

JHARSUGUDA ENGINEERING SCHOOL, JHARSUGUDA			
Department of Civil Engineering			
4th Sem (2nd Year) Summer 2023			
Theory No:	1	Name of The Faculty: Sri Dhanurjaya Behera, Sri Swapnashish Patel	
Subject:	STRUCTURAL DESIGN – I		
SI No	Chapter No	No. Of Classes Scheduled	Topics to be covered
1	1	1	1. Working stress method (WSM) 1.1 Objectives of design and detailing. State the different methods of design of concrete structures.
2		1	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	1.3 Flexural design and analysis of single reinforced sections from first principles.
4		1	1.4 Concept of under reinforced, over reinforced and balanced sections. .
5		1	Revision
6		1	Revision
7		1	Practice on Problems
8		1	Practice on Problems
9		1	Practice on Problems
10		1	1.5 Advantages and disadvantages of WSM, reasons for its obsolescence
11	2	1	2.Philosophy Of Limit State Method (LSM)2.1 Definition, Advantages of LSM over WSM,
12		1	IS code suggestions regarding design philosophy.
13		1	2.2 Types of limit states, partial safety factors for materials strength,
14		1	characteristic strength, characteristic load, design load, loading on structure as per I.S. 875
15		1	Revision
16		1	Revision
17		1	Practice on Problems
18		1	Practice on Problems

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1	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. .
1	Revision
1	Revision
1	Practice on Problems
1	Practice on Problems
1	3. Analysis and Design of Single and Double Reinforced Sections (LSM)3.1 Limit state of collapse (flexure), Assumptions,
1	Stress-Strain relationship for concrete and steel,
1	neutral axis, stress block diagram and strain diagram for singly reinforced section
1	Revision
1	Revision
1	Practice on Problems
1	Practice on Problems
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.
1	3.3 Analysis and design: determination of design constants, moment of resistance and area of steel for rectangular sections
1	3.4 Necessity of doubly reinforced section, design of doubly reinforced rectangular section
1	Revision
1	Revision
1	Practice on Problems
1	Practice on Problems
1	4.Shear, Bond and Development Length (LSM)

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1	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.
1	4.2 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.
1	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)
1	Revision
1	Revision
1	Practice on Problems
1	Practice on Problems
1	5. Analysis and Design of T-Beam (LSM)
1	5.1 General features, advantages, effective width of flange as per IS: 456-2000 code provisions.
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.
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)..
1	Revision

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51		1	Revision	
52		1	Practice on Problems	
53		1	Practice on Problems	
54	6	1	6. Analysis and Design of Slab and Stair case (LSM)	
55		1	6.1 Design of simply supported one-way slabs for flexure check for deflection control and shear.	
56		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.	
57		1	6.3 Design of two-way simply supported slabs for flexure with corner free to lift.	
58		1	Revision	
59		1	Revision	
60		1	Practice on Problems	
61		1	Practice on Problems	
62		1	6.4 Design of dog-legged staircase	
63		1	Practice on Problems	
64		1	6.5 Detailing of reinforcement in stairs spanning longitudinally.	
65		1	Practice on Problems	
66		7	1	7 Design of Axially loaded columns and Footings (LSM)
67			1	7.1 Assumptions in limit state of collapse- compression.
68	1		7.2 Definition and classification of columns, effective length of column.	
69	1		Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.	
70	1		7.3 Analysis and design of axially loaded short square, rectangular and circular columns (with lateral ties only).	
71	1		Revision	
72	1		Practice on Problems	

73	1	7.4 Types of footing, Design of isolated square column footing of uniform thickness for flexure and shear.
74	1	Revision
75	1	Practice on Problems
Total		75

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