

# PADMASHREE KRUTARTHA ACHARYA INSTITUTE OF ENGINEERING & TECHNOLOGY, BARGARH



## LESSON PLAN Session-2022-2023

Discipline: Civil Engineering Engg. Semester: 4th

Name of the Teaching Faculty: Bikramaditya Bagh

Subject: Structural Design-I No. of Days/per week class allotted 05

Semester From Date: 14/02/2022 To Date: 23/05/2023 No. of Weeks: 15

Week	Class Day	Theory /Practical Topics
1	1 <sup>st</sup>	Working stress method. objective of design and detailing. state the different methods of design of concrete structure
	2 <sup>nd</sup>	Introduction to reinforced concrete, R.C. section their behaviours, grades of concrete and steel. Permissible stresses assumption in WSM
	3 <sup>rd</sup>	Flexural design and analysis of singly reinforced sections from first principles
	4 <sup>th</sup>	concept of under-reinforced, over reinforced and balanced sections
	5 <sup>th</sup>	Advantages and disadvantages of WSM, reason for its obsolescence
2	1 <sup>st</sup>	philosophy of limit state method. Definition, advantages of LSM over WSM, IS code suggestion regarding design philosophy
	2 <sup>nd</sup>	Types of limit states, partial safety factors for material strength characteristic strength, characteristic load, design loads, loading on structure as per IS 875
	3 <sup>rd</sup>	study of I.S. specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam, column & footing, minimum reinforcement in slab, beams & column, lapping, anchorage & effective span for beam & slab
	4 <sup>th</sup>	Analysis and design of single and double reinforced section (LSM) Limit state of collapse (flexure). Assumptions
	5 <sup>th</sup>	stress-strain relationship for concrete and steel, neutral axis
3	1 <sup>st</sup>	stress block diagram and strain diagram for singly reinforced section
	2 <sup>nd</sup>	concept of under-reinforced, over-reinforced

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	3 <sup>rd</sup>	limiting section, neutral axis coefficient
	4 <sup>th</sup>	limiting value of moment of resistance and limiting percentage of steel required for limiting singly R.C. section
	5 <sup>th</sup>	Analysis and design: determination of design constant.
4	1 <sup>st</sup>	determination of design constants
	2 <sup>nd</sup>	moment of resistance
	3 <sup>rd</sup>	area of steel for rectangular section
	4 <sup>th</sup>	area of steel for rectangular section
	5 <sup>th</sup>	Necessity of doubly reinforced section
5	1 <sup>st</sup>	design of doubly reinforced rectangular section
	2 <sup>nd</sup>	design of doubly reinforced rectangular section
	3 <sup>rd</sup>	design of doubly reinforced rectangular section
	4 <sup>th</sup>	shear, Bond and Development Length (L <sub>SD</sub> ) 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

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Week	Class Day	Theory /Practical Topics
	5 <sup>th</sup>	Bond and types of bond, bond stress, check bar bond stress development length in tension and compression, anchorage value bar hooks 90° bend and 45° bend standard lapping of bars
6	1 <sup>st</sup>	check bar development length, Numericals problems on deciding whether shear reinforcement is required or not check bar adequacy of the section in shear
	2 <sup>nd</sup>	design of shear reinforcement, Minimum shear reinforcement in beams
	3 <sup>rd</sup>	Analysis and design of T-beam (LSM) General features
	4 <sup>th</sup>	Advantages of T-beam
	5 <sup>th</sup>	effective width of flange as per IS:456-2000 code provision
7	1 <sup>st</sup>	Analysis of singly reinforced T-beam
	2 <sup>nd</sup>	Analysis of singly reinforced T-beam
	3 <sup>rd</sup>	strain & stress diagram
	4 <sup>th</sup>	depth of neutral axis
	5 <sup>th</sup>	depth of neutral axis
8	1 <sup>st</sup>	moment of resistance of T-beam sections with neutral axis lying within the flange

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Week	Class Day	Theory /Practical Topics
	2 <sup>nd</sup>	moment of resistance of T-beam section with neutral axis lying within the flange
	3 <sup>rd</sup>	simple numerical problems on deciding effective flange width
	4 <sup>th</sup>	simple numerical problems on deciding effective flange width
	5 <sup>th</sup>	problems only on finding moment of resistance of T-beam section when N.A. lies within flange
9	1 <sup>st</sup>	problem only on finding moment of resistance of T-beam section when N.A. lies upto the bottom of flange
	2 <sup>nd</sup>	problems on finding moment of resistance of T-beam section when N.A. lies upto the bottom of flange
	3 <sup>rd</sup>	Analysis and design of slab and staircase (IS 456) Design of simply supported one-way slabs for flexure check for deflection control and shear.
	4 <sup>th</sup>	Design of simply supported one-way slabs for flexure check for deflection control and shear
	5 <sup>th</sup>	Design of simply supported one-way slabs for flexure check for deflection control and shear
10	1 <sup>st</sup>	Design of one-way cantilever slabs
	2 <sup>nd</sup>	Design of one-way cantilever slabs
	3 <sup>rd</sup>	Design of one-way cantilever chajja for flexure check for deflection control and check for development length and shear

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Week	Class Day	Theory/Practical Topics
	4 <sup>th</sup>	Design of two-way simply supported slabs for flexure with corner brace to lift
	5 <sup>th</sup>	Design of two-way simply supported slabs for flexure with corner brace to lift
11	1 <sup>st</sup>	Design of two-way, simply supported slabs for flexure with corner brace to lift
	2 <sup>nd</sup>	Design of dog-legged staircase
	3 <sup>rd</sup>	Design of dog-legged staircase
	4 <sup>th</sup>	design of dog-legged staircase
	5 <sup>th</sup>	detailing of reinforcement in stairs spanning longitudinally
12	1 <sup>st</sup>	detailing of reinforcement in stairs spanning longitudinally
	2 <sup>nd</sup>	detailing of reinforcement in stairs spanning longitudinally
	3 <sup>rd</sup>	Design of Axially loaded column and footing (LSM) Assumptions in limit state of collapse-compression
	4 <sup>th</sup>	Assumption in limit state of collapse-compression
	5 <sup>th</sup>	Definition and classification of columns

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Week	Class Day	Theory / Practical Topics
13	1st	effective length of column, specification, bar minimum reinforcement
	2nd	cover, maximum reinforcement
	3rd	number of bars in rectangular, square and circular section
	4th	diameter and spacing of lateral ties
	5th	diameter and spacing of lateral tie
14	1st	Analysis and design of axially loaded short square column
	2nd	Analysis and design of axially loaded short square column
	3rd	Analysis and design of axially loaded rectangular column
	4th	Analysis and design of axially loaded rectangular column
	5th	Analysis and design of axially loaded short circular column
15	1st	Analysis and design of axially loaded circular column
	2nd	Types of footing

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