BACHELOR OF TECHNOLOGY

Civil Engineering Department

Semester - VI

Course Scheme

Course Code	Course Name	Lecture hours	Tutorial hours	Practical hours	Credit
HS XXXX	HSS (Elective)	3	0	0	3
CE XXXX	Department Elective-1	3	1	0	4
CE 213001	Reinforced Concrete Design	3	2	0	5
CE 213002	Construction Management & Costing	3	2	0	5
CE 213003	Geotechnical Engineering-2	3	1	0	4
CE 213103	Geotechnical Engineering Laboratory-2	0	0	2	1
CE 213601	Seminar	0	0	0	2
	Total	**15**	**6**	**6**	**24**

I	Course Code	**CE 213001**			
II	Course Title	**Reinforced Concrete Design**			
III	Credit Structure	**L**	**T**	**P**	**C**
		3	2	0	5
IV	Prerequisite(If any for the student)	Structural Analysis, Strength of Materials, Construction Materials			
V	Course Content	• **Elementary Materials:** cement, aggregate, admixture and reinforcement, Strength and durability, shrinkage and creep. Design of concrete mixes, Acceptability criterion, IS Specifications, • **Basic design philosophies in reinforced concrete:** Objective of structural design, working stress and limit state methods, IS Code of practices and Specifications, Normal distribution curve, concepts of probability and reliability, characteristic strength and characteristics loads, design values, Partial safety factors and factored loads, load combinations, stress-strain relationship for concrete and steel. • **Working Stress Method:** Basic assumptions, permissible stresses in concrete and steel, design of singly and doubly reinforced rectangular and flanged beams in flexure, theory of flexure, inverted flanged beams, design examples. • **Limit State Method**: Basic assumptions, Limit state of collapse in flexure, shear and Limit state of serviceability in deflection and cracking, design of singly and doubly reinforced rectangular and T sections for flexure, design of members in shear and bond, design of beam subjected to bending and torsion. Requirements governing reinforcement detailing. • **Design of Slabs**: Design of one-way and two-way slabs, openings in slabs, Design examples. • **Columns and Foundation:** Limit state of collapse compression for short and slender column. Members subjected to combined axial and uni-axial as well as biaxial bending. Development of interactive curves and their use in column design. Isolated square and rectangular footings subjected to axial load and moments. Design of combined footing and strap footing. • **Design of Staircases**: Design of dog legged and open well type staircase using limit state method • **Design of Retaining Walls**: Classification, Forces on retaining walls, design criteria, stability requirements, Design of cantilever and counter fort type retaining wall using limit state method.			
VI	Text/References	1. Design of Reinforced Concrete Structures,P.Dayaratnam,Oxford & IBH Pub.,N.Delhi. 2. Reinforced Concrete-Limit State Design, A.K.Jain, Nem Chand & Bros.,Roorkee. 3. Reinforced Concrete, I.C.Syal & A,K,Goel, A.H,Wheeler & Co.Delhi. 4. Reinforced Concrfete Design, S.N.Sinha, TMH Pub.,N.Delhi. 5. Reinforced Concrete Fundamentals: Ferguson, P. M., Breen, J. E., and Jirsa,			

		J. O., John Wiley and Sons (1988) 5th Edition. Relevant IS codes and Design Aids, BIS Publications. (i) IS 456:2000 Plain and Reinforced concrete, Code of Practice. (ii) IS 10262: 2019 Concrete Mix Proportioning Guidelines (Second Revision) (iii) SP-16(S&T)-1980, 'Design Aids for Reinforced Concrete to IS:456, BIS, N.Delhi. (iv) IS 875: -1987 (Part I to V) Code of Practice For Design Loads (Other Than Earthquake) For Buildings And Structures (v) IS 3370-1976(Part I to IV), Indian Standard Code of Practice for Liquid Retaining Structures.

<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">CE 213002</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Construction Management and Costing</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>3</td><td>2</td><td>0</td><td>5</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4"></td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">

CONSTRUCTION PROJECTS:
Construction Industry in India, Project Categories, Project Planning & Organization Systems, Heavy Construction Projects, Overview of Building codes, local laws, approvals
Estimation and Costing:
Principles of estimation; Quantity estimation of various building units, Principles of general and detailed specifications; Methods of costing; Cost estimating: Material, Labour, Equipment, Cost Optimization
Rate Analysis:
General; Factor affecting rate analysis; Importance of rate analysis; Schedule of rate
Construction Management:
Construction and its challenges, Role and features of construction management, Factors governing construction managements, Methods for planning of construction activity and its managements: Defining activities and their interdependence, network, time and resource estimations, Project scheduling: bar charts, PERT, CPM, network diagrams
Project management:
Quality assurance, claims management, safety; Resource Planning; Resource allocation: Resource smoothing, Resource Levelling.

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<tr><td>VI</td><td>Text/References</td><td colspan="4">
Aggarwal A. and A. K. Upadhyay, Civil Estimating, costing and valuation, Kataria & Sons, New Delhi, 1994
Birdie G. S., Estimating and Costing, Dhanpat Rai & Sons, Delhi. 1996
Dutta B. N., Estimating and Costing, S. Dutta & Co., Lucknow-1, 1995
Schexnayder C. J. and R. E. Mayo, Construction Management Fundamentals, McGraw Hill, New Delhi, 2003.
Srinath, L.S. PERT and CPM principles and Applications, Third edition, Affiliated east-west press Pvt Ltd, 2001.
Berrie D.S. and B.C. Paulson, Professional construction management including C.M., Design construct and general contracting, Third edition, McGraw Hill International edition, 1992.
Chitkara, K.K. Construction project management: planning, scheduling and controlling, Tata McGraw-Hill, 2008.
Rangwala S.C. Estimating, Costing and Valuation, Charotar Publishing house Pvt. Ltd., 2012
Kumar Neeraj Jha. Construction Project Management: Theory and Practice, Pearson Education India, 2011
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<tr><td>I</td><td>Course Code</td><td colspan="4">CE 213003</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Geotechnical Engineering -2</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Geotechnical Engineering- 1</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">• Site investigation: Planning and various stages of subsurface investigation, Methods of exploration, Types of soil samples and samplers, Design features affecting sample disturbance, In- situ tests for determining properties of soil, Geophysical methods of subsurface investigation.

• Earth pressure theory: Lateral earth pressure- at rest, active and passive, Rankine's and Coulomb's earth pressure theories, Graphical methods for earth pressure determination.

• Stability of slopes: Types of slope, Causes and type of slope failure, Factor of safety, Stability of infinite slopes, Analytical and graphical methods to find stability of finite slope, Stability number.

• Bearing capacity of shallow foundation: Basic definitions, Factors influencing bearing capacity, Modes of shear failure, Terzaghi's bearing capacity theory, various equations used to find bearing capacity of soil including IS method, Effect of water table, Field methods of evaluation of bearing capacity, Immediate and consolidation settlement of foundation, Effect of eccentric loading (one- way and two-way), Proportioning isolated footing, Allowable bearing capacity and settlement, Introduction to combined footing

• Axially loaded pile foundations: Necessity and classifications of pile foundations, Construction methods of bored and driven piles, Load carrying capacity of single pile in cohesionless and cohesive soil by (a) Static methods, (b) Dynamic methods and (c) Pile load test as per IS: 2911, Ultimate capacity, settlement and efficiency of pile group in cohesionless and cohesive soils, Negative skin friction.</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">1. B. M. Das, Principles of Foundation Engineering, Cengage Learning.
2. Joseph E. Bowles, Foundation Analysis and Design, McGraw Hill International Ed.
3. V. N. S. Murty, Soil Mechanics and Foundation Engineering, CRC Press.
4. Gopal Ranjan, Basic and Applied Soil Mechanics, New Age Publication.
5. M Tomlinson and J Woodward, Pile design and construction practice, Tailor and Francis
6. Relevant Indian Standard Codes (IS 2720 Series)</td></tr>
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<tr><td>I</td><td>Course Code</td><td colspan="4">CE 213103</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Geotechnical Engineering Laboratory-2</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4"></td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Laboratory experiments:
1. Determination of cohesion from unconfined compression test
2. Determination of shear parameters from direct shear test
3. Determination of shear strength of soft clays from vane shear test
4. Determination of shear parameters form unconsolidated undrained triaxial compression test
5. Determination of consolidation characteristics of soil specimen by one dimensional consolidation test
6. Determination of swelling characteristics by free swell index and swelling pressure test
7. Determination of swelling pressure by indirect method (odometer test)
8. Determination of California Bearing Ratio (CBR) from CBR test
9. Identification of dispersive soil by crumb test</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">1.Manual of Soil Laboratory Testing (Volume 2) by K. H. Head
2.Soil Mechanics Laboratory Testing by B. M. Das
3.Relevant Indian Standard Codes (IS 2720 Series)</td></tr>
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