

GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF CIVIL ENGINEERING

LESSION PLAN

SESSION 2023-24

SUBJECT: STRUCTURAL DESIGN - 1	BRANCH: CIVIL ENGINEERING
NAME OF THE FACULTY: SOURAV KUMAR BEHERA & MANAS MEHER	SEMESTER: 4TH

SL NO.	CHAPTER	HOURS	LECTURE NO.	TOPIC TO BE COVERED
1	CHAPTER 01	05		Working stress method (WSM)
			1	Objectives of design and detailing. State the different methods of design of concrete structures.
			2	Introduction to reinforced concrete, R.C. sections their behaviour, grades of concrete and steel. Permissible stresses, assumption in W.S.M.
			3	Flexural design and analysis of single reinforced sections from first principles.
			4	Concept of under reinforced, over reinforced and balanced sections
			5	Advantages and disadvantages of WSM, reasons for its obsolescence.
2	CHAPTER 02	03		Philosophy of Limit state method (LSM)
			1	Definition, Advantages of LSM over WSM, IS code suggestions regarding design philosophy.
			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	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	CHAPTER 03	15		Analysis and Design of Single and Double Reinforced Sections (LSM)
			1	Limit state of collapse (flexure)
			2	Assumptions
			3	Neutral Axis
			4	Stress-Strain relationship for concrete and steel.
			5	Stress block diagram and strain diagram for singly reinforced section.
			6	Concept of under- reinforced Section
			7	Over-reinforced and limiting section

			8	Neutral axis co-efficient
			9	Limiting value of moment of resistance
			10	Limiting percentage of steel required for limiting singly R.C. section.
			11	Analysis and design: determination of design constants
			12	Moment of resistance
			13	Area of steel for rectangular sections
			14	Necessity of doubly reinforced section
			15	Design of doubly reinforced rectangular section
4	CHAPTER 04	04		Shear, Bond and Development Length (LSM)
			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.
			2	Bond and types of bond, bond stress, check for bond stress, development length in tension and compression, anchorage value for hooks 90° bend and 45° bend standards lapping of bars, check for development length.
			3	Numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of the section in shear.
			4	Design of shear reinforcement; Minimum shear reinforcement in beams (Explain through examples only)
5	CHAPTER 05	15		Analysis and Design of T-Beam (LSM)
			1	General features.
			2	Advantages
			3	Types of T - Beam
			4	Effective width of flange as per IS: 456-2000 code provisions.
			5	Effective width of flange as per IS: 456-2000 code provisions.
			6	Analysis of singly reinforced T-Beam
			7	Strain diagram
			8	Stress diagram
			9	Depth of neutral axis
			10	Moment of resistance of T-beam section with neutral axis lying within the flange
			11	Moment of resistance of T-beam section with neutral axis lying within the flange

			12	Numerical Problem Practice
			13	Numerical Problem Practice
			14	Simple numerical problems on deciding effective flange width
			15	Simple numerical problems on deciding effective flange width
6	CHAPTER 06	15		Analysis and Design of Slab and Stair case (LSM)
			1	Introductory
			2	Types of Slabs
			3	Design of simply supported one-way slabs for flexure check for deflection control and shear
			4	Design of simply supported one-way slabs for flexure check for deflection control and shear
			5	Design of one-way cantilever slabs
			6	Design for flexure, Check for Shear
			7	Check for development length, Check for deflection
			8	Design of cantilever slab
			9	Check for development length, deflection and shear
			10	Design of two-way simply supported slabs for flexure with corner free to lift.
			11	Design of two-way simply supported slabs for flexure with corner free to lift.
			12	Classification of stairs
			13	Design of dog-legged staircase
			14	Detailing of reinforcement in stairs spanning longitudinally
			15	Numerical Problem Practice
7	CHAPTER 07	18		Design of Axially loaded columns and Footings (LSM)
			1	Assumptions in limit state of collapse- compression
			2	Assumptions in limit state of collapse- compression
			3	Definition and classification of columns
			4	Definition and classification of columns
			5	Effective length of column
			6	Specification for minimum reinforcement, Cover

			7	Maximum reinforcement
			8	Number of bars in rectangular, square and circular sections,
			9	Number of bars in rectangular, square and circular sections,
			10	Diameter and spacing of lateral ties
			11	Analysis and design of axially loaded short square columns
			12	Analysis and design of axially loaded rectangular columns
			13	Analysis and design of axially loaded circular columns
			14	Types of footing
			15	Types of footing
			16	Design of isolated square column footing of uniform thickness for flexure and shear
			17	Design of isolated square column footing of uniform thickness for flexure and shear
			18	Numerical Problem Practice