

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



ACADEMIC YEAR: 2018-2019 ODD

Subject Code	CE6505			P	T	C
Subject Title	Design of reinforced concrete elemen	ts	3	0	0	3
Year / Dept / Sem	III / CIVIL / V	Regulation	Year	2013		
Faculty Name / Desg / Dept	Mr.S.Keerthi Priyan / Assistant Professor / CIVIL					
Course Prerequisite	 The students must have more fundamentals of mathematics. The students must have more bending moment. The students must have more components. 	ics. ore knowledge	e abou	ıt shea	ar force	and

Syllabus

CE6505 DESIGN OF REINFORCED CONCRETE ELEMENTS

LTPC 3 0 0 3

OBJECTIVES:

> To introduce the different types of philosophies related to design of basic structural elements such as slab, beam, column and footing which form part of any structural system with reference to Indian standard code of practice.

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES

9

Concept of Elastic method, ultimate load method and limit state method – Advantages of Limit State Method over other methods – Design codes and specification – Limit State philosophy as detailed in IS code – Design of beams and slabs by working stress method.

UNIT II LIMIT STATE DESIGN FOR FLEXURE

9

Analysis and design of singly and doubly reinforced rectangular and flanged beams - Analysis and design of one way, two way and continuous slabs subjected to uniformly distributed load for various boundary conditions.

UNIT III LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR & TORSION 9

Behaviour of RC members in bond and Anchorage - Design requirements as per current code - Behaviour of RC beams in shear and torsion - Design of RC members for combined bending shear and torsion.

UNIT IV LIMIT STATE DESIGN OF COLUMNS

9

Types of columns – Braced and unbraced columns – Design of short Rectangular and circular columns for axial, uniaxial and biaxial bending.

UNIT V LIMIT STATE DESIGN OF FOOTING

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Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only.

TOTAL: 45 PERIODS

OUTCOMES:

> The student shall be in a position to design the basic elements of reinforced concrete structures.

TEXTBOOKS

- 1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002.
- 2. Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi 2006
- 3. Subramanian, N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013.

REFERENCES:

- 1. Jain, A.K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
- 2. Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002
- 3. Unnikrishna Pillai, S., Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009

- 4. Punmia.B.C., Ashok Kumar Jain, Arun Kumar Jain, "Limit State Design of Reinforced Concrete", Laxmi Publication Pvt. Ltd., New Delhi, 2007.
- 5. Bandyopadhyay. J.N., "Design of Concrete Structures"., Prentice Hall of India Pvt. Ltd., New Delhi, 2008.
- 6. IS456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
- 7. SP16, IS456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999
- 8. Shah V L Karve S R., "Limit State Theory and Design of Reinforced Concrete", Structures Publications, Pune, 2013
- 9. N.Aravind., "Design of RC Elements" A.R.S. Publications, Chennai.

CO5

CO₆

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			C	O1: To i	ntroduce	the diffe	rent type	es of phil	osophies	related t	to design	of slab
				which form part of any structural system with reference to Indian standard								
				code of practice.								
			C	CO2: To introduce the different types of philosophies related to design of								
				beam which form part of any structural system with reference to Indian								
	•	70)	sta	standard code of practice.								
Course Object	ctives (C	.CO)	C	CO3: To introduce the different types of philosophies related to design of								
			co	lumn w	hich fori	n part o	f any st	ructural	system v	with refe	erence to	Indian
			sta	andard co	ode of pr	actice.						
			C	CO4: To introduce the different types of philosophies related to design of								
			fo	footing which form part of any structural system with reference to Indian								
			sta	andard co	ode of pr	actice.						
			At	At the end of the course, the students should be able to:								
				ECO1: The student shall be in a position to design the basic elements of								
			re	reinforced concrete structures.								
				ECO2: The student will able to understand the fundamental of design and								
				alysis of	reinforc	ed concr	ete mem	ber.				
Expected Cor	urse Ou	tcomes	E	ECO3: The student will able to understand the behavior of beams, slabs &								
(ECO)			co	lumns.								
			E	ECO4: The student will able to design the beam slab under flexures.								
			E	ECO5: The student will able to design the beam, slab under shear.								
			E	CO6: Th	e studen	t will at	ole to de	sign the	column	under a	xial, uni	axial &
			bi	axial loa	ds.							
Mapping of CO & PO(Specify the PO's) - (Fill the col.s with the legend given below)												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2	-	-	-	-	-	-	-	1	2
CO2	3	1	-	-	-	-	-	-	-	-	1	-
CO3	2	2	2	1	-	-	-	-	1	-	-	-
CO4	2	2	2	1	-	-	-	-	1	-	-	-

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Bridging the Curriculum Gap (Additional Topics beyond syllabus/Seminars/Assignments)	BCG1: Design of arches. BCG2: Design of domes BCG3: Design of walls
Related Website URLs	W1: nptel.ac.in/courses/105105104/pdf/m3l6.pdf W2:www.sut.ac.th/engineering/Civil/CourseOnline/430431/RC04_Bending 2.pdf W3: www.uwplatt.edu/~robermat/CEE3150/example/full.pdf
Related Video Course Materials (min. 3 no.s)	V1: https://www.youtube.com/watch?v=0fTvE8aSsiE V2: https://www.youtube.com/watch?v=FPeV2MDXvfY V3: https://www.youtube.com/watch?v=pldaC_l6H_M

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES	S.No	Topic Name	Book – P. No	Teaching Aids	No of hrs	Cumulative hrs		
Load method and limit state method 1-5 teaching	UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES							
2. Advantages of Limit State Method over other methods 3. Design codes and specification 4. Limit State philosophy as detailed in IS code 5. Design of beams by working stress method 6. Design of singly reinforced beams by working stress method 7. Design of slabs by working stress method 8. Design of slabs by working stress method 9. Design of one way slabs by working stress method 10. Design of cantilever slabs by working stress method 11. Design of cantilever slabs by working stress method 12. Design of cantilever slabs by working stress method 12. Design of singly reinforced rectangular beams 13. Class room 14. Class room 15. Class room 16. Class room 17. Design of slabs by working stress method 18. Design of slabs by working stress method 18. Design of slabs by working stress method 19. Design of one way slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 11. Class room 12. Class room 13. Class room 14. Class room 15. Class room 16. Class room 17. Class room 18. Class room 18. Class room 29. Design of cantilever slabs by working stress method 19. Class room 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of one way slabs by working stress method 10. Design of one way slabs by working stress method 10. Design of one way slabs by working stress method 10. Design of one way slabs by working stress method 10. Design of one way slabs by working stress method 10. Design of one way slabs by working stress method 10. Desi	1.	Concept of Elastic method, ultimate	T1	Class room	2	2		
other methods 1.5 teaching 3. Design codes and specification R9 Class room 1 4 4. Limit State philosophy as detailed in IS code 2.2 teaching 5. Design of beams by working stress method 6. Design of singly reinforced beams by working stress method 7. Design of doubly reinforced beams by working stress method 8. Design of slabs by working stress method 9. Design of one way slabs by working stress method 1.20 teaching 1.20 teaching 1.20 teaching 1.20 Lass room 2 10 teaching 2 Lass room 2 10 teaching 3 teaching 4 Lass room 1 1 11 11 11 11 11 11 11 11 11 11 11 1		load method and limit state method	1-5	teaching				
3. Design codes and specification	2.		R9	Class room	1	3		
4. Limit State philosophy as detailed in IS code 2.2 teaching 5. Design of beams by working stress method 3. Design of singly reinforced beams by working stress method 4. Design of singly reinforced beams by working stress method 5. Design of doubly reinforced beams by working stress method 6. Design of doubly reinforced beams by working stress method 7. Design of doubly reinforced beams by working stress method 8. Design of slabs by working stress method 9. Design of one way slabs by working R9 Class room 1 11 11 120 teaching 9. Design of one way slabs by working R9 Class room 2 13 stress method 1.20 teaching 10. Design of cantilever slabs by working R9 Class room 2 15 teaching 11. Analysis and design of singly reinforced rectangular beams 1.81 teaching 2. Analysis and design of doubly reinforced rectangular beams 1.81 Class room 1 16 teaching 2. Analysis and design of doubly reinforced rectangular beams 1.82 teaching 1.83 teaching 1.84 teaching 1.84 teaching 2. Analysis and design of doubly reinforced rectangular beams 1.85 teaching 1.86 Class room 2 18 teaching 1.87 Class room 2 20 18 teaching 1.86 Class room 2 20 18 teaching 1.87 Class room 2 20 20 18 teaching 1.84 Class room 2 20 20 18 teaching 1.85 Class room 2 20 20 18 teaching 1.86 Class room 2 22 20 18 19-145 teaching 1.87 Class room 2 22 20 18 19-145 teaching 1.87 Class room 2 22 20 18 18 19-145 teaching 1.87 Class room 2 22 20 18 18 19-145 teaching 1.86 Class room 2 22 20 18 18 19-145 teaching 1.87 Class room 2 22 20 18 18 19-145 teaching 1.87 Class room 2 22 20 18 18 19-145 teaching 1.88 Class room 2 22 24 19 19-145 teaching 1.99 Class room 2 22 24 19 19-145 teaching 1.90 Class room 2 22 26 19-145 19-145 teaching 1.90 Class room 2 24 24 19-145 19-145 teaching 1.90 Class room 2 24 24 19-145 19-145 teaching			1.5	teaching				
4. Limit State philosophy as detailed in IS code 2.2 teaching 5. Design of beams by working stress R9 Class room 1 teaching 6. Design of singly reinforced beams by working stress method 7. Design of doubly reinforced beams by working stress method 8. Design of slabs by working stress method 8. Design of one way slabs by working stress method 9. Design of one way slabs by working R9 Class room 1 teaching 1.20 teaching 9. Design of one way slabs by working R9 Class room 2 teaching 10. Design of cantilever slabs by working R9 Class room 2 teaching 10. Design of cantilever slabs by working R9 Class room 2 teaching 11. Analysis and design of singly reinforced rectangular beams 12. Analysis and design of doubly reinforced rectangular beams 3. Analysis and design of singly reinforced flanged beams 4. Analysis and design of doubly reinforced flanged beams 4. Analysis and design of how way subjected to uniformly distributed load. 5. Analysis and design of two way subjected to uniformly distributed load for subj	3.	Design codes and specification	R9	Class room	1	4		
Code			1.7	teaching				
S. Design of beams by working stress method 1.8 teaching 1.21 teaching 1.21 teaching 1.21 teaching 1.21 teaching 1.21 teaching 1.43 teaching 1.43 teaching 1.43 teaching 1.44 teaching 1.20 te	4.	Limit State philosophy as detailed in IS	R9	Class room	1	5		
method		code	2.2	teaching				
6. Design of singly reinforced beams by working stress method 1.21 teaching 2 7. Design of doubly reinforced beams by working stress method 1.43 teaching 2 8. Design of slabs by working stress method 1.20 teaching 2 9. Design of one way slabs by working stress method 1.79 teaching 3 10. Design of cantilever slabs by working stress method 1.81 teaching 4 10. Design of cantilever slabs by working stress method 1.81 teaching 4 11. Analysis and design of singly reinforced rectangular beams 48-69 teaching 48-69 teaching 48-69 teaching 48-69 teaching 48-69 teaching 48-69 teaching 49-68 teaching 49-68 teaching 49-68 teaching 49-68 teaching 49-69 teaching 49-6	5.		R9	Class room	1	6		
working stress method 1.21 teaching			1.8	teaching				
7. Design of doubly reinforced beams by working stress method	6.		R9	Class room	2	8		
working stress method 1.43 teaching			1.21	teaching				
8. Design of slabs by working stress method 1.20 teaching 9. Design of one way slabs by working stress method 1.20 teaching 1.20	7.		R9	Class room	2	10		
1.20		working stress method	1.43	teaching				
9. Design of one way slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Design of cantilever slabs by working stress method 10. Lass room 1	8.	Design of slabs by working stress method	R9	Class room	1	11		
stress method 1.79 teaching 10. Design of cantilever slabs by working stress method 1.81 teaching UNIT II LIMIT STATE DESIGN FOR FLEXURE 1. Analysis and design of singly reinforced rectangular beams 48-69 teaching 2. Analysis and design of doubly reinforced rectangular beams 70-88 teaching 3. Analysis and design of singly reinforced flanged beams 119-145 teaching 4. Analysis and design of doubly reinforced flanged beams 119-145 teaching 5. Analysis and design of one way subjected to uniformly distributed load. 189-213 teaching 6. Analysis and design of two way subjected to uniformly distributed load for subjected to unifor			1.20	teaching				
10. Design of cantilever slabs by working stress method 1.81 teaching UNIT II LIMIT STATE DESIGN FOR FLEXURE 1. Analysis and design of singly reinforced rectangular beams 2. Analysis and design of doubly reinforced rectangular beams 3. Analysis and design of singly reinforced flanged beams 4. Analysis and design of doubly reinforced flanged beams 4. Analysis and design of one way subjected to uniformly distributed load. 5. Analysis and design of two way subjected to uniformly distributed load for support teaching 1. Class room 1 1 16 16 16 16 16 16 16 16 16 16 16 16	9.		R9	Class room	2	13		
Stress method 1.81 teaching			1.79	teaching				
UNIT II LIMIT STATE DESIGN FOR FLEXURE 1. Analysis and design of singly reinforced rectangular beams 2. Analysis and design of doubly reinforced rectangular beams 3. Analysis and design of singly reinforced flanged beams 4. Analysis and design of doubly reinforced flanged beams 4. Analysis and design of one way subjected to uniformly distributed load. 5. Analysis and design of two way subjected to uniformly distributed load for subjected to uniformly d	10.	•	R9	Class room	2	15		
1.Analysis and design of singly reinforced rectangular beamsT1Class room teaching1162.Analysis and design of doubly reinforced rectangular beamsT1Class room teaching2183.Analysis and design of singly reinforced flanged beamsT1Class room teaching2204.Analysis and design of doubly reinforced flanged beamsT1Class room teaching2225.Analysis and design of one way subjected to uniformly distributed load.T1Class room teaching2246.Analysis and design of two way subjected to uniformly distributed load for subjected teachingT1Class room teaching subjected teaching226		stress method	1.81	teaching				
rectangular beams 2. Analysis and design of doubly reinforced rectangular beams 3. Analysis and design of singly reinforced flanged beams 4. Analysis and design of doubly reinforced flanged beams 4. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to uniform			TE DESIGN	Y FOR FLEXU	JRE			
2. Analysis and design of doubly reinforced rectangular beams 3. Analysis and design of singly reinforced flanged beams 4. Analysis and design of doubly reinforced flanged beams 5. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to uniformly distributed load	1.		T1	Class room	1	16		
rectangular beams 3. Analysis and design of singly reinforced flanged beams 4. Analysis and design of doubly reinforced flanged beams 5. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to uniformly distributed load		rectangular beams	48-69	teaching				
3. Analysis and design of singly reinforced flanged beams 4. Analysis and design of doubly reinforced flanged beams 5. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to u	2.		T1	Class room	2	18		
flanged beams 4. Analysis and design of doubly reinforced flanged beams 5. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to u		_	70-88	teaching				
4. Analysis and design of doubly reinforced flanged beams 5. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to uniformly distri	3.		T1	Class room	2	20		
flanged beams 5. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to uniformly distri		flanged beams	119-145	teaching				
5. Analysis and design of one way subjected to uniformly distributed load. 6. Analysis and design of two way subjected to uniformly distributed load for subjected to uniformly distributed load for 241-265 teaching	4.	, ,			2	22		
to uniformly distributed load. 189-213 teaching 6. Analysis and design of two way subjected to uniformly distributed load for 241-265 teaching			119-145	teaching				
6. Analysis and design of two way T1 Class room 2 26 subjected to uniformly distributed load for 241-265 teaching	5.		T1	Class room	2	24		
subjected to uniformly distributed load for 241-265 teaching		to uniformly distributed load.	189-213	teaching				
	6.		T1	Class room	2	26		
various boundary conditions.		subjected to uniformly distributed load for various boundary conditions.	241-265	teaching				

7.	Analysis and design of one way	T1	Class room	2	28
	continuous slabs, two way continuous	189-265	teaching		
	slabs subjected to uniformly distributed				
	load for various boundary conditions. UNIT III LIMIT STATE DESIGN FO	OD DOND A	NCHODACE	CHEAD & T	ODCION
1.	Behaviour of RC members in bond	T1	Class room	SHEAR & I	29
1.	Benaviour of RC members in bond	170-188	teaching	1	29
2.	Behaviour of RC members in Anchorage	T1	Class room	1	30
۷.	Benaviour of RC members in Anchorage	170-188	teaching	1	30
3.	Design requirements as per current code	R 6	Class room	1	31
٥.	Design requirements as per current code	1-90	teaching	1	31
4.	Behaviour of RC beams in shear	T1	Class room	1	32
7.	Benaviour of Re beams in shear	89-118	teaching	1	32
5.	Behaviour of RC beams in torsion	T1	Class room	1	33
3.	Benaviour of Re beams in torsion	388-420	teaching	1	33
6.	Design of RC members for combined	T1	Class room	2	35
0.	bending shear.	89-118	teaching	2	33
7.	Design of RC members for torsion.	T1	Class room	2	37
/.	Design of Re members for torsion.	388-420	teaching	2	37
8.	Design of RC members for combined	T1	Class room	2	39
0.	bending shear problems	89-118	teaching	2	39
9.	Design of RC members for torsion	T1	Class room	2	41
9.	probelems	388-420	teaching	2	41
	_		GN OF COLU	MNC	
1.		T1	Class room	1	42
1.	Types of columns	266	teaching	1	72
2.		T1	Class room	1	43
2.	Braced and unbraced columns	267	teaching	1	
3.	Design of short Rectangular for axial,	T1	Class room	2	45
	bending.	268-280	teaching	_	
4.	Design of short Rectangular for uniaxial	T1	Class room	2	47
	bending.	268-280	teaching		
5.	Design of short Rectangular for biaxial	T1	Class room	2	49
	bending.	268-280	teaching		
6.	Design of short circular columns for axial,	T1	Class room	2	51
	bending.	268-280	teaching		
7.	Design of short circular columns for	T1	Class room	1	52
	uniaxial bending.	268-280	teaching		
8.	Design of short circular columns for	T1	Class room	1	53
	biaxial bending.	268-280	teaching		
	UNIT V LIMIT S'	TATE DESIG	GN OF FOOT	ING	
1.	Introduction	T1	Class room	1	54
		466	teaching		
2.	Design of wall footing	T1	Class room	1	55
		466- 480	teaching		
3.	Design of axially loaded rectangular pad	T1	Class room	2	57
	footings	466- 480	teaching		
4.	Design of eccentrically loaded rectangular	T1	Class room	2	59
	pad footings	466- 480	teaching		
5.	Design of axially loaded sloped footings	T1	Class room	2	61
		466- 480	teaching		

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6.	Design of eccentrically loaded sloped	T1	Class room	2	63
	footings	466- 480	teaching		
7.	Design of combined rectangular footing	T1	Class room	2	65
	for two columns only.	466- 480	teaching		

	Prepared by	Approved by
Signature		
Name	Mr.S.Keerthi Priyan	Mr.P.SureshKumar
Designation	Assistant Professor / CIVIL	HOD/CIVIL
Signed date		

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