ADVANCED REINFORCED CONCRETE DESIGN

II Semester: ST								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BSTC15	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	30	70	100
Contact Classes: 45	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 45**		

I. COURSE OVERVIEW:

Design of reinforced concrete structures is an introductory design course in civil engineering. In this course, basic elements governed by bending, shear, axial forces or combination of them are identified and are considered as building blocks of the whole structure. The design will be done as per IS 456:2000.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The design of special structures by understanding their behaviour in terms of shear force and bending moment.
II. Design and prepare detail structural drawings for execution citing relevant IS codes.
III. The Design independently civil engineering structures as per the requirements of client and provide detailed design drawings, quality control reports during construction for ensuring quality and economical structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain the behaviour of reinforced concrete under flexure and shear for designing beams, slabs and columns under various load condition.	Understand
CO 2	Explain the concepts of plastic hinge and plastic moment for understanding the redistribution of moments and moment rotation characteristics of reinforced concrete members.	Understand
CO 3	Analyse flat and ribbed slabs under given loading for designing and obtaining the reinforcement detailing in end and middle strips of the slab.	Analyse
CO 4	Analyse the load distribution in deep beams for designing and fixing of reinforcement details in deep beams.	Analyse
CO 5	Develop the concept of axial, uni-axial and bi-axial loading on compression members for designing the same to meet the safety and serviceability conditions.	Apply
CO 6	Analyse the soil properties for designing various types of footings for transferring the superimposed loads safely to the soil beneath.	Analyse

IV. SYLLABUS:

MODULE-I: BASIC DESIGN CONCEPTS (09)

Behavior in flexure, design of singly reinforced rectangular sections, design of doubly reinforced rectangular sections, design of flanged beams, design of shear, design for torsion, Limit state of serviceability: Deflections of reinforced concrete beams and slabs, short term deflection and long term deflection, estimation of crack width in RCC members, calculation of crack widths.

MODULE-II: LIMIT ANALYSIS OF R.C. STRUCTURES (09)

Rotation of a plastic hinge, redistribution of moments, moment rotation characteristics of RC member, I.S. code provisions, applications for fixed and continuous beam. Yield line analysis for slabs: Upper bound and lower bound theorems, yield line criterion, virtual work and equilibrium methods of analysis for square and circulars labs with simple and continuous end conditions.

MODULE-III: DESIGN OF RIBBED SLABS, FLAT SLABS (09)

Analysis of the slabs for moment and shears, ultimate moment of resistance, design for shear, deflection, arrangement of reinforcements. Flat slabs: Direct design method, distribution of moments in column strips and middle strip moment.

Shear transfer from slabs to columns, shear in flat slabs, check for one way and two way shears, introduction to equivalent frame method. Limitations of direct design method, distribution of moments in column strips and middle strip.

MODULE-IV: DESIGN OF REINFORCED CONCRETE DEEP BEAMS & CORBELS (09)

Steps of designing deep beams, design by IS 456, checking for local failures, detailing of deep beams, design of curved beams, analysis of forces in a corbels, design of procedure of corbels, design of nibs.

MODULE-V: DESIGN OF COMPRESSION MEMBERS (09)

Estimation of effective length of a column, code requirements on slenderness limits, design of short columnsunder axial compression, design of short columns with uni-axial bending, design of short columns under biaxialbending, design of slender columns. Design of combined footings, distribution of soil Pressure, geometry oftwo Column combined footing, design considerations in combined footing for two, columns.

V.TEXT BOOKS:

1. Pillai S. U. and MenonD, 'Reinforced Concrete Design", Tata McGraw-Hill, 3rd Edition, 1999.
2. Reinforced concrete design by S. Unnikrishna Pillai & Menon, Tata McGraw Hill, 3rd Edition, 2009
3. Park R. and Paulay T, "Reinforced Concrete Structures", John Wiley & Sons, 1995.

VI. REFERENCE BOOKS:

1. Varghese P. C, "Advanced Reinforced Concrete Design", Prentice Hall of India, New Delhi, 1995.
2. Hsu T. T. C. and Mo Y. L, "Unified Theory of Concrete Structures", John Wiley & Sons, 2010.
3. SalmonC. G., Johnson J. E. and Malhas F. A. "Steel Structures Design and Behavior Emphasizing Load and Resistance Factor Design", Pearson Education, 5th Edition, 2009.
4. Ramchandra, "Design of Steel Structures",Vol. II, Standard Book House, Delhi, 1999.
5. Neal B.G, "Plastic Methods of Structural Analysis", Chapman and Hall London, 2005.

VII. WEB REFERENCES:

1. https://lecturenotes.in/subject/179/design-of-advanced-concrete-structures-dacs

VIII. E-TEXT BOOKS:

1. http://nptel.ac.in/downloads/105105104/