Program :	**Diploma in Architecture / Civil Engineering**
Course Code : **5012**	Course Title: **Design of Steel and RCC Structures**
Semester : **5**	Credits: **4**
Course Category: **Program Core**	
Periods per week: **4 (L:3, T:1, P:0)**	Periods per semester: **60**

Course Objectives:

- To learn the concept of design of tension and compression members in steel structures by limit state design.

- To learn the concept of limit state design of steel beams.

- To understand design of RCC elements.

- To know the design of short RCC columns and isolated footing.

Course Prerequisites:

Topic	Course Code	Course name	Semester
Theory of simple bending, Shear force Diagram, Bending Moment Diagram, Deflection		Theory of Structures	3

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Determine the sectional properties and meet structural stability and serviceability conditions of steel members under tension and compression.	16	Applying
CO2	Determine the sectional properties to meet structural stability and serviceability conditions of steel I beam sections.	14	Applying

CO3	Determine the sectional properties to meet structural stability and serviceability conditions of Singly and doubly reinforced beams, one way slab and two-way slab.	14	Applying	
CO4	Determine the sectional properties to meet structural stability and serviceability conditions of short RCC column & Isolated footing	14	Applying	
	Series Test	2		

CO – PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1			3				
CO2			3				
CO3			3				
CO4			3				

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Determine the sectional properties and meet structural stability and serviceability conditions of steel members under tension and compression.**		
M1.01	Discuss the types of sections used for tension and compression members	1	Understanding
M1.02	Determine the sectional properties to meet structural stability and serviceability conditions of single and double angle tension members.	6	Applying
M1.03	Determine the sectional properties to meet structural stability and serviceability conditions of single and double angle struts	8	Applying
M1.04	Identify laced and battened built up sections.	1	Remembering

Contents:

Types of sections used for Tension members. Strength of tension member by yielding of section and rupture of net cross-section. Design of axially loaded single angle and double angle tension members with welded connection.

Types of section used as compression member. Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design constant for Compressive stress.

Design of single and double angle struts with welded connections

Introduction to build up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems).

CO2	Determine the sectional properties to meet structural stability and serviceability conditions of steel I beam sections.		
M2.01	Compare the plastic moment carrying capacity of various sections	1	Understanding
M2.02	Identify the classification of sections	2	Understanding
M2.03	Compare laterally supported and unsupported beams	3	Understanding
M2.04	Determine the sectional properties to meet structural stability and serviceability conditions of laterally supported beams (I -sections only)	8	Applying
	Series Test – I	1	

Contents:

Design of Steel beams: - Plastic moment carrying capacity of section–Classification of cross section- Design strength in Bending (flexure), shearing and deflection for laterally supported beam. (Symmetrical Cross sections only)

Plate girders and Steel trusses (Illustration only)

CO3	Determine the sectional properties to meet structural stability and serviceability conditions of Singly reinforced beams, doubly reinforced beams, one way slab and two-way slab.		
M3.01	Describe the limit state design philosophy of RCC members	1	Understanding
M3.02	Describe the concept of under reinforced, over reinforced, and balanced section	1	Understanding
M3.03	Determine the sectional properties to meet structural stability and serviceability conditions of singly reinforced beam section and doubly reinforced beam section	4	Applying

M3.04	Determine the sectional properties to meet structural stability and serviceability conditions of one-way slab and two-way slab	8	Applying

Contents:

Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, Design requirements as per IS456/2000,

Concept of under reinforced, over reinforced and balanced sections.

Simple numerical problem on ultimate moment of resistance. Design of singly reinforced beam-

Design of doubly reinforced beam using Design aids of IS 456 (SP16)

Check for shear and Design the vertical shear reinforcement in beams. Concept of Development length in tension and compression members. Anchorage value of 90o hook and lapping of bars

Differentiate one way slab and two-way slab

Design of one way (simply supported condition) and two-way slab (simply supported condition and restrained condition) -simple problems

CO4	**Determine the sectional properties to meet structural stability and serviceability conditions ofshort RCC column & Isolated RCC footing**		
M4.01	Compare short column and long column	2	Understanding
M4.02	Determine sectional properties to meet structural stability and serviceability conditions of axially loaded short columns	6	Applying
M4.03	Discuss the types of footings	2	Understanding
M4.04	Determine the sectional properties to meet structural stability and serviceability conditions of isolated footings	4	Applying
	Series Test – II	1	

Contents:

Definition and classification of column, Effective length of column. Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc.

Differentiate short column and long column

Design of axially loaded short column - Square, Rectangular, and Circular only.

Brief description on selection of footing.

Design of Isolated column footing (square). Check for Bending, One way shear, Two-way shear

Text / Reference:

T/R	Book Title/Author
T1	N Subramanian: Steel structures; Oxford Press
T2	S Unnikrishna Pillai and Devadas Menon: Limit State Design of RC structures; Tata McGraw Hill
R1	S SBhavikatti: Design of Steel Structures; I K International Publishers
R2	Duggal: Limit state Design of steel structures; McGraw Hill
R3	SarwarAlamRaz: Structural Design in Steel; New Age International Publishers
R4	P C Varghese: Limit State Design of RCC; Prentice Hall of India Ltd
R5	Ramamrutham: Design of RCC Structures; DhanpatRai& Sons
R6	B C Punmia: Design of RCC Structures; Standard Publishers
R7	S.S. Bhavakkatti: Design of RCC structural elements(vol-I);New age International

Online Resources:

Sl.No	Website Link
1	https://www.sciencedirect.com/topics/engineering/tension-member
2	http://ecoursesonline.iasri.res.in
3	https://www.structuralguide.com/plate-girder
4	https://nptel.ac.in/content/storage2/courses/105105104/pdf/m2l3.pdf