KL University, Guntur
B.Tech

Course Handout

Date:

Course No : **09 CE 304**

Course Title : **Design of Concrete Structures**

Course Coordinator : **Dr. P. Saha**

Course Structure : **L-T-P-Cr = 3-1-2-5**

Course Detail : Theory & Tutorial

Lecture Hours : 45

Prerequisite : Strength of materials and structural analysis

1. COURSE DESCRIPTION:

Design of Concrete Structures is the most important civil engineering subject must be understood by student. A project is composed of Design procedures of structural elements are related one to the other in some manner, and all of these should be completed in order to complete the Design of structures like Design of Concrete Structures. Every project has one specific purpose, it starts at some specific moment and it is finished when its objectives have been fulfilled. Similarly management increases the productivity through technological innovation taking into account human factors involved in this structural design.

The subject matter includes such fundamental concepts as a Design of concrete structures, Design of concrete beams, slabs, columns, foundations and Prestressing concrete.

2. COURSE OBJECTIVES & OUTCOMES:

After thorough learning of **Design of Concrete Structures**

The student should be able to:

1. Identify the type of loading coming on the structural elements
2. Design challenged designs of structures by using Limit state design method.
3. Design any real life problems
4. Design of Prestressed concrete structures

3. RECOMMENDED TEXT BOOKS: supplemented with IS:456-2000

1. Reinforced Concrete Design by S.Unnikrishna Pillai and Devdas Menon, Tata McGraw-Hill, Education Private Limited, New Delhi, Third Edition-2009**.**
2. Prestressed Concrete by N. Krishna Raju; Tata Mc Graw - Hill Publishing Company Limited Delhi.

RECOMMENDED REFERENCES:

1. Limit State theory & Design of reinforced concrete by Dr. V. L. Shah and Dr. S. R. Karve, Structures Publications, Pune, Fourth Edition-2003.

2. Design of concrete structures by Arther H.Nilson, Tata Mc Graw-Hill Publishing Co. Ltd, New Delhi.

4. SYLLABUS:

UNIT – I

INTRODUCTION

Introduction, working stress method, Code recommendations for Limit state design.

LIMIT STATE OF COLLAPSE-FLEXURE

Introduction, Analysis at Ultimate Limit state, Assumptions in analysis, Analysis of Singly and doubly reinforced rectangular sections, Analysis of Flanged sections, Design of Singly and doubly reinforced rectangular sections. Design of Flanged Beam sections.

UNIT – II

DESIGN FOR SHEAR, TORSION, BOND AND DEFLECTION

Shear stresses in rectangular beams, Shear failure modes, normal shear stress, design shear strength with and without shear reinforcement, Design for torsion of rectangular section.

Design for bond, mechanism of bond resistance, Serviceability limit states: deflection and cracking, short term and Long term deflection.

DESIGN OF SLABS

Introduction, Effective span for slabs, Design of Continuous One-way slab, Two-way slab: restrained slabs and unrestrained slabs, Introduction to Flat slabs.

UNIT – III

DESIGN OF COMPRESSION MEMBERS

Introduction, Classification of columns, Effective length of column, slenderness limits, minimum eccentricities and reinforcement, Design of Short columns under axial compression, compression with uniaxial and Biaxial bending, Design of slender columns.

UNIT – IV

DESIGN OF FOUNDATIONS

Introduction, Types of footing, Depth of foundation, Design of Isolated footings, Design of combined footing.

UNIT – V

PRESTRESSED CONCRETE

Introduction: Basic concepts of prestressing; Historical development; Need for High strength steel and high strength concrete; Advantages of prestressed concrete.

PRESTRESSING SYSTEMS & ANALYSIS

Tensioning devices; Hoyer's long line system of pretensioning; Post tensioning systems; Basic assumptions; Analysis of prestress; Resultant stresses at a section;

5. SESSION WISE DISTRIBUTION OF UNITS

Unit	Sessions	Hours
I	1 to 11	11
II	12 to 22	11
III	23 to 31	09
IV	32 to 38	07
V	39 to 45	07
Total Contact hours excluding tutorials		45

6. COURSE PLAN

Lecture No.	Learning Objectives	Topics to be covered	Chapter in the text book
Unit-I			
1	Introduction	Objective and Basic Requirements of Structural Design	R1; Chap-1
2	To know the design philosophies	Design concepts, working stress, limit stress, Behavior in flexure: theory of flexure	T1; Chap-4
3	To understand the concept of Working stress method	Modular ratio and cracking moment, Flexure behavior of reinforced concrete, Code recommendation for limit state design	T1; Chap-4
4	To understand the concept of Limit state method	Analysis at ultimate limit state, rectangular sections, neutral axis	T1; Chap-4
5	To understand the concept of Limit state method	Analysis at ultimate limit state, rectangular sections,	T1; Chap-4
6	To understand the concept of Limit state method	Analysis at ultimate limit state, doubly reinforced sections, compression steel	T1; Chap-4
7	To understand the concept of Limit state method	Analysis at ultimate limit state, doubly reinforced sections	T1; Chap-4
8	To understand the concept of Limit state method	Analysis at ultimate limit state, flanged sections	T1; Chap-4
9	Design procedure of singly reinforced sections	Design of singly reinforced rectangular section	T1; Chap-5
10	Design procedure of Doubly reinforced sections	Design of doubly reinforced rectangular sections	T1; Chap-5
11	Design procedure of Flanged reinforced sections	Design of flanged beam section	T1; Chap-5
Unit-II			
12	To understand the shear concept	shear stresses in rectangular sec beams, Shear failure modes, normal shear stress	T1; Chap-6
13	To know the Shear detailing in beams	Critical section for shear design, design shear strength with and without shear	T1; Chap-6
14	To understand the Torsion concept	Design for torsion of rectangular section	T1; Chap-7
15	To understand the Bond concept	Design for bond, mechanism of bond resistance	T1; Chap-8
16	To understand the Deflection concept	Serviceability limit states: deflection and cracking, short term deflection	T1; Chap-10
17	To understand the Cracking concept	Long term deflection, Cracking in R.C. members	T1; Chap-10
18	To understand design procedure of one-way slab	Design of one-way slab	T1; Chap-4

19	To understand design procedure of continuous one-way slab	Design of continuous one-way slabs	T1; Chap-5
20	To understand design procedure of restrained two way slab	Design of restrained two way slab	T1; Chap-11
21	To understand design procedure of unrestrained two way slab	Design of unrestrained two way slab	T1; Chap-11
22	Introduction to flat slab	Introduction to flat slab, Methods of Design	T1; Chap-11
Unit-III			
23	Introduction	Design of compression members,	T1; Chap-13
24	To know the code provisions for compression member design	Code requirements on slenderness limit, eccentricities and min. Rein	T1; Chap-13
25	To understand the design procedure of short column with axially loaded	Design of short column under axial compression	T1; Chap-13
26	To understand the design procedure of short column with uniaxially loaded	Design of short column under compression with uniaxial bending	T1; Chap-13
27	To know how to use interaction diagrams	Use of interaction diagram	T1; Chap-13
28	To understand the design procedure of short column with	Design of short column under compression with biaxial bending	T1; Chap-13
29	To understand the design procedure of short column with	Design of short column under compression with biaxial bending	T1; Chap-13
30	To understand the design procedure of slender column	Design of slender column	T1; Chap-13
31	To understand the design procedure of slender column	Design of slender column	T1; Chap-13
Unit-IV			To know
32	Introduction to the footings	Design of footings: types of footings	T1; Chap-14
33	To understand the pressure concept	Distribution of base pressure	T1; Chap-14
34	To know the code provisions	General design considerations and code requirements	T1; Chap-14
35	To understand the design procedure of Isolated footing	Design of Isolated footing for Bending moment, One way shear and two way shear	T1; Chap-14
36	To understand the design procedure of Isolated footing	Design of Isolated footing for Bending moment, One way shear and two way shear	T1; Chap-14
37	To understand the design procedure of Combined footing	Design of combined rectangular footings	T1; Chap-14
38	To understand the design procedure of Combined footing	Design of combined Trapezoidal footings	T1; Chap-14
Unit-V			

39	Introduce the concept of prestressed concrete & Historical development of prestressed	Basic concepts of prestressing, Historical development	T2; Chap-1
40	To know Requirement of high strength material, Advantages of PSC concrete and comparison of PSC and RCC	Need for high strength steel and concrete, advantages of PSC and PSC & RCC comparison	T2; Chap-1
41	To know Concept of prestressing systems, To know the Different types of tension devices	prestressing systems, tension devices	T2; Chap-3
42	To know the Different methods of pre tensioning	Different methods of pre tensioning	T2; Chap-3
43	To know the Different methods of post tensioning	Different methods of post tensioning	T2; Chap-3
44	To understand the basic assumptions and resultant	Basic assumptions in the analysis of prestress (At Transfer) and resultant stress at a section	T2; Chap-4
45	To understand the basic assumptions and resultant	Analysis of prestress (At Service loads) and resultant stress at a section	T2; Chap-4

Plan for Tutorials: (Plan for 15 x T)

S.No	Topic	Pedagogical tool type
1	Analysis of Singly reinforced beams	Problem solving
2	Analysis of Doubly reinforced beams	Problem solving
3	Analysis of Flanged beams	Problem solving
4	Shear calculations for flexural members as per IS 456-2000, Bond and Development length	Problem solving
5	Calculations for torsional reinforcement	Problem solving
6	Design of One-way slab	Problem solving
7	Design of Two-way restrained slab	Problem solving
8	Design of Two-way Unrestrained slab	Problem solving
9	Design of axially loaded short column	Problem solving
10	Design of combined axial and uniaxial bending	Problem solving
11	Design of slender column	Problem solving
12	Design of Isolated column footing	Problem solving
13	Design of Rectangular combined footing	Problem solving
14	Design of Trapezoidal combined footing	Problem solving
15	Analysis of beam sections at transfer and service load	Problem solving

Plan for Lab Practicals:

Students are required to design any Twelve of the following structures using Software packages like STRUDS

1. Design of continuous beam.
2. Design of plane frame.
3. Design of space frame.
4. Design of 4 storey residential building:
    a) Creating model from the given drawing.
    b) Assigning loads and load combinations
    c) Beams and Slabs
    d) Column and Footing
    e) Preparation of Design Document and detail drawing

Self Learning Topics:

Unit	Topic	Source
I	**INTRODUCTION, LIMIT STATE OF COLLAPSE-FLEXURE**	http://www.nptel.iitm.ac.in/video.php?subjectId=105105105
II	**SLABS**	http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Design%20of%20Con%20Struc/pdf/m8l18.pdf
III	**COLUMNS**	http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Design%20of%20Con%20Struc/pdf/m10l21.pdf
IV	**FOUNDATIONS**	http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Design%20of%20Con%20Struc/pdf/m11l28.pdf
V	**PRESTRESSED CONCRETE**	http://nptel.iitm.ac.in/courses.php?branch=Civil http://en.wikipedia.org/wiki/Prestressed_concrete

8. EXAMINATION PATTERN

Evaluation Scheme:

As per KLUniversity Evaluation Scheme

EC No.	COMPONENT	Weightage	Date, Time & Venue
1	Test-I	10	
2	Test-II	10	
3	Home Assignement	05	
4	Assignment Based Test	05	
5	Quiz	05	
6	Attedance	05	
	TOTAL	40	

Attendance will be considered for 5 marks. The demarcation is as follows:

95% and above: 5 marks
90% and above: 4 marks
85% and above: 3 marks
80% and above: 2 marks
75% and above: 1 mark.

9. CHAMBER CONSULTATION : Everyday between 16.00 to 17.00 & whenever I am free

10. **NOTICE/COURSE MATERIALS:** All notices, assignments and course materials will be uploaded in the e-learning site from time to time

COURSE COORDINATOR STRUCTURE GROUP HEAD HOD-CE