Discipline: **CE**	Semester: 4th	Name of the Teaching Faculty: **AMRIT GAJENDRA**
Subject: **STRUCTURAL DESIGN I**	No. of Days/per week class allotted: 05	Semester From Date: **02-01-2024**To Date: **23-04-2024** No. of Weeks : **15**
Week	**Class Day**	**Theory Topics**
1st	01	**1.0 Working stress method (WSM)** Objectives of design and detailing. State the different methods of design of concrete structures
	02	Introduction to reinforced concrete
	03	R.C. sections their behavior
	04	grades of concrete and steel
	05	Permissible stresses
2nd	01	assumption in W.S.M.
	02	Basic concept of under reinforced section
	03	Basic concept of over reinforced section
	04	Basic concept of balanced reinforced section
	05	flexural design& analysis of singly reinforced rectangular sections.
3rd	01	analysis of doubly reinforced rectangular sections.
	02	flexural design of doubly reinforced rectangular sections.
	03	**2.0 Limit state method (LSM)** Definition, types of limit states
	04	partial safety factors for materials strength, characteristic strength, characteristic load
	05	design load, loading on structure as per I.S. 875
4th	01	I.S specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing
	02	minimum reinforcement in slab, beam & column, lapping, anchorage, effective span for beam & slab.
	03	**3.0 Analysis and design of singly reinforced sections (LSM)** Limit state of collapse (flexure)
	04	Assumptions, Stress-Strain relationship for concrete and steel
	05	neutral axis, stress block diagram and strain diagram for singly reinforced section.
5th	01	Concept of under- reinforced, over-reinforced section
	02	Concept of limiting section
	03	neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section.
	04	Numerical problems on determining design constants
	05	Numerical problems on moment of resistance
6th	01	Numerical problems on moment of resistance
	02	Numerical problems on area of steel for rectangular sections
	03	**4.0 Analysis and design of doubly reinforced section (LSM)** General features, necessity of providing doubly reinforced section
	04	reinforcement limitations. Analysis of doubly reinforced section
	05	strain diagram, stress diagram, depth of neutral axis
7th	01	moment of resistance of the rectangular section.
	02	Numerical problems on finding moment of resistance of beam
	03	Numerical problems on design of beam sections
	04	**5.0 Shear, Bond and Development Length (LSM)** Nominal shear

		stress in R.C. section, design shear strength of concrete, maximum shear stress
	05	design of shear reinforcement, minimum shear reinforcement, forms of shear reinforcement.
8th	01	Bond and types of bond, bond stress, check for bond stress
	02	development length in tension and compression, anchorage value for hooks 90^0 bend and 45^0 bend standards lapping of bars, check for development length
	03	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
	04	Determination of Development length required for tension reinforcement of cantilevers beam and slab, check for development length.
	05	**6.0 Analysis and Design of T-Beam (LSM)** General features
9th	01	advantages, effective width of flange as per IS: 456-2000 code provisions
	02	Analysis of singly reinforced T-Beam
	03	strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section with neutral axis lying within the flange.
	04	Design of T-beam for moment and shear for neutral axis within flange bottom.
	05	Design of T-beam for moment and shear for neutral axis up to flange bottom.
10th	01	Simple numerical problems on deciding effective flange width
	02	Problems on finding moment of resistance of T-beam section when N.A. lies within or up to the bottom of flange
	03	**7.0 Design of Slab and Stair case (LSM)**Design of simply supported one-way slabs for flexure check
	04	Design of simply supported one-way slabs ;check for deflection control and shear.
	05	Design of simply supported one-way slab for shear.
11th	01	Design of one-way cantilever slabs for flexure check for deflection control
	02	Design of one-way cantilevers chajjas for flexure check for deflection control
	03	Design of one-way cantilever slabs for flexure check for deflection control and check for development length and shear.
	04	Design of one-way cantilevers chajjas for flexure check for deflection control and check for development length and shear.
	05	Design of two-way simply supported slabs for flexure with corner free to lift.
12th	01	Design of two-way simply supported slabs for flexure with corner free to lift.
	02	Design of dog-legged staircase
	03	Design of cantilever staircase
	04	Simple numerical problems on design of one-way simply supported slabs cantilever slab,
	05	Simple numerical problems on two-way simply supported slab
13th	01	Simple numerical problems on dog-legged staircase and cantilever

		staircase
	02	**8.0 Design of Axially loaded columns and Footings (LSM)** Assumptions in limit state of collapse- compression
	03	Definition and classification of columns
	04	effective length of column.
	05	Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties
14th	01	Analysis and design of axially loaded short column
	02	Analysis and design of axially loaded square column,
	03	Analysis and design of axially loaded rectangular column
	04	Analysis and design of axially loaded circular columns
	05	check for short column and check for minimum eccentricity
15th	01	Types of footing
	02	Design of isolated square column footing for flexure and shear
	03	Design of Strip footing for walls
	04	Simple numerical problems on isolated footings and wall footings
	05	Simple numerical problems on axially loaded short column