

GUJARAT TECHNOLOGICAL UNIVERSITY

Diploma in Environmental Engineering

Semester: 4

Subject Name: STRUCTURAL DESIGN AND DRAWING

Sr. No.	Course Content
1.	INTRODUCTION (R.C.C.): 1.1 Scope 1.2 Importance of use of reinforcement. 1.3 Limit state method of design. 1.4 Limit state of collapse and serviceability and state of shear. 1.4.1 State the assumptions made in theory of limit state of collapse . I.S. 456-2000. 1.4.2 Limit State of Serviceability. 1.5 Define characteristic strength of concrete and steel 1.6 Define characteristic load 1.7 Partial safety factor for load and strength of materials 1.8 Define 1.8.1 Partial safety factor for material: γ_m 1.8.2 Partial safety factor for load: γ_f 1.8.3 Grades of concrete and steel 1.8.4 Flexural members beam, slab, & footing.
2.	I.S. PROVISIONS FOR DESIGN CONSIDERATIONS: 2.1 Effective depth 2.2 Effective span. 2.3 Control of deflection. 2.4 Cover to reinforcement. 2.5 Spacing of reinforcement. 2.6 Requirements of reinforcement for beam 2.7 Requirements of reinforcement for slab 2.8 Requirements of reinforcement for column 2.9 Minimum eccentricity in column. 2.10 Development length of bars. 2.11 Shear reinforcement
3.	DESIGNS AND DETAILING OF BEAMS 3.1 Flexural members. 3.2 Classification of beam: 3.2.1 Singly reinforced beam. 3.3 Methods of design of beam. 3.3.1 Design of singly reinforced rectangular and doubly reinforced beam using I.S.456-2000.

	3.3.2 Design of singly reinforced rectangular and doubly reinforced beam using SP: 16 Handbooks 3.4 Design of shear reinforcement using I.S.456-2000. (a) $\tau_v < \tau_c$ (b) $\tau_v = \tau_c$ (c) $\tau_v > \tau_c$ (d) $\tau_v > \tau_{cmax}$. 3.5 Check for development length and deflection using I.S.456-2000 and S16 Handbook.
4.	DESIGN AND DETAILING OF SLAB : 4.1 One-way slab and Two-way slab. 4.2 Load on slab as per I.S. 875-1987. 4.3 Design of one way simply supported slab using I.S. 456-2000 and SP:16 Hand book. 4.4 Reinforcement Details of One-way slab
5.	DESIGN AND DETAILING OF AXIALLY LOADED COLUMNS: 5.1 Compression member. 5.1.1 State the assumptions in designing a compression member by limit state method. 5.1.2 Define: short and long column. 5.1.3 State the types of failures that may be observed in columns with sketches. 5.2 Effective length of column as per I.S. 456-2000 5.3 Design of column as per I.S 456-2000 5.4 Check for minimum eccentricity.
6.	DESIGN AND DETAILING OF ISOLATED COLUMN FOOTINGS: 6.1 Bearing capacity of soil. 6.2 Type of footing. 6.3 Design of square pad footing. 6.4 Check the footing for one-way shear, two-way shear.. 6.5 Check for the development length of the base.
7.	INTRODUCTION (STEEL STRUCTURES):-Advantages of steel structures. 7.1 Various types of Roof Truss 7.2 Shape, size and properties of different Indian Standard steel sections from steel hand book 7.3 Provisions for riveted joints in IS-800. 7.4 Design of riveted and welded joints., permissible stress, Edge distance, Pitch, Dia. of rivets.
8.	LOADS ON ROOF TRUSS 8.1 Dead Loads as per IS- 875 part -1

	8.2 Live Load as per IS- 875 part -2 8.3 Wind Loads as per IS- 875 part -3
9.	TENSION MEMBER 9.1 Standard sections used as tension member 9.2 Provision in I.S 800-1984 to design tension member 9.2.1 Permissible stress. 9.2.2 Effective cross sectional area 9.2.3 Use of tacking rivets & min. thickness of section 9.3 Design of tension member. 9.3.1 To Select the section. 9.3.2 To find effective area 9.4 Find the strength of member 9.5 Sketch the section with joints
10.	COMPRESSION MEMBER : 10.1 Standard sections used as Strut or Compression Member 10.2 Provision of I.S. 800-1984 to design a Compression member 10.2.1 Permissible Compressive stress & allowable stress 10.2.2 Effective length of compression member 10.3 Design of Strut 10.3.1 Calculate the allowable compressive stress. 10.3.2 Find the effective length of strut. 10.3.3 Calculate the safe load for strut. 10.3.4 Design a strut for given data. 10.4 Provision in IS 800 to design simple column. 10.4.1 Find effective length of column. 10.4.2 Find strength of column. 10.4.3 Design a simple column
11.	SKETCHES OF STEEL ROOF TRUSS 11.1 Various types of roof truss 11.2 Detail of joint at support 11.2.1 Detail of joint at crown 11.3 Detail of connection between purlin and roofing with principal Rafter
12.	SKETCHES OF REINFORCEMENT DETAILS 12.1 Reinforcement Details of various R.C structures like Beam, slab, column, footing

LABORATORY EXPERIENCES/TERM WORK :

SR NO .	NAME OF TOPIC
1	Introduction to I. S. Code provision for design of steel & R.C.C. Structures & terminology.
2	Design and detailing of singly reinforced R.C.C. Beam.
3	Design and detailing of one way R.C.C. Slab.
4	Design and detailing of two way R.C.C. Slab
5	Design and detailing of axially loaded , R.C.C. short column & isolated column footing.
6	Design and detailing of steel column & slab base footing.
7	Design and detailing of simply supported steel beam techniques
8	(I)types of steel roof trusses : (a) howe truss (b) pratt truss(c) fan truss(d) fink truss (e) component fink truss (f) north roof truss.
9	Show details of roof truss joints(a)eaves joint(b)ridge joint(c) intermediate joint with riveted or weld connection.
10	Show details of reinforcement in R.C.C. (a) staircase(b)cantilever beam (c) one way continuous slab.
11	Show details of connections in steel structures.(a) beam to column (framed connection & seated connection)(b)beam to beam connection(framed connection & seated connection)

REFERENCES BOOKS:

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| [1] Limit State Theory & Design of Reinforce concrete | Dr.S.R.Karve & Dr. D.L. SHAH |
| [2] Illustrated Reinforced concrete design | Dr. S.R. Karve & Dr. D.L.Shah |
| [3] Hand Book of Reinforced concrete design | Dr.S.R.Karve& Dr. D.L.Shah |
| [4] Reinforced Concrete | A.K. Jain. |
| [5] Reinforced Concrete Design | S.N. Sinha. |
| [6] Design for Reinforced concrete structure | P. Dayaratnam. |
| [7] Design of Reinforced Concrete | S. Ramamrutham. |
| [8] Design aids for Reinforced concrete to IS:456-2000 | B.I.S. |
| [9] Design aid SP: 16 Handbook B.I.S. | |