LESSON PLAN : TH-1. STRUCTURAL DESIGN – I , SESSION -2023-2024 (SUMMER 2024)BATCH-2022-2025(4th Semester)		
Discipline: civil engineering	**Semester: 4th**	**Name of the Teaching Faculty: SUBHASHREE DASH**
Subject: TH.1-STRUCTURAL DESIGN -I	**No. of days/ per week class allotted: 5**	**Semester From Date : 16/01/24 to Date: 26/04/24** **No. of Weeks: 15**
Week	**Class Day**	**Theory/ Practical Topics**
		1 Working stress method (WSM)
1ST	1	1.1 Objectives of design and detailing. State the different methods of design of concrete structures
	2	1.2 Introduction to reinforced concrete, R.C. sections their behavior, grades of concrete and steel. Permissible stresses, assumption in W.S.M.
	3	1.3 Flexural design and analysis of single reinforced sections from first principles.
	4	1.4 Concept of under reinforced, over reinforced and balanced sections
	5	1.5 Advantages and disadvantages of WSM, reasons for its obsolescence
		2 Philosophy Of Limit State Method (LSM)
2ND	1	2.1 Definition, Advantages of LSM over WSM, IS code suggestions regarding design philosophy
	2	2.2 Types of limit states, partial safety factors for materials strength, characteristic strength, characteristic load, design load, loading on structure as per I.S. 875
	3	2.3 Study of I.S specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchorage, effective span for beam & slab.
		3 Analysis and Design of Single and Double Reinforced Sections (LSM)
	4	3.1 Limit state of collapse (flexure), Assumptions, Stress-Strain relationship for concrete and steel, neutral axis, stress block diagram and strain diagram for singly reinforced section.
	5	3.1 Limit state of collapse (flexure), Assumptions, Stress-Strain relationship for concrete and steel, neutral axis, stress block diagram and strain diagram for singly reinforced section.
3RD	1	3.1 Limit state of collapse (flexure), Assumptions, Stress-Strain relationship for concrete and steel, neutral axis, stress block diagram and strain diagram for singly reinforced section.
	2	3.1 Limit state of collapse (flexure), Assumptions, Stress-Strain relationship for concrete and steel, neutral axis, stress block diagram and strain diagram for singly reinforced section.
	3	3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.
	4	3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.
	5	3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.

4TH	1	3.2 Concept of under- reinforced, over-reinforced and limiting section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.
	2	3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections
	3	3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections
	4	3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections
	5	3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections
5TH	1	3.4 Necessity of doubly reinforced section, design of doubly reinforced rectangular section
	2	3.4 Necessity of doubly reinforced section, design of doubly reinforced rectangular section
	3	3.4 Necessity of doubly reinforced section, design of doubly reinforced rectangular section
		4 Shear, Bond and Development Length (LSM)
	4	4.1 Nominal shear stress in R.C. section, design shear strength of concrete, maximum shear stress, design of shear reinforcement, minimum shear reinforcement, forms of shear reinforcement.
	5	4.1 Nominal shear stress in R.C. section, design shear strength of concrete, maximum shear stress, design of shear reinforcement, minimum shear reinforcement, forms of shear reinforcement
6TH	1	4.2 Bond and types of bond, bond stress, check for bond stress, development length in tension and compression, anchorage value for hooks 900 bend and 450 bend standards lapping of bars, check for development length.
	2	4.3 Numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams (Explain through examples only).
		5 Analysis and Design of T-Beam (LSM)
	3	5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.
	4	5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.
	5	5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.
7TH	1	5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.
	2	5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.
	3	5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.
	4	5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.
	5	5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.

8TH	1	5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.
	2	5.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.
	3	5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination).
	4	5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination).
	5	5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination).
9TH	1	5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination).
	2	5.3 Simple numerical problems on deciding effective flange width. (Problems only on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange shall be asked in written examination).
		6 Analysis and Design of Slab and Stair case (LSM)
	3	6.1 Design of simply supported one-way slabs for flexure check for deflection control and shear.
	4	6.1 Design of simply supported one-way slabs for flexure check for deflection control and shear.
	5	6.1 Design of simply supported one-way slabs for flexure check for deflection control and shear.
10TH	1	6.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.
	2	6.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.
	3	6.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.
	4	6.3 Design of two-way simply supported slabs for flexure with corner free to lift.
	5	6.3 Design of two-way simply supported slabs for flexure with corner free to lift.
11TH	1	6.3 Design of two-way simply supported slabs for flexure with corner free to lift.
	2	6.4 Design of dog-legged staircase
	3	6.4 Design of dog-legged staircase
	4	6.4 Design of dog-legged staircase
	5	6.5 Detailing of reinforcement in stairs spanning longitudinally.
12TH	1	6.5 Detailing of reinforcement in stairs spanning longitudinally.
	2	6.5 Detailing of reinforcement in stairs spanning longitudinally.
		7. Design of Axially loaded columns and Footings (LSM)
	3	7.1 Assumptions in limit state of collapse- compression.
	4	7.1 Assumptions in limit state of collapse- compression.
	5	7.1 Assumptions in limit state of collapse- compression.

13TH	1	7.1 Assumptions in limit state of collapse- compression.
	2	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
	3	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
	4	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
	5	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
14TH	1	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
	2	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
	3	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
	4	7.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.
	5	7.3 Analysis and design of axially loaded short square, rectangular and circular columns (with lateral ties only).
15TH	1	7.3 Analysis and design of axially loaded short square, rectangular and circular columns (with lateral ties only).
	2	7.3 Analysis and design of axially loaded short square, rectangular and circular columns (with lateral ties only).
	3	7.4 Types of footing, Design of isolated square column footing of uniform thickness for flexure and shear.
	4	7.4 Types of footing, Design of isolated square column footing of uniform thickness for flexure and shear.
	5	7.4 Types of footing, Design of isolated square column footing of uniform thickness for flexure and shear.

Subhashree Dash.

Govt. Polytechnic Kandhamal

11/01/2024