Ramgarhia Polytechnic College, Phagwara

Civil Engineering Department

Head of Department:	Er. Gurcharan Singh
Name of the Faulty:	Er. Gurcharan Singh
Discipline:	Civil Engineering Department
Semester:	5th
Subject:	REINFORCED CONCRETE DESIGN
Lesson Plan Duration:	16 Weeks

RATIONALE

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise RC Construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters. This subject thus deals with elementary design principles as per IS:456-2000

Learning Outcomes

After undergoing the subject, students will be able to:

CO1 Explain methods of RCC design i.e. - Working stress methods - Limit state methods

CO2 Design singly, doubly reinforced rectangular and T&L beams as per IS Code

CO3 Design one way and two way slab

CO4 Design axially loaded column and their isolated footing

PO ⇨ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1							
CO2							
CO3							
CO4							

Syllabus

Units	Details	Hours
1.	Introduction 1.1 Concept of Reinforced Cement Concrete (RCC) 1.2 Reinforcement Materials: - Suitability of steel as reinforcing material - Properties of mild steel and HYSD steel 1.3. Loading on structures as per IS: 875	(2 hrs)

2.	Introduction to following methods of RCC design 2.1 Working stress method: Definition and basic assumptions 2.2 Limit state method: Definition and basic assumptions	(4 hrs)
3.	Shear and Development Length Shear as per IS:456-2000 by working stress method i) Shear strength of concrete without shear reinforcement ii) Maximum shear stress iii) Shear reinforcement	(4 hrs)
4.	Concept of Limit State Method 4.1. Definitions and assumptions made in limit state of collapse (flexure) 4.2. Partial factor of safety for materials 4.3. Partial factor of safety for loads 4.4. Design loads 4.5. Stress block, parameters	(8hrs)
5.	Singly Reinforced beam Theory and design of singly reinforced beam by Limit State Method	(10 hrs)
6.	Doubly Reinforced Beams Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method	(09 hrs)
7.	Behaviour of T beam, inverted T beam, isolated T beam and 'L' beams (No Numericals)	(4 hrs)

8	One Way Slab Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..	(10hrs)
9	Two Way Slab Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections)	(10 hrs)
10	Axially Loaded Column 10.1 Definition and classification of columns 10.2. Effective length of column, 10.3. Specifications for longitudinal and lateral reinforcement 10.4. Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)	(10 hrs)
11	Column Footing 11.1 Strip footing for walls 11.2 Isolated footing for axially load column with uniform thickness 143	(04 hrs)
12	Pre-stressed Concrete 12.1 Concept of pre-stressed concrete 12.2 Methods of pre-stressing : pre-tensioning and post-tensioning 12.3 Advantages and disadvantages of pre-stressing 12.4 Losses in pre-stress	(05hrs)

Reference Books:

1. 1Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
2. Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi
3. Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
4. Singh, Birinder “RCC Design and Drawing”, Kaption Publishing House, New Delhi

5. Singh Harbhajan “Design of Reinforced Concrete Structures” Abhishek Publishers Ltd., Chandigarh
6. Mallick, SK; and Gupta, AP; "Reinforced Concrete", Oxford and IBH Publishing Co, New Delhi

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	
1st	1st	Introduction Concept of Reinforced Cement Concrete (RCC)	1.	N/A
	2nd	Reinforcement Materials: - Suitability of steel as reinforcing material - Properties of mild steel and HYSD steel Loading on structures as per IS: 875 2.		
	3rd	Introduction to following methods of RCC design		
	4th	Working stress method: Definition and basic assumptions		

	5th	Limit state method: Definition and basic assumptions		
2nd	6th	Limit state method: Definition and basic assumptions	2.	N/A
	7th	Pre-stressed Concrete Concept of pre-stressed concrete Methods of pre-stressing : pre-tensioning and post-tensioning Advantages and disadvantages of pre-stressing Losses in pre-stress		
	8th	Shear as per IS:456-2000 by working stress method		
	9th	i) Shear strength of concrete without shear reinforcement		
	10th	ii) Maximum shear stress iii) Shear reinforcement 142		
3rd	11th	4. Concept of Limit State Method	3.	N/A
	12th	Definitions and assumptions made in limit state of collapse (flexure)		
	13th	Partial factor of safety for materials		
	14th	Partial factor of safetyfor loads		
	15th	Design loads		
4th	16th	Stress block		N/A
	17th	Parameters		

	18th	Assumptions made in limit state of collapse (flexure)	4.	
	19th	Singly Reinforced beam		
	20th	Theory and design of singly reinforced beam by Limit State Method		
5th	21st	Theory and design of singly reinforced beam by Limit State Method	5.	N/A
	22nd	Singly Reinforced beam		
	23rd	Design of singly reinforced beam by Limit State Method		
	24th	Theory and design of singly reinforced beam by Limit State Method		
	25th	Theory and design of singly reinforced beam by Limit State Method		
6th	26th	Theory and design of singly reinforced beam by Limit State Method	6.	N/A
	27th	Theory and design of singly reinforced beam by Limit State Method		
	28th	Theory and design of singly reinforced beam by Limit State Method		
	29th	Doubly Reinforced Beams		
	30th	Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method		
7th	31st	Doubly Reinforced Beams	7.	N/A
	32nd	Theory and design of simply supported doubly reinforced rectangular		N/A

		beam by Limit State Method		
	33rd	Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method		
	34th	Doubly Reinforced Beams		
	35th	Doubly Reinforced Beams		
8th	36th	Doubly Reinforced Beams	8.	N/A
	37th	Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method		
	38th	Behaviour of T beam		
	39th	Inverted T beam		
	40th	Isolated T beam		
9th	41st	'L' beams (No Numericals)	9.	N/A
	42nd	One Way Slab		
	43rd	Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..		
	44th	Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..		

	45th	Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..		
10th	46th	Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..	10. .	N/A
	47th	Limit State Method		
	48th	Limit State Method		
	49th	Limit State Method		
	50th	Limit State Method		
11th	51st	Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..	11	N/A
	52nd	Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..		
	53rd	Two Way Slab		
	54th	Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State		

	55th	Method including sketches showing reinforcement details (plan and two sections)		
12th	56th	Method including sketches showing reinforcement details (plan and two sections)	12.	N/A
	57th	Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State		
	58th	Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State		
	59th	Method including sketches showing reinforcement details (plan and two sections)		
	60th	Method including sketches showing reinforcement details (plan and two sections)		
13th	61st	Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State	13.	N/A
	62nd	Method including sketches showing reinforcement details (plan and two sections)		
	63rd	Axially Loaded Column Definition and classification of columns		
	64th	Effective length of column		

	65th	Specifications for longitudinal and lateral reinforcement		
14th	66th	Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)	14.	N/A
	67th	Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)		
	68th	Specifications for longitudinal and lateral reinforcement		
	69th	Specifications for longitudinal and lateral reinforcement		
	70th	Design of axially loaded square		
15th	71st	Shear and Development Length	15.	N/A
	72nd	Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)		
	73rd	Design of axially loaded square, rectangular and circular short columns by		

		Limit State Method including sketching of reinforcement(sectional elevation and plan)		
	74th	Column Footing		
	75th	Strip footing for walls		
16th	76th	Isolated footing for axially load column with uniform thickness 143	16.	N/A
	77th	Isolated footing for axially load column with uniform thickness 143		
	78th	Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)		
	79th	Isolated footing for axially load column with uniform thickness 143		
	80th	Strip footing for walls		

NBA has defined the following seven POs for an Engineering diploma graduate:

i) **Basic and Discipline specific knowledge**: Apply knowledge of basic mathematics, science and engineering fundamentals and engineering specialization to solve the engineering problems.

ii) **Problem analysis:** Identify and analyze well-defined engineering problems using codified standard methods.

iii**)** **Design/ development of solutions**: Design solutions for well-defined technical problems and assist with the design of systems components or processes to meet specified needs.

iv) **Engineering Tools, Experimentation and Testing**: Apply modern engineering tools and appropriate technique to conduct standard tests and measurements.

v) **Engineering practices for society, sustainability and environment**: Apply appropriate technology in context of society, sustainability, environment and ethical practices.

vi) **Project Management**: Use engineering management principles individually, as a team member or a leader to manage projects and effectively communicate about well-defined engineering activities.

vii) **Life-long learning**: Ability to analyze individual needs and engage in updating in the context of technological changes.

Program Specific Outcomes (PSOs)

PSOs are a statement that describes what students are expected to know and be able to do in a specialized area of discipline upon graduation from a program. Program may specify 2-4 program specific outcomes, if required.

These are the statements, which are specific to the particular 11 program. They are beyond POs. Program Curriculum and other activities during the program must help in the achievement of PSOs along with POs.