

LESSON PLAN WINTER 2026			
Department: Civil Engineering	Semester : 5TH SEC B	Name of the Teaching faculty: Debashis Behera	
Subject :- TH 2 DESIGN OF REINFORCED CEMENT CONCRETE	No. of Days/ week class allotted : 04	Semester from date: 01/07/2026 to 05/11/2026 No. of Weeks : Topics to be covered:-	
Week	Class Day	Topics	Remarks
1st	1	Design Philosophies, Shear, Bond and Development length in Design of RCC member	
	2	Design Philosophies, Design of Singly Reinforced & Doubly Reinforced beam for Flexure using LSM.	
	3	Design Philosophies, Design of Singly Reinforced & Doubly Reinforced beam for Flexure using LSM.	
2nd	1	Design Philosophies, Design of Singly Reinforced & Doubly Reinforced beam for Flexure using LSM.	
	2	Design Philosophies, Design of Singly Reinforced & Doubly Reinforced beam for Flexure using LSM.	
3rd	1	- Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, - Minimum Shear Reinforcement, Provisions of IS 456 2000, forms of shear reinforcement	
	2	Types of bond, Bond stress, check for bond stress Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of 90o hook, Lapping of bars.	
	3	Simple numerical on: Shear reinforcement, Adequacy of section for shear.	
4th	1	- Simple numerical on: Shear reinforcement, Adequacy of section for shear. - Introduction to serviceability limit state check	
	2	Design of axially loaded RCC Column Definition and classification of column, Limit state of compression members, Effective length of column.	
5th	1	Provisions of IS 456 2000 for minimum steel, cover, maximum steel, spacing of ties etc.	
	2	Design of axially loaded short column - Square, Rectangular, and Circular only.	
	3	Design of axially loaded short column - Square, Rectangular, and Circular only.	
6th	1	Design of axially loaded short column - Square, Rectangular, and Circular only.	
	2	Design of axially loaded short column - Square, Rectangular, and Circular only.	
7th	1	Design of axially loaded short column - Square, Rectangular, and Circular only.	
	2	Design of RC flanged beam General features of T and L beams, Advantages, Effective width as per BIS 456 2000	
8th	1	Design of singly reinforcement T beam, Stress and Strain diagram,	
	2	Depth of neutral axis, Moment of resistance, T and L beams with neutral axis in flange only.	
9th	2	Simple numerical on location of neutral axis, Effective width of flange.	
	3	Simple numerical on location of neutral axis, Effective width of flange.	

10th	1	Design of slab • Design of simply supported one-way slab for flexure, shear and deflection and checks, as per the provisions of BIS 456	
	3	• Design of simply supported one-way slab for flexure, shear and deflection and checks, as per the provisions of BIS 456	
11th	1	• Design of one-way cantilever slab, Chajjas, Flexure including checks for Development length and Shear stress.	
	2	• Design of one-way cantilever slab, Chajjas, Flexure including checks for Development length and Shear stress.	
12th	2	• Design of two-way simply supported slab,	
	3	• Design of two-way simply supported slab,	
13th	1	• Design of two-way simply supported slab,	
	2	• Introduction to design of dog-legged staircases	
14th	1	• Introduction to design of dog-legged staircases	
	3	Design of Footing • Design of footing for axially loaded column only.	
15th	1	• Design of footing for axially loaded column only.	
	2	• Design of footing for axially loaded column only.	
16th	1	• Design of footing for axially loaded column only.	
	2	• Design of footing for axially loaded column only.	
17th	1	• Minimum Eccentricity, Design of Footing for uni-axial bending, column with uni- axial moment as per IS 456 provisions.	
	2	• Minimum Eccentricity, Design of Footing for uni-axial bending, column with uni- axial moment as per IS 456 provisions.	
18th	1	• Minimum Eccentricity, Design of Footing for uni-axial bending, column with uni- axial moment as per IS 456 provisions.	
	2	Revision and semester question discussion	
	3		
19th	1		

CO-1 Determine the development length in tension and compression members

CO-2 Apply the codal provision

CO-3 Design of singly and doubly reinforced RCC beam.

CO-4 Design of RCC beam for shear and development length.

CO-5 Design of short and long RCC columns.



Signature of faculty

LESSON PLAN WINTER 2026

Department: Civil Engineering	Semester : 3RD SECTION B	Name of the Teaching faculty: Debashis Behera	
Subject :- Th4 GEOTECHNICAL ENGINEERING	No. of Days/ week class allotted : 03	Semester from date:01/07/2026 to No. of Weeks : Topics to be covered:-05/11/2026	
Week	Class Day	Topics	Remarks
1st	2	Overview of Geology and Geotechnical Engineering Introduction of Geology, Branches of Geology, Importance of Geology for civil engineering structure and composition of earth,	
	3	Definition of a rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks. (Concepts only)	
2nd	1	Importance of soil as construction material in Civil engineering structures and as foundation bed for structures. (Concepts only)	
	2	Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam. (Concepts only)	
	3	Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam. (Concepts only)	
3rd	1	Physical and Index Properties of Soil Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index, air Content, Percentage of air voids, Relation between the parameters.	
	2	Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index, air Content, Percentage of air voids, Relation between the parameters.	
4th	1	Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.	
	2	Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.	
	3	Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.	
5th	1	Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer.	
	2	Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index.	
	3	Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.	
6th	1	Permeability and Seepage Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems). Effective stress, quick Sand	
	2	Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems). Effective stress, quick Sand	

6th	3	Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems). Effective stress, quick Sand	
7th	1	Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems). Effective stress, quick Sand	
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	3	Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems). Effective stress, quick Sand	
8th	1	Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems). Effective stress, quick Sand	
	2	Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (Concepts only No numerical problems). Effective stress, quick Sand	
	3	Compaction, Consolidation and stabilization of soil Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line.	
9th	1	Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line.	
10th	1	Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line.	
	2	Factors affecting compaction, field methods of compaction - rolling, ramming and vibration.	
	3	Consolidation, Difference between compaction and consolidation. Terzaghi's Model analogy of compression/springs showing the process of consolidation, Field implications	
11th	1	Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction	
	2	Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil - dry strength test, dilatancy test and toughness test.	
	3	Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil - dry strength test, dilatancy test and toughness test.	
12th	puja vacation		
13th	1	Shear Strength of Soil Shear failure of soil-General, local and punching shear, concept of shear strength of soil.	
	2	Shear failure of soil-General, local and punching shear, concept of shear strength of soil.	

13th	3	Shear failure of soil-General, local and punching shear, concept of shear strength of soil.	
14th	1	Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear, triaxial and vane shear test laboratory methods.	
	2	Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear, triaxial and vane shear test laboratory methods.	
	3	Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear, triaxial and vane shear test laboratory methods.	
15th	1	Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear, triaxial and vane shear test laboratory methods.	
	2	Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear, triaxial and vane shear test laboratory methods.	
15th	3	Bearing Capacity of Soil and Foundation Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity.	
16th	1	Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity.	
	2	Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity.	
	3	Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131. Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non- cohesive Soils.	
17th	2	Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131. Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non- cohesive Soils.	
	3	Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131. Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non- cohesive Soils.	
18th	1	Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131. Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non- cohesive Soils.	
	2	Type of foundations-shallow,deep foundation	
19th	3	Revision and question discussion	

CO-1 Determine physical and index properties and classification of soil

CO-2 Estimate permeability and shear strength of soil

CO-3 Identify the load bearing capacity of soil

CO-4 Explain various soil stabilization and compaction methods

CO-5 Use IS codes for different soil testing

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Signature of faculty

LESSON PLAN WINTER 2026

Department: Civil Engineering	Semester: 3rd SEC- A	Name of the Teaching faculty: Debashis Behera	
Subject :- Th3 MECHANICS OF MATERIAL	No. of Days/ week class allotted : 03	Semester from date:01/07/2026 to 05/11/2026 No. of Weeks : Topics to be covered:-	
Week	Class Day	Topics	Remarks
1st		Centre of Gravity and Moment of Inertia	
	1	Definition of centre of gravity -Centre of gravity of of Symmetrical shapes (solid / hollow square, rectangular, circular, I Sections)	
2nd	2	Moment of inertia (M.I.): Definition, M.I. of plane lamina, Radius of gyration, section modulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semicircle, quarter circle and triangle section (without derivations).	
	1	and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semicircle, quarter circle and triangle section (without derivations).	
3rd	2	M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections and built up sections about centroidal axes and any other reference axis.	
	1	M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section, Hollow sections and built up sections about centroidal axes and any other reference axis.	
4th	2	Polar Moment of Inertia of solid circular sections.	
	2	Simple Stresses and Strains Definition of rigid, elastic and plastic bodies, deformation of elastic body under various forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity	
5th	1	Standard stress strain curve for steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety. Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading	
	2	Concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section)	
6th	1	Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only)	
	2	Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).	
7th	1	Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).	
	2	COMPLEX STRESSES AND STRAINS Principal stresses and strains: Occurrence of normal and tangential stresses - Concept of Principal stress and Principal Planes - major and minor principal stresses and their orientations - stresses on a given plane -shear and normal stress components on any inclined plane - Mohr's circle and its use in solving problems on complex stresses - Numerical problems	
8th	1	Principal stresses and strains: Occurrence of normal and tangential stresses - Concept of Principal stress and Principal Planes - major and minor principal stresses and their orientations - stresses on a given plane -shear and normal stress components on any inclined plane - Mohr's circle and its use in solving problems on complex stresses - Numerical problems	
	2	Principal stresses and strains: Occurrence of normal and tangential stresses - Concept of Principal stress and Principal Planes - major and minor principal stresses and their orientations - stresses on a given plane -shear and normal stress components on any inclined plane - Mohr's circle and its use in solving problems on complex stresses - Numerical problems	
9th	2	Shear Force and Bending Moment Types of supports, beams and loads. Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation).	

	1	Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	
	2	Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	
9th	1	Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	
	2	Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	
10th	1	Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	
	2	Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.	
11th		puja vacation	
12th	1	Bending and Shear Stresses in beams Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram	
	2	Concept of moment of resistance and simple numerical problems using flexural equation	
13th	1	Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram.	
	2	Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram.	
14th	1	Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.	
	2	Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.	
15th	1	Columns Concept of compression member, short and long column, Effective length, Radius of gy-ration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns.	
17th	2	Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load.	
	1	Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load.	
	2	Rankine's formula and its application to calculate crippling load. Concept of working load/safe load, design load and factor of safety.	
18th	1	Revision and semester questions discussion	
	2		

CO 1-Describe the Mechanical properties of important Engineering materials.

CO-2 Determine stresses, strains and deformations in elastic bodies of different shapes under different loading conditions for engineering applications

CO-3 Determine load carrying capacity of different types of members

CO-4 Calculate the design load to design the column

Debashis

Signature of faculty