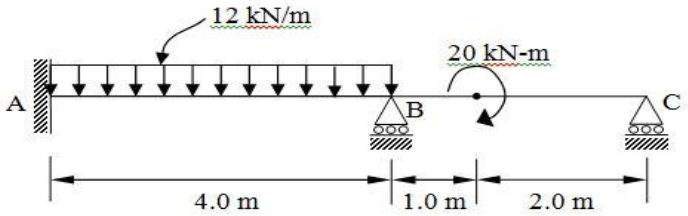
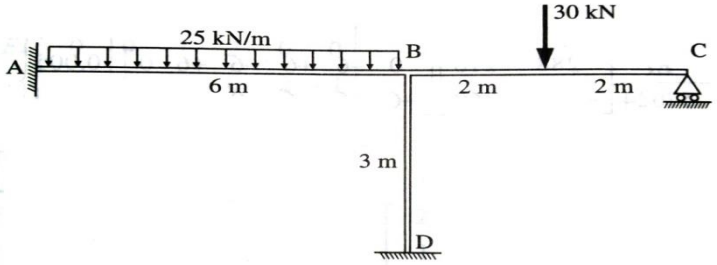
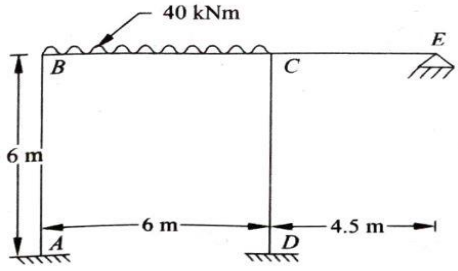
3.		Solve the continuous beam as shown in the **Fig.3** by using flexibility matrix method. Take EI is constant throughout the structure. Draw bending moment and diagrams  **Fig. 3**	2	3	14
		OR			
4.		Solve the continuous beam shown in **Fig. 4** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 4**	2	3	14
		UNIT-III			
5.		Solve the portal frame shown in **Fig. 5** by using flexibility matrix method. And draw bending moment diagram.  **Fig. 5**	2	3	14
		OR			
6.		Solve the portal frame shown in **Fig. 6** by using flexibility matrix method. And draw bending moment diagram.  			

		Fig. 6			
		UNIT-IV			
7.		Solve the continuous beam as shown in the **Fig. 7** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 7**	3	3	14
		OR			
8.		Solve the continuous beam as shown in the **Fig. 8**by using stiffness matrix method.And draw bending moment diagram.  **Fig. 8**	3	3	14
		UNIT-V			
9.		Solve the portal frame shown in **Fig. 9** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 9**	3	3	14
		OR			
10.		Solve the portal frame shown in **Fig. 10** by using stiffness matrix method. And draw bending moment diagram.  **Fig. 10**	3	3	14

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks

Code	Category	L	T	P	C	I.M	E.M	Exam
B20CEH401	**Honors**	**3**	**1**	**--**	**4**	**30**	**70**	**3 Hrs.**

EARTHQUAKE ENGINEERING

(Honors Degree course in CE)

Course Objectives:

1.	To learn the fundamentals of seismology and basic earthquake mechanisms, tectonics types of Ground motion and propagation of ground motion.
2.	Learn the fundamentals of building code based structural design

Course Outcomes: At the end of the course, Student will be able to

S. No	Outcome	Knowledge Level
1.	Understand Elements of Seismology and classify Earthquakes and Seismic Zoning Map of India	K2
2.	Understand Earthquake Response Spectrum	K2
3.	Determine the liquefaction of Soils and able to understand concept of Aseismic Design of RC Structures	K3
4.	Analyze and Design of RC Building As per IS1893 (PART 1):2002	K4
5.	Design Ductile Detailing of RC Structures Subjected to Seismic Forces As per IS 3920:1993	K4

SYLLABUS

UNIT-I (10 Hrs)	Engineering Seismology: Introduction - Reid's elastic Rebound Theory- Theory of Plate tectonics- Seismic waves- Earthquake Size- Local Effects- Internal structure of The earth- Seismotectonics of India- Seismicity of India- Classification of Earthquake- Tsunami-Seismic Zoning Map of India.
UNIT-I (10 Hrs)	Response Spectrum- Introduction- Response Spectrum of Sinusoidal pulse-Water Tank Subjected to base Acceleration-Earthquake Response Spectra-Design Spectra-Concepts of PGA-Site –Site Specific Response Spectra-Response Spectrum IS 1893:2002
UNIT-II (10 Hrs)	Liquefaction of Soils: Introduction-Types of Liquefaction-Effects of Liquefaction-Methods to Reduce Liquefaction-Factors Controlling Liquefaction - Concept of Aseismic Design of RC Structures – Introduction- Design Methodology-Architectural Consideration- Geotechnical Consideration – Structural Design Consideration – Capacity Design- Techniques of Aseismic Design
UNIT-IV (10 Hrs)	Seismic Analysis of RC Building As per IS1893 (PART 1):2002: Introduction-General Principles- load combinations and Increase in Permissible Stresses –

	Design Spectrum- Buildings-Dynamic Analysis- Torsion- Step by Step Procedure For Seismic Analysis of RC Buildings
UNIT-V (8 Hrs)	Ductile Detailing of RC Structures Subjected to Seismic Forces As per IS 3920:1993: Introduction- Design of Flexural Members- Longitudinal Reinforcement- Web Reinforcement- Design of Columns and Frame Members Subjected to Bending and Axial load- Design of joints of Frames
Text Books:	
1.	Earthquake Resistant Design of Structures Pankaj Agarwal and Manish ShriKhande, Prentice -Hall of India, 2007, New Delhi.
2.	Structural Dynamics and Aseismic design – S.R.Damodarasamy and S.Kavitha, PHI Learning private limited
Reference Books:	
1.	Earthquake Resistant Design of Structures- S.K. Duggal, Oxford Publications
2.	Seismic design of reinforced concrete and masonry buildings by Paulay and Priestley
3.	Earthquake Resistant Design and Risk Reduction- David Dowrick

			Course Code: B20CEH401		
		SAGI RAMA KRISHNAM RAJU ENGINEERING COLLEGE (A)			**R20**
		IV B. Tech. I Semester MODEL QUESTION PAPER			
		EARTHQUAKE ENGINEERING			
		(Honors Degree course in CE)			
Time: 3 Hrs.					**Max. Marks: 70 M**
		Answer **ONE Question** from **EACH UNIT**			
		All questions carry equal marks			
		Assume suitable data if necessary			
			CO	**KL**	**M**
		UNIT - I			
1.	**a).**	What is plate tectonic theory of origin of earthquakes and explain associated type of movement at the plate boundaries	**1**	**2**	**10**
	b).	How are earthquakes classified based on different aspects	**1**	**2**	**4**
		OR			
2.	**a).**	Explain the characteristics of different types of seismic waves	**1**	**2**	**7**
	b).	Explain the concept of elastic rebound theory with a neat sketch	**1**	**2**	**7**
		UNIT - II			
3.		Explain Response Spectrum of Sinusoidal Pulse?	**2**	**2**	**14**
		OR			
4.		Explain the Response Spectrum of Water Tank Subjected to Base Acceleration?	**2**	**2**	**14**
		UNIT - III			
5.	**a).**	Explain Types of Liquefactions and Effects of Liquefaction of Soils	**3**	**3**	**7**
	b).	Explain Methods to Reduce Liquefaction	**3**	**3**	**7**
		OR			
6.		Explain Design Methodology according to Architectural, Geotechnical and Structural Design Considerations	**3**	**3**	**14**
		UNIT-IV			
7.	**a).**	Explain general Aseismic Design Principles	**4**	**3**	**7**
	b).	Explain Load Combinations and permissible Stresses	**4**	**3**	**7**
		OR			
8.	**a).**	Explain the plan irregularities and Vertical Irregularities in Buildings	**4**	**3**	**7**
	b).	Determine the design horizontal Seismic Coefficient for an ordinary reinforced concrete moment resisting Frame hospital building without infill panels for a damping of 5 %. The Building is Situated in Salem. Height of the Building is 22m and it is resting on Hard Soil.	**4**	**3**	**7**

		UNIT-V			
9.		Explain Ductile Design of Flexural Members?	**5**	**3**	**14**
		OR			
10.		Explain Ductile Design of Columns and Frames Subjected to Bending and Axial Load?	**5**	**3**	**14**

CO-COURSE OUTCOME **KL-KNOWLEDGE LEVEL** **M-MARKS**

NOTE: Questions can be given as A,B splits or as a single Question for 14 marks