

Course Title: Design of RC Structural Elements			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – V			
Subject Code	15CT51	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. Identify, formulate and solve engineering problems of RC elements subjected to different kinds of loading. 2. Follow a procedural knowledge in designing various structural RC elements. 3. Impart the culture of following the codes for strength, serviceability and durability as an ethics. 4. Provide knowledge in analysis and design of RC elements for the success in competitive examinations. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>Introduction to Limit State Design and Serviceability: Introduction to working stress method, Difference between Working stress and Limit State Method of design, Modular Ratio and Factor of Safety.</p> <p>Philosophy and principle of limit state design with assumptions. Partial Safety factors, Characteristic load and strength. Stress block parameters, concept of balanced section, under reinforced and over reinforced section.</p> <p>Limiting deflection, short-term deflection, long-term deflection, Calculation of deflection of singly reinforced beam only. Cracking in reinforced concrete members, calculation of crack width of singly reinforced beam. Side face reinforcement, slender limits of beams for stability.</p>		12 Hours	L1,L2
Module -2:			
<p>Limit State Analysis of Beams: Analysis of singly reinforced, doubly reinforced and flanged beams for flexure and shear.</p>		08 Hours	L2,L4
Module-3:			
<p>Limit State Design of Beams: Design of singly and doubly reinforced beams, Design of flanged beams for shear, design for combined bending and torsion as per IS-456</p>		10 Hours	L2,L4

Module -4:		
Limit State Design of Slabs and Stairs: Introduction to one way and two-way slabs, Design of cantilever, simply supported and one-way continuous slab. Design of two-way slabs for different boundary conditions. Design of dog legged and open well staircases. Importance of bond, anchorage length and lap length.	10 Hours	L2,L4
Module -5:		
Limit State Design of Columns and Footings: Analysis and design of short axially loaded RC column. Design of columns with uniaxial and biaxial moments, Design concepts of the footings. Design of Rectangular and square column footings with axial load and also for axial load & moment	10 Hours	L2,L4

<p>Course outcomes:</p> <p>After studying this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the design philosophy and principles. 2. Solve engineering problems of RC elements subjected to flexure, shear and torsion. 3. Demonstrate the procedural knowledge in designs of RC structural elements such as slabs, columns and footings.
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i>
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Unnikrishnan Pillai and Devdas Menon, "Reinforced Concrete Design", McGraw Hill, New Delhi 2. Subramanian, "Design of Concrete structures", Oxford university Press 3. H J Shah, "Reinforced Concrete Vol 1 (Elementary Reinforced Concrete)", Charotar Publishing House Pvt. Ltd.

Reference Books:

1. P C Varghese, "Limit State design of reinforced concrete" , PHI, New Delhi
2. W H Mosley, R Husle, J H Bungey, "Reinforced Concrete Design", MacMillan Education, Palgrave publishers
3. Kong and Evans, "Reinforced and Pre-Stressed Concrete", Springer Publications
4. A W Beeby and Narayan R S, "Introduction to Design for Civil Engineers", CRC Press
5. Robert Park and Thomas Paulay, "Reinforced Concrete Structures", John Wiley & Sons, Inc.

<p align="center">Course Title: Construction Economics and Finance</p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center">SEMESTER – V</p>			
Subject Code	15CT52	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. To understand the importance of financial management in construction. 2. To determine flow statements in construction economics. 3. To ascertain and measure the financial aspect of construction projects. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>INTRODUCTION</p> <p>Engineering economics, types of economics, Support Matters of Economy as related to Engineering, Market demand and supply, Choice of Technology, Theory of Production, Economics of Scale, Theory of Costs and Break Even Analysis.</p>		10 Hours	L1,L2,L3
Module -2:			
<p>CONSTRUCTION ECONOMICS</p> <p>Role of Civil Engineering in Industrial Development, Construction development in Housing, transport and other infrastructures, Economics of ecology, environment, energy resources. Construction workers - Urban Problems, Poverty, Unemployment Effects on economics due to migration of construction workers to urban area.</p>		10 Hours	L1,L2
Module-3:			
<p>CAPITAL STRUCTURE</p> <p>The need for financial management, Types of financing - short term borrowing, long term borrowing, leasing, equity financing – Internal generation of funds, External commercial borrowings, Assistance from government budgeting support and international finance corporations.</p>		10 Hours	L2,L3

Module -4:		
FINANCIAL ANALYSIS Fund Flow and Cash Flow statements (Simple Problems), Financial Analysis – Meaning and Types, Tools and Techniques, Ratio Analysis, Types of Ratios, Profitability Ratio, Turnover ratio, Financial ratio (Balance sheet ratios) (Simple problems).	10 Hours	L2,L3,L4,L5
Module -5:		
WORKING CAPITAL MANAGEMENT Working Capital Management – Concept of Working Capital – Factors Affecting Working Capital – Sources of Working Capital – Forecasting The Working Capital Requirements. Liquidity and Profitability, Determination of Working Capital-Theories and Approaches	10 Hours	L1,L2

<p>Course outcomes:</p> <p>After studying this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Recognize the importance of working capital management and engineering economics. 2. Prepare fund flow and cash flow statements and implement in construction accounting. 3. Analyze and evaluate financial stature of construction projects.
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i>
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have ten questions, each full question carrying 16 marks. • There will be two full questions (with a maximum three sub divisions, if necessary) from each module. • Each full question shall cover the topics under a module. • <i>The students shall answer Five full questions selecting one full question from each module.</i> • If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Urban Economics by Warneer Z Hirsch, Macmillan, New York. 2. Financial Management, I.M. Pandey 3. P. Saravanavelu, "Management Accounting - Principles and Practice". 4. Prof. K.S. Nagapathi "Management Accounting", R. Chand & Co., New Delhi.

Course Title: Geotechnical Engineering			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – V			
Subject Code	15CT53	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks- 100	
Course objectives: This course will enable students;			
<ol style="list-style-type: none"> 1. To understand the significance of engineering properties of soils and their relation to the formation of soils. 2. To comprehend the procedural knowledge of compaction & consolidation of soils and analyze the effects of permeability on soil behavior. 3. To apply the knowledge of shear strength of soils in the actual field conditions with respect to drainage conditions available in the field. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
INTRODUCTION Introduction, origin and formation of soil, Phase Diagram, phase relationships, definitions and their interrelationships.		03 Hours	L1,L2
INDEX PROPERTIES Determination of Index Properties -Specific gravity, water content, in-situ density and particle size analysis (sieve and sedimentation analysis)Atterberg'sLimits, consistency indices, relative density, activity of clay, Plasticity chart, unified and BIS soil classification.		07 Hours	L1,L2,L3

Module -2:		
SOIL STRUCTURE AND CLAY MINERALOGY Single grained, honey combed, flocculent and dispersed structures, Valence bonds, Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphous substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite and their application in Engineering.	05 Hours	L1,L2,L3
COMPACTION OF SOILS Definition, Principle of compaction, Standard and Modified proctor's compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control - compactive effort & method of compaction, lift thickness and number of passes, Proctor's needle, Compacting equipment's and their suitability.	05 Hours	L1,L2,L3
Module-3:		
FLOW THROUGH SOILS Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, superficial velocity and coefficient of percolation, Capillary Phenomena. SEEPAGE ANALYSIS- Laplace equation, assumptions, limitations and its derivation.	06 Hours	L1,L2,L3
EFFECTIVE STRESS ANALYSIS Geostatic stresses, Effective stress concept-total stress, effective stress and Neutral stress and impact of the effective stress in construction of structures, quick sand phenomena.	04 Hours	L2,L3,L4

Module -4:		
CONSOLIDATION OF SOIL Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory - assumption and limitations. Derivation of Governing Differential Equation. Pre-consolidation pressure and its determination by Casagrande's method. Over consolidation ratio, normally consolidated, under consolidated and over consolidated soils.	05 Hours	L2,L3
Consolidation characteristics of soil (C_c , a_v , m_v and C_v . Laboratory one dimensional consolidation test, characteristics of e - $\log(\sigma')$ curve, Determination of consolidation characteristics of soils-compression index and coefficient of consolidation (square root of time fitting method, logarithmic time fitting method). Primary and secondary consolidation.	05 Hours	L2,L3
Module -5:		
SHEAR STRENGTH OF SOIL Concept of shear strength, Mohr-Coulomb Failure Criterion, Modified Mohr-Coulomb Criterion, Concept of pore pressure, Total and effective shear strength parameters, factors affecting shear strength of soils. Thixotrophy and sensitivity, Measurement of shear strength parameters - Direct shear test, unconfined compression test, triaxial compression test and field Vane shear test, Test under different drainage conditions. Total and effective stress paths.	10 Hours	L2,L3,L4

Course outcomes:

After studying this course, students will be able to;

1. Describe engineering properties of soils and their relation to the formation of soils.
2. Illustrate the procedural knowledge of compaction & consolidation of soils and predict the effects of permeability on soil behavior.
3. Solve practical problems related to shear strength of soils in the actual field conditions.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- ***The students shall answer Five full questions selecting one full question from each module.***
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. Alam Singh and Chowdhary G.R. (1994), "Soil Engineering in Theory and Practice", CBS Publishers and Distributors Ltd., New Delhi.
 2. Bowles, J.E. (1996), "Foundation Analysis and Designs", 5th Edition, McGraw Hill Publishing Co., New York.
 3. Murthy, V.N.S. (1996), "Soil Mechanics and Foundation Engineering", 4th Edition, UBS Publishers and Distributors, New Delhi.
 4. Punmia, B.C. (2003), "Soil Mechanics and Foundations", Laxmi Publishing Co., New Delhi.
 5. Gopal Ranjan and Rao, A.S.R. (2000), "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi.
 6. Narasimha Rao A.V., and Venkatramaiah C. (2000), "Geotechnical Engineering", University press (India) Ltd., Hyderabad.
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Course Title: Transportation Engineering			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – V			
Subject Code	15CT54	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks- 100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. To understand the history and development, role of railways, railway planning and development based on essential criteria's. 2. To learn different types of structural components, engineering properties of the materials in roads and railway infrastructure. 3. To calculate the material quantities required for construction of roads and design geometric elements of railway system. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
PRINCIPLES OF TRANSPORTATION ENGINEERING		03 Hours	L1,L2
Importance of Transportation, Different modes of transportation, characteristics and comparison of different modes, Jayakar committee recommendations and implementation.			
HIGHWAY DEVELOPMENT AND PLANNING		07 Hours	L2,L3
Road Types and classification, road patterns. Planning surveys, Master plan - saturation system of road planning, phasing road development programme Road Development in India, 1st, 2nd & 3rd 20-year road development plan and problems only on 3rd 20-year road plan. Present scenario of road development in India (NHDP & PMGSY) and in Karnataka (KSHIP & KRDCCL) – problems on best alignment among alternate proposals and phasing, Road Development Plan Vision 2021.			

Module -2:		
HIGHWAY ALIGNMENT AND SURVEYS Ideal alignment, factors affecting alignment, engineering surveys for new and realignment projects.	03 Hours	L1,L2
HIGHWAY GEOMETRIC DESIGN Importance, Factors controlling the design of geometric elements, highway cross section elements – pavement surface characteristics, camber, width of carriageway, shoulder width, formation width, right of way, typical cross section of roads. Sight distance, Types and importance - Design of horizontal and vertical alignment – Numerical problems on above (No derivation of formulae)	07 Hours	L2,L3
Module -3:		
PERMANENT WAY Role of railways in transportation, Indian Railways, selection of routes. Introduction to Permanent Way, requirements for an ideal permanent way, typical cross sections of single and double line B.G. tracks – in cutting, embankment and electrified tracks. Gauges and types of gauges with dimensions. Coning of wheels and tilting of rails. Track stresses in rails, sleepers, ballast and subgrade. Problems on these. Rails functions requirements, types of rail sections, length of rails, defects in rails. Wear on rails, rail joints, welding of rails, creep of rails.	10 Hours	L1,L2,L3,L4

Module-4:**BALLAST AND SLEEPERS**

Functions, requirements, types, track fittings and fasteners, calculation of quantity of materials needed for laying a track. Traction and tractive resistances, tractive power, Hauling capacity. Problems on above.

GEOMETRIC DESIGN OF TRACK

Necessity of Geometric Design of railway track, gradient and types of gradient. Speed of train, curve, transition curve, super elevation, cant - deficiency, negative cant- speed calculation based on Indian Railways Formulae for High speed tracks only-problems on above.

10 Hours**L1,L2,L3,L4****Module -5:****POINTS AND CROSSING**

Necessity and its components, turnout, design of turnout, Types of switches, crossings, track junctions. Stations and yards, marshalling yard, signalling and interlocking, track defects, track maintenance, level crossing, Indian Railway standards (no derivations, only relevant problems). Equipment in stations and yards such as turntable, water columns, fouling marks, buffer stops etc.

10 Hours**L1,L2**

Course outcomes:

After studying this course, students will be able to;

1. Identify different modes of transportation and planning stages for highways.
2. Acquires capability of choosing alignment and design geometric aspects of railway system, runway and taxiway.
3. Suggest and estimate the material quantity required for laying a railway track and will be able to determine the hauling capacity of a locomotive.

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- *The students shall answer Five full questions selecting one full question from each module.*
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Highway Engineering- Khanna, S.K. & Justo, C.E.G., Nem Chand & Bros, Roorkee (2003).
2. Highway Engineering- Kadiyali, L.R., Khanna Publishers, New Delhi.
3. Railway Engineering- Saxena and Arora, Dhanpat Rai and Sons, New Delhi.
4. Railway Engineering- Satish Chandra & Agarwal, M.M., Oxford University Press, New Delhi
5. Indian railway Track, Agarwal M.M, Jaico Publications, Bombay.

Course Title: Air Pollution and Control			
Professional Elective-1			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – V			
Subject Code	15CT551	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 03		Total Marks- 100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. Study the sources and effects of air pollution 2. Learn the meteorological factors influencing air pollution. 3. Analyze air pollutant dispersion models 4. Illustrate particular and gaseous pollution control methods. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.		08 Hours	L1,L2
Module -2:			
Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths. Development of air quality models-Gaussian dispersion model.		08 Hours	L1,L2,L3
Module -3:			
Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX,NOX, CO, NH3)		08 Hours	L2,L3,L4
Module -4:			
Control Techniques: Particulate matter and gaseous pollutants- settling chambers, cyclone separators, scrubbers, filters & ESP.		08 Hours	L3,L4
Module -5:			
Air pollution due to automobiles, standards and control methods. Noise pollution causes, effects and control, noise standards.		08 Hours	L3,L4
Environmental issues, global episodes, laws, acts, protocols			

Course outcomes:

After studying this course, students will be able;

1. Identify the major sources of air pollution and understand their effects on health and environment.
2. Evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
3. Ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
4. Choose and design control techniques for particulate and gaseous emissions.

Question paper pattern:

- The question paper will have Ten questions, each fullquestion carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- *The students shall answer Five full questions selecting one full question from each module.*
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. M. N. Rao and H V N Rao, "Air pollution", Tata Mc-Graw Hill Publication.
2. H. C. Perkins, "Air pollution". Tata McGraw Hill Publication
3. Mackenzie Davis and David Cornwell, "Introduction to Environmental Engineering" McGraw-Hill Co.

Reference Books:

1. Noel De Nevers, "Air Pollution Control Engineering", Waveland Pr Inc.
2. Anjaneyulu Y, "Text book of Air Pollution and Control Technologies", Allied Publishers

<p align="center">Course Title: Advance Surveying</p> <p align="center">Professional Elective-1</p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center">SEMESTER – V</p>			
Subject Code	15CT552	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students to:</p> <ol style="list-style-type: none"> 1. Gain the knowledge of principles to arrive at solutions to surveying problems. 2. Analyze spatial data using appropriate computational and analytical techniques. 3. Use the concepts of advanced data capturing methods necessary for engineering practice. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1			
<p>THEORY OF ERRORS AND TRIANGULATION ADJUSTMENT</p> <p>Errors and classification of errors Precision and accuracy, Laws of weights and accidental errors.</p> <p>PROBABILITY</p> <p>Probability distribution function and density function-normal distribution. RMS error - measure of precision. Rejection of observations-principles of least squares - Normal equations.</p>		08 Hours	L1,L2

Module -2		
METHOD OF CORRELATES Triangulation adjustment. Angle adjustment, station adjustment and figure adjustment.	08 Hours	L2,L3
HYDROGRAPHIC SURVEYING Methods of soundings. Instruments. Three-point problem. Tidal and Stream discharge measurement		
Module -3		
ELECTRONIC DISTANCE MEASUREMENT (EDM): Introduction, Electro Magnetic (EM) Waves. Phase comparison and modulations. Instruments – Geodimeter – Tellurimeter – Distomat – Range finders – Radars. Introduction to GPS Total station.	08 Hours	L1,L2, L3

Module -4		
FIELD ASTRONOMY Earth celestial sphere. Solar system Position by altitude and azimuth system-spherical triangle and spherical trigonometry. Astronomical triangle. Nepiers rule.	04 Hours	L2,L3
TIME Siderial time, day and year-solar time and day-Greenwich mean time-standard time. Meridian and azimuth-their determination-latitude and its determination.	04 Hours	L2,L3
Module -5:		
SETTING OUT WORKS Introduction. Setting out of buildings, culverts, bridge, pipeline and sewers, tunnels.	08 Hours	L2,L3

Course outcomes: After a successful completion of the course, the student will be able to: 1. Reproduce the knowledge of geometric principles to arrive at surveying problems 2. Analyze spatial data using appropriate computational and analytical techniques with aid of electronic instruments.
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i>

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Surveying Vol I, II & III- Punmia. B.C. - Lakshmi Publications, New Delhi.
2. Surveying Vol I & II- Duggal S.K. - Tata Mc Graw-Hill publishing Co.,
3. Surveying Levelling-Part I & II – Kanitkar T.P.& Kulkarni S.V. – Pune VidhyarthiGruhaPrakashana.

REFERENCE BOOKS:

1. Introduction to Surveying- James, M. Anderson and Edward, M. Mikhail – Mc Graw Hill Book Co., 1985.
2. Analysis and survey measurements- M. Mikhailil and Gracie, G. - Van Nostrand Reinhold Co., (NY)- 1980.
3. Plane and Geodetic Surveying for Engineers - David Clark -Vol I & II-CBS publishers and distributors, New Delhi.

<p align="center">Course Title: Building Planning and Standards</p> <p align="center">Professional Elective-1</p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center">SEMESTER – V</p>			
Subject Code	15CT553	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives:</p> <p>This course will enable students to:</p> <ol style="list-style-type: none"> Gain the knowledge of types of building and their standards for building planning and construction. Understand the building components for planning and functional design of public buildings. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1			
<p>INTRODUCTION</p> <p>Terminologies, Requirement of parts of building, building component standards, Sizes of parts of building, Positioning of various components of buildings, orientation of buildings, set back distances and calculation of carpet area, plinth area and floor area ratio (simple problems).</p>		10 Hours	L1,L2,L3
Module -2			
<p>BASIC PARAMETERS OF PLANNING</p> <p>Principles of site selection, Site plan, Principles of Planning, Essential factors of planning, Consideration of Architectural design – Bye laws of locality, climate and its effects, materials and methods of construction, people and their requirements, State building Bye-Law's.</p>		10 Hours	L1,L2

Module -3		
BUILDING TYPES AND STANDARDS	10 Hours	L1,L2
Building types – Private, public, commercial, industrial, Planning criteria pertaining to various cases. Building Standards for Residential Buildings, Hospitals, Educational / Schools, Public offices, Commercial Buildings.		
Module -4		
RURAL HOUSING STANDARDS	10 Hours	L1,L2
Village planning, Components of rural house, Typical modern village plan, Rural house specifications – foundation and plinth, DPC, Superstructure, Doors and Windows, roofs, flooring, plastering and finishing, Bye-Laws for rural housing.		
Module -5:		
Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram only for following building i) Primary health centre, ii) Primary school building, iii) College canteen iv) Office building v) Rural house (2 rooms quarter)	10 Hours	L2,L3

Course outcomes:
After a successful completion of the course, the student will be able to:
<ol style="list-style-type: none"> 1. Select building type and their standards for planning and construction. 2. Outline the building components for planning and functional design of public buildings.
Program Objectives (as per NBA)
<ul style="list-style-type: none"> o <i>Engineering Knowledge.</i> o <i>Problem Analysis.</i>
Question paper pattern:
<ul style="list-style-type: none"> • The question paper will have Ten questions, each full question carrying 16 marks. • There will be two full questions (with a maximum Three sub divisions, if necessary) from each module. • Each full question shall cover the topics under a module. • The students shall answer Five full questions selecting one full question from each module. • If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

REFERENCE BOOKS:

1. IS 1256-1967
2. National Building Code, BIS, New Delhi.
3. G.S. Birdie: "Estimating and Costing", Dhanpat Rai Publishing Company, New Delhi.
4. Gurucharan Singh: "Building Construction", Standard Publishers and Distributors, New Delhi.
5. Sushil Kumar "Building Construction", Lakshmi Publishers, New Delhi.
6. Chiara and callender (Ed) – Time Saver Standards for Building Types, McGraw Hill
7. Poulhans Peters (Ed) – Design and Planning series (i) Factories (ii) New Schools (iii) Laboratories (iv) Centres for storage and distributors – Van Nostrand
8. M.F. Schmertz (Ed) – Office Building Design – II Ed., McGraw Hill.
9. Edward D. Mills – Planning Buildings for Administration, Entertainment and recreation – Newnes Butterworth.
10. Kunders – Hospital Planning, Design and Management, Book Base

<p style="text-align: center;">Course Title: Fundamentals of Architecture</p> <p style="text-align: center;">Professional Elective-1</p> <p style="text-align: center;">[As per Choice Based Credit System (CBCS) scheme]</p> <p style="text-align: center;">SEMESTER – V</p>			
Subject Code	15CT554	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives:</p> <p>This course will enable students:</p> <ol style="list-style-type: none"> 1. To remember the basic components for architectural design in building construction. 2. To understand the physical and aesthetic experience of buildings in order to appreciate the complexity of the influences bearing on architecture, as reflected in the major historical periods. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1			
INTRODUCTION		08 Hours	L1,L2
Aim and importance of architecture; Perceptions of architecture by Architects, Definitions, Architectural composition and analysis – Terms associated with qualities, The aesthetic and functional components.			
Module -2			
INFLUENCES OF THE FOLLOWING ON ARCHITECTURE		08 Hours	L1,L2
Association, tradition, climate, materials, topography, religion, social customs and aspirations of the times.			
Various factors influencing the architecture of a region, architecture as a response to social, technological and environment forces. Evolution of shelter forms in regions of the world and examples of vernacular architecture in the world, with particular reference to India.			
Module -3			
INDIAN ARCHITECTURE		08 Hours	L1,L2
Historical perspective – Hindu, Jain, Buddhist, Indo-saracenic and colonial. Features, characteristics and analysis.			
Module -4			

WORLD ARCHITECTURE Greek, Roman, Egyptian and Saracenic – Epochs in world architecture, Description and examples	08 Hours	L1,L2
Module -5:		
MODERN ARCHITECTURE Modern movements and modern architecture, Post-independence Architecture in India, Influences, trends and developments important Indian architects and their works, Examples of noted Indian architectural works.	08 Hours	L2,L3

Course outcomes:

After a successful completion of the course, the student will be able to:

1. Describe the basic components for architectural design in building construction.
2. Distinguish the physical and aesthetic experience of buildings in order to appreciate the complexity of the influences bearing on architecture globally.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum Three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- The students shall answer Five full questions selecting one full question from each module.
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

REFERENCE BOOKS:

1. Indian Architecture by Percy Brown, Vol. 1 & II., Tarapore Publishers, Bombay, 1981.
2. History of Architecture by Fletcher, CBS Publishers, Delhi, 1983.

Course Title: Engineering Ethics

Open Elective 1

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V			
Subject Code	15CT561	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students:			
<ol style="list-style-type: none"> 1. To enable the students to create an awareness on Engineering Ethics and Human Values 2. To instill Moral and Social Values and Loyalty and to appreciate the rights of others. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
HUMAN VALUES Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.		8 Hours	L1,L2
Module -2:			
ENGINEERING ETHICS Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.		8 Hours	L1,L2
Module-3:			
ENGINEERING AS SOCIAL EXPERIMENTATION Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.		8 Hours	L1,L2
Module -4:			
SAFETY, RESPONSIBILITIES AND RIGHTS Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.		8 Hours	L1,L2

Module -5:		
GLOBAL ISSUES	8 Hours	L1,L2
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.		

Course outcomes:		
After studying this course, students will be able to;		
<ol style="list-style-type: none"> 1. State the ethics in society and discuss the ethical issues related to engineering. 2. Recognize the responsibilities and rights in the society related to engineering. 		
Program Objectives (as per NBA)		
<ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> 		
Question paper pattern:		
<ul style="list-style-type: none"> • The question paper will have Ten questions, each full question carrying 16 marks. • There will be two full questions (with a maximum three sub divisions, if necessary) from each module. • Each full question shall cover the topics under a module. • <i>The students shall answer Five full questions selecting one full question from each module.</i> • If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
TEXTBOOK		
<ol style="list-style-type: none"> 1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004. 2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics –Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc.,United States, 2000 3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003 4. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001. 		

Course Title: SPECIAL CONCRETE

Open Elective 1

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15CT562	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	

Course objectives: This course will enable students:

1. To gain the fundamental knowledge of various special concrete over conventional concrete.
2. To comprehend the various properties of special concrete and conventional concrete.
3. To apply the codal procedural knowledge for calculation of mix proportions for various special concrete.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
<p>INTRODUCTION</p> <p>Fundamentals of concrete technology in relation to special concrete requirements, types of special concretes and their applications.</p> <p>FIBER REINFORCED CONCRETE</p> <p>Fiber material, mix proportions, fiber content – distribution, orientation and interfacial bond. Fiber concrete properties in fresh state. Strengthen behavior in tension, compression and bending. Toughness and related tests, Mix design criteria and application.</p>	8 Hours	L2,L3
Module -2:		
<p>HIGH DENSITY CONCRETE</p> <p>Materials, placement method, properties in wet and hardened state, Mix design criteria and applications</p> <p>SELF COMPACTING CONCRETE</p> <p>Introduction, Properties, Test methods and its application.</p>	8 Hours	L2,L3
Module-3:		
<p>LIGHTWEIGHT CONCRETE</p> <p>Classification, Properties of lightweight concrete, Strength and durability, Design of lightweight concrete mixes.</p> <p>POLYMER CONCRETE</p> <p>Materials, Types, Properties, Mix design criteria and its applications</p>	8 Hours	L2,L3
Module -4:		
<p>HIGH STRENGTH CONCRETE</p> <p>General introduction, significance of HSC, methods of making HSC, materials and mix proportions. Application of HSC, Ultra HSC, Methods of making Ultra HSC.</p>	8 Hours	L2,L3

Module -5:		
HIGH PERFORMANCE CONCRETE	8 Hours	L2,L3
General introduction and significance of HPC. Mix design criteria using plasticizers, SP, HP, Pozzolanic materials such as fly ash, ground granulated blast furnace slag, silica fumes, Metakaolin rice husk ash.		

<p>Course outcomes:</p> <p>After studying this course, students will;</p> <ol style="list-style-type: none"> 1. Acquire the knowledge of various special concrete over conventional concrete. 2. Compare the various properties of special concrete with conventional concrete. 3. Design the mix proportions for special concrete as per relevant codal standards.
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i>
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have Ten questions, each full question carrying 16 marks. • There will be two full questions (with a maximum three sub divisions, if necessary) from each module. • Each full question shall cover the topics under a module. • <i>The students shall answer Five full questions selecting one full question from each module.</i> • If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Concrete Microstructures, Properties and Materials by P.K. Mehta, and Paulo J.M., Monteiro, Indian Edition. 2. Properties of Concrete by A.M. Neville, Longmans, 4th Edition, 1995 3. Relevant National, International Codes, Technical Papers and Internet Information for Special Concrete.

Course Title: Remote Sensing and GIS Open Elective 1 [As per Choice Based Credit System (CBCS) scheme] SEMESTER – V			
Subject Code	15CT563	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students; <ol style="list-style-type: none"> 1. Understand the basic concepts of remote sensing. 2. Analyze satellite imagery and extract the required units. 3. Extract the GIS data and prepare the thematic maps. 4. Use the thematic maps for various applications. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Remote Sensing:- Basic concept of Remote sensing, Data and Information, Remote sensing data collection, Remote sensing advantages & Limitations, Remote Sensing process. Electromagnetic Spectrum, Energy interactions with atmosphere and with earth surface features(soil, water, vegetation),Indian Satellites and Sensors characteristics, Resolution, Map and Image and False color composite, introduction to digital data, elements of visual interpretation techniques.		8 Hours	L1,L2,L3
Module -2:			

<p>Remote Sensing Platforms, Sensors and Properties of Digital Data, Data Formats: Introduction, platforms- IRS, Landsat, SPOT, Cartosat, Ikonos, Envisatetc. Sensors-active and passive, MSS, AVHRR, LISS, TM, PAN, WIFS, microwave sensors, sensor resolutions (spatial, spectral, radiometric and temporal). Basics of digital image processing- radiometric and geometric corrections. Image enhancements, image transforms based on arithmetic operations, image filtering.</p>	<p>8 Hours</p>	<p>L2, L3,L4</p>
<p>Module-3:</p>		
<p>Geographic Information System: Introduction to GIS; components of a GIS ; Geo spatial Data: Spatial Data- Attribute data-Joining Spatial and attribute data;</p> <p>GIS Operations: Spatial Data Input – Attribute data Management -Data display Data Exploration – Data Analysis.</p> <p>Coordinate Systems: Geographic coordinate System: approximation of the Earth, Datum; Map Projections: Types of Map Projections – Map projection parameters</p> <p>– Commonly used Map Projections- Projected coordinate Systems.</p>	<p>8 Hours</p>	<p>L2, L3,L4</p>
<p>Module -4:</p>		
<p>Vector and Raster Data Model: Vector data model: Representation of simple features – Topology and its importance; coverage and its data structure, Shape file; Data models for composite feature Objects based Vector Data Model.</p> <p>Raster Data Model: Elements of the Raster data model, Types of Raster Data, Raster Data Structure, Data conversion, Integration of Raster and Vector data.</p>	<p>8 Hours</p>	<p>L3,L4,L5</p>
<p>Module -5:</p>		
<p>Integrated Applications of Remote sensing and GIS: Applications in land use, land cover analysis, change detection, water resources, urban planning, environmental planning, Natural resource management and Traffic management.</p>	<p>8 Hours</p>	<p>L3,L4,L5</p>

Course outcomes:

At the end of the course, the student will be able to:

1. Collect data and delineate various elements from the satellite imagery using their spectral signature.
2. Analyze different features of ground information to create raster or vector data.
3. Perform digital classification and create different thematic maps for solving specific problems
4. Make decision based on the GIS analysis on thematic maps

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- *The students shall answer Five full questions selecting one full question from each module.*
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Narayan Panigrahi, "**Geographical Information Science**", ISBN 10: 8173716285 / ISBN 13: 9788173716287, University Press 2008.
2. Basudeb Bhatta, "**Remote sensing and GIS**", ISBN:9780198072393, Oxford University Press 2011
3. Kang – Tsurg Chang, "**Introduction to Geographic Information System**". Tata McGraw Hill Education Private Limited 2015.
4. Lillesand, Kiefer, Chipman, "**Remote Sensing and Image Interpretation**", Wiley 2011.

Reference Books:

1. Chor Pang Lo and Albert K.W Yeung, "Concepts & Techniques of GIS", PHI, 2006
2. John R. Jensen, "Remote sensing of the environment", An earth resources perspective – 2nd edition – by Pearson Education 2007.
3. Anji Reddy M., "Remote sensing and Geographical information system", B.S. Publications 2008.
4. Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd, "Principals of Geo physical Information system", Oxford Publications 2004.

Course Title: CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

Open Elective 1

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – V

Subject Code	15CT564	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	

Course objectives: This course will enable students;

1. Identify the factors influencing the global climate systems and clean technologies for sustainable development
2. Assess the impacts of climate change on global, regional and local scales.
3. Develop strategies for adaptation and mitigation measures.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
EARTH'S CLIMATE SYSTEM Introduction-Climate in the spotlight - The Earth's Climate Machine – Climate Classification - Global Wind Systems – Trade Winds and the Hadley Cell – The Westerlies - Cloud Formation and Monsoon Rains – Storms and Hurricanes – The Hydrological Cycle – Global Ocean Circulation – El Nino and its Effect - Solar Radiation - The Earth's Natural Green House Effect – Green House Gases and Global Warming – Carbon Cycle.	9 Hours	L1,L2
Module -2:		

<p>CLIMATE CHANGES AND ITS CAUSES</p> <p>Observation of Climate Change – Changes in patterns of temperature, precipitation and sea level rise – Observed effects of Climate Changes – Patterns of Large Scale Variability – Drivers of Climate Change – Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC – Evidences of Changes in Climate and Environment – on a Global Scale and in India – climate change modelling.</p>	<p>8 Hours</p>	<p>L1,L2</p>
<p>Module-3:</p>		
<p>IMPACTS OF CLIMATE CHANGE</p> <p>Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.</p>	<p>7 Hours</p>	<p>L1,L2</p>
<p>Module -4:</p>		
<p>CLIMATE CHANGE ADAPTATION AND MITIGATION MEASURES</p> <p>Adaptation Strategy/Options in various sectors – Water – Agriculture – Infrastructure and Settlement including coastal zones – Human Health – Tourism – Transport – Energy – Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture – Forestry - Carbon sequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation.</p>	<p>9 Hours</p>	<p>L2,L3</p>
<p>Module -5:</p>		
<p>CLEAN TECHNOLOGY AND ENERGY</p> <p>Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco-Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydropower – Mitigation Efforts in India and Adaptation funding.</p>	<p>7 Hours</p>	<p>L2,L3</p>

Course outcomes:

At the end of the course, the student will be able to:

1. Identify the factors influencing the global climate systems and clean technologies for sustainable development
2. Assess the impacts of climate change on global, regional and local scales.
3. Develop strategies for adaptation and mitigation measures.

Program Objectives (as per NBA)

- Engineering Knowledge.
- Problem Analysis.

Question paper pattern:

- The question paper will have Ten questions, each full question carrying 16 marks.
- There will be two full questions (with a maximum three sub divisions, if necessary) from each module.
- Each full question shall cover the topics under a module.
- *The students shall answer Five full questions selecting one full question from each module.*
- If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. Anil Markandya, Climate Change and Sustainable Development: Prospects for Developing Countries, Routledge, 2002
2. Heal, G. M., Interpreting Sustainability, in Sustainability: Dynamics and Uncertainty, Kluwer Academic Publ., 1998
3. Jepma, C.J., and Munasinghe, M., Climate Change Policy – Facts, Issues and Analysis, Cambridge University Press, 1998
4. Munasinghe, M., Sustainable Energy Development: Issues and Policy in Energy, Environment and Economy: Asian Perspective, Kleindorfer P. R. et. al (ed.), Edward Elgar, 1996
5. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007

<p align="center">Course Title: Computer Aided Building Drawing</p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center">SEMESTER – V</p>			
Subject Code	15CTL57	I.A. Marks	20
Number of Lecture Hours/Week	03 (1hr Instructions + 2hr Drawing)	Exam. Marks	80
Total Number of Lecture Hours	42	Exam. Hours	03
CREDITS – 02		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. Understand the details of construction of different building elements. 2. Visualize the completed form of the building and the intricacies of construction based on the engineering drawings in software. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>Basics of AUTOCAD:</p> <p><i>Drawing tools:</i> Lines, Circle, Arc, Polyline, Multiline, Polygon, Rectangle, Spline, Ellipse</p> <p><i>Modifying tools:</i> Erase, Copy, Mirror, Offset, Array, Move, Rotate, Scale, Stretch, Lengthen, Trim, Extend, Break, Chamfer and Fillet</p> <p><i>Using Text:</i> Single line text, Multiline text, Spelling, Edit text,</p> <p><i>Special Features:</i> View tools, Layers concept, Dimension tools, Hatching, Customizing toolbars, Working with multiple drawings</p>		06 Hours	L1,L2
Module -2:			

<p>Use of AUTOCAD in Civil Engineering Drawings:</p> <p>Drawings Related To Different Building Elements:</p> <ul style="list-style-type: none"> i) Cross section of Foundation - masonry wall, Isolated RCC columns ii) Different types of staircases(Dog-legged and open well) iii) RCC - Lintel and Chejja iv) Doors – Two Panelled, Glazed and Partially Glazed. v) RCC slabs (Simply supported-discontinuous- One-Way & Two Way slab) and beams. 	24 Hours	L2,L3
Module -3:		
<p>Building Drawings:</p> <p>Drawing of Plan, elevation and sectional elevation of single storied and two storied residential building given the single line diagram</p>	12 Hours	L2,L3

<p>Course outcomes:</p> <p>After a successful completion of the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Prepare, read and interpret the drawings in a professional set up. 2. Plan and design a residential or public building as per the given requirements with software aid.
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> o <i>Engineering Knowledge.</i> o <i>Problem Analysis.</i>
<p>Question paper pattern:</p> <ul style="list-style-type: none"> - There will be two full questions with sub divisions if necessary from Module 2 with each full question carrying thirty marks. Students have to answer one question. - There will be one compulsory full question from Module 3 carrying fifty marks.
<p>REFERENCE BOOKS:</p> <ol style="list-style-type: none"> 1. Computer Aided Design Laborator- DrM.N.Shesha Prakash, Dr.G.S.Suresh, Lakshmi Publications 2. CAD Laboratory- M.A.Jayaram, D.S.Rajendra Prasad- Sapna Publications

Course Title: Geotechnical Engineering Laboratory			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – V			
Subject Code	15CTL58	I.A. Marks	20
Number of Lecture Hours/Week	03 (1hr tutorial + 2hr laboratory)	Exam. Marks	80
Total Number of Lecture Hours	42	Exam. Hours	03
CREDITS – 02		Total Marks-100	
Course Objectives: Provide students with a basic understanding;			
<ol style="list-style-type: none"> 1. To carry out laboratory tests and to classify soil as per IS codal procedures. 2. To conduct experiments to determine hydraulic conductivity and degree of compaction of soil. 3. To perform tests to determine shear strength and consolidation characteristics of soils. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Exercise -1:			
Tests for determination of specific gravity and moisture content		3	L2,L3,L4
Exercise -2:			
Grain Size analysis of soil samples (Sieve analysis)		3	L2,L3,L4
Exercise -3:			
In situ density by core cutter and sand replacement methods		3	L2,L3,L4
Exercise -4:			
Consistency limits – Liquid limit (Casagrande and cone penetration methods), plastic limit and shrinkage limit		6	L2,L3,L4
Exercise -5:			
Standard proctor compaction test and modified proctor compaction test		6	L2,L3,L4
Exercise -6:			
Coefficient of permeability by constant head and variable head methods		3	L2,L3,L4
Exercise -7:			
Strength tests		9	L2,L3,L4
7.1 Unconfined compression test			
7.2 Direct shear test			
7.3 Triaxial compression test (Undrained)			
Exercise -8:			
Consolidation test – Determination of compression index and coefficient of consolidation		3	L2,L3,L4

Exercise -9:		
Demonstration of 9.1 Miscellaneous equipment's such as augers, samplers, rapid moisture meter, Proctor's needle 9.2 Free swell index test 9.3 Determination of relative density of sand 9.4 Plate Load Test 9.5 Standard Penetration Test 9.6 Cone (Dynamic & static) Penetration Test 9.7 Seismic Refraction Method 9.8 Rock Quality Designation	6	L1,L2

Course outcomes: After a successful completion of the course, the student will be able to: 1. Reproduce procedural knowledge of laboratory tests and to identify soil as per IS codal procedures. 2. Determine index properties of soil as per IS codal procedures
Program Objectives (as per NBA) ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i>
Question paper pattern: • All experiments are to be included in the examination except demonstration exercises. • Candidate to perform experiment assigned to him • Marks are to be allotted as per the split up of marks shown on the cover page of answer script

Reference Books:

1. Punmia B C, Soil Mechanics and Foundation Engineering- (2017), 16th Edition, Laxmi Publications co., New Delhi.
2. Lambe T W "Soil Testing for Engineers", Wiley Eastern Ltd, New Delhi.
3. Head K H (1986) "Manual of soil laboratory testing", Vol I, II and III, Pentech Press, London.
4. Bowles J E (1988) "Engineering Properties of soils and their measurements", McGraw Hill Book Co, New York
5. Relevant BIS Codes of Practice: 2720(Part-3/Sec. 1) – 1987; IS 2720 (Part – 2)- 1973; IS 2720 (Part – 4) –1985; IS 2720 (Part – 5) – 1985; IS 2720 (Part – 6) – 1972; IS 2720 (Part – 7) – 1980; IS 2720 (Part – 8) –1983; IS 2720 (Part – 17) – 1986; IS 2720 (Part - 10) – 1973; IS 2720 (Part – 13) – 1986; IS2720 (Part 11) –1971; IS2720 (Part 15) – 1986; IS 2720 (Part 30) – 1987; IS 2720 (Part 14) – 1977; IS 2720 (Part – 14) – 1983;IS 2720 (Part – 28) – 1974; IS 2720 (Part – 29) – 1966, IS 2720 (Part-60) 1965.

Course Title: Construction Quality Management			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VI			
Subject Code	15CT61	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. To facilitate the understanding of Quality Management principles and process. 2. To remember quality control processes for different works in construction industry. 3. To apply the knowledge of Total Quality Management for quality certification of construction projects. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>QUALITY: Principles, Concepts in Quality Management, Managing for quality, Impact of Quality Management in Business and Commerce.</p> <p>Quality Control, Quality costs and its components, Features of Quality, Determinants of service Quality, Need for Quality management in industry.</p>		10 Hours	L1,L2
Module -2:			
<p>TOTAL QUALITY MANAGEMENT: Meaning and Scope, TQM models – Oakland Model, integrated model of TQM, Building blocks of TQM, 3-D Model of TQM, Benefits of TQM program, causes for TQM failures, Remedial measures, Quality Manuals, System Procedures. ISO: 9001:2000 - Process Approach, Compatibility with other management systems, certification Procedure, ISO: 9000 for construction, ISO 14000: Environmental Management – general requirements, Environmental Policy, Planning, Implementation and operation, Checking and Corrective action.</p>		10 Hours	L1,L2,L4

Module-3:		
QUALITY CIRCLE: Objectives, structure, steps in formation of Quality Circle, Roles and Responsibilities of QC members and Facilitator, Skills for the Facilitator, precautions to be taken by the Facilitator. Roles and Responsibilities of Leader/ Deputy leader, Prerequisites for a successful leader, Roles and Responsibilities of Steering Committee, Procedure to conduct QC meetings, Quality Audit.	10 Hours	L2,L4
Module -4:		
QUALITY CONTROL IN CONSTRUCTION PROJECTS QC in concreting, Brick work, stone masonry, Formwork, Foundations, Piling work, Structural work, Woodwork & Timber, Painting, Electrical system, Waste recovery and maintenance.	10 Hours	L2,L4
Module -5:		
QUALITY MANAGEMENT SYSTEM IN CONSTRUCTION PROJECTS: Concept, Approach to Problems, Quality Assurance, Quality Control, Quality Inspection, Records and Reports, Training, Total Quality Control, Manual/Check Lists, Guide Lines. BENCH MARKING: Sources, Process & Step model for Benchmarking, Types of Benchmarking and Code of Conduct. Internal & External Benchmarking, Advantages of Benchmarking.	10 Hours	L1,L2,L4
Course outcomes: After studying this course, students will be able to; <ol style="list-style-type: none"> 1. Describe the quality management principles & process related to construction projects 2. Select the quality control processes required for different works in construction industry. 3. Demonstrate the knowledge of Total Quality Management for quality certification of construction projects 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Total Quality Management for Engineers by Mohammed Zairi, Aditya Books Pvt. Ltd., New Delhi. 1992.
2. Project Planning and Control with PERT and CPM by B.C. Punmia and K.K. Khandelwal, Lakshmi Publications Pvt. Ltd., New Delhi.
3. Total Quality Management by B. Janakiraman and R.K. Goopal, Prentice-Hall of India Private Limited, New Delhi.

Reference Books:

1. Quality in the Construction Project by Fox, Arthur J., and Holly A. Cornell, American Society of Civil Engineers, New York, Latest Edition.
2. Total Quality Management by Mohantray R.P. and Lakhe R.R., Jaico Publishing House, Mumbai, 2000.
3. Total Quality Management by Break Joseph and Susan Joseph, Excel Books, New Delhi, 1995.
4. Total Quality in Construction Projects by Hellard R.B.: Achieving profitability with customer satisfaction, Thomas Telford, London, 1993.
5. Quality Management by Manjuaal, Satish, Raj Publishing House, Jaipur, 1999.

Course Title: Building Services-I

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

Subject Code	15CT62	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
Course objectives: This course will enable students; 1. To gain the knowledge of different building services and their types used in buildings. 2. To comprehend requirements and constraints in providing building services suitable for buildings. 3. To determine design factors of building services suitable for buildings.			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Introduction: requirements and necessity of services for buildings. Types of Building services. Water supply in buildings- systems of water supply, types of distribution system, appurtenances, Fire water supply system.		10 Hours	L1,L2,
Module -2:			
Drainage system of buildings- systems of drainage, methods of carrying refuse from buildings, House Drainage- General Principles, Traps- Classification of Traps and Sanitary Fittings Air conditioning of buildings- essentials of air-conditioning systems, classification based on function & season, systems, design- AC load calculations, installation and maintenance cost.		10 Hours	L2,L3,L4

Module-3:		
Acoustics <ul style="list-style-type: none"> - Definition of terminologies - Behaviour of Sound in enclosures - Acoustic materials-properties, Acoustical Defects & Remedies - design of assembly halls, theatre, auditorium and musical studio Noise control in buildings: Sound insulation-Materials, Types-Horizontal Barriers & Vertical Barriers	10 Hours	L2,L4
Module -4:		
Fire protection: necessity, fire hazards, characteristics and types of fire resistant materials, fire load and its calculation, fire resistant construction – walls and columns, floors and roofs, wall openings, escape elements and strong room construction, fire protection equipment. General fire safety requirements.	10 Hours	L1,L2,L4
Module -5:		
Electrical wiring- <ul style="list-style-type: none"> - Planning of Electrical Supply System - Systems of wiring- domestic and commercial buildings - Materials and Devices used in Wiring - Earthing- Procedure and Types - Inspection and Testing of Installation - Electrical Supply layout and conventional symbols of electrical items 	10 Hours	L1, L2,L4
Course outcomes: After studying this course, students will be able to; <ol style="list-style-type: none"> 1. Outline different building services and their types used in buildings. 2. Describe requirements and constraints in providing building services 3. Interpret the knowledge of design factors of services in building construction. 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Water supply and sanitary engineering by Rangwala,
2. Acoustics and noise control-theory, design by S.K.Kandaswamy(Ed),practice-allied publishers
3. Mechanical and electrical systems by Mc Gainess and stein, John Wiley and Sons.1977.

Reference Books:

1. ISSP35: Hand Book on water supply and drainage.
2. Architectural acoustic design guide by Acenteen and Cowan, Book Base Member.

Course Title: Fluid Mechanics and Hydraulic Structures

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

Subject Code	15CT63	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	

Course Objectives: The objectives of this course is to make students to learn:

1. Basic concepts of fluid, Energy concepts of fluid in open channel, Energy dissipation, Water surface profiles at different conditions.
2. The working principles of the hydraulic machines for the given data and analyzing the performance of turbines for various design data.
3. Design the open channels of various cross sections including design of economical sections.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
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Module -1:

BASIC PROPERTIES OF FLUIDS: Introduction, Definition of Fluid, Systems of units and properties of fluid: Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension, & Capillarity. Newton's law of viscosity (theory & problems). Capillary rise in a vertical tube and between two plane surfaces (theory & problems).

PRESSURE AND ITS MEASUREMENT: Definition of pressure, Pressure at a point, Pascal's law, Variation of pressure with depth. Types of pressure. Vapor pressure. Measurement of pressure using a simple, differential & inclined manometer (theory & problems). Introduction to Mechanical and electronic pressure measuring devices.

10 Hours

L1,L2,L3

Module -2:

Basic definitions of hydrostatic pressure, equations for hydrostatic force and depth of centre of pressure for Vertical and inclined submerged laminae (plane and curved)- Problems.

DYNAMICS OF FLUID FLOW: Introduction, Energy possessed by a fluid body. Euler's equation of motion along a streamline and Bernoulli's equation. Assumptions and limitations of Bernoulli's equation. Problems on applications of Bernoulli's equation (with and without losses). Introduction to kinetic energy correction factor.

10 Hours

L2,L3,L4

Momentum equation problems on pipe bends.		
Module-3:		
Introduction, losses in pipe flow, Darcy-Weisbach equation for head loss due to friction in a pipe. Pipes in series, pipes in parallel, equivalent pipe – problems. DISCHARGE MEASUREMENTS: Introduction, Venturimeter, Orifice meter, Triangular notch, Rectangular notch, Cipolletti notch.	10 Hours	L2,L3,L4
Module -4:		
IMPACT OF JET ON VANES: Introduction to Impulse – momentum equation and its applications, Force exerted by a jet on a fixed target, Derivations, Force exerted by a Jet on a moving target, Derivations, Force exerted by a jet on a series of curved vanes, Concept of velocity triangles, Equation for work done & efficiency, Problems of force exerted by a Jet on a series of curved vanes. FLOW IN OPEN CHANNELS: Definition of open channels, Classification, Difference between pipe flow & open channel flow, Types of flow, Geometric properties of open channels, Uniform flow in open channels, Chezy’s and Manning’s formulae, Problems on uniform flow, Most economical open channels. Derivation of conditions for rectangle, triangle and trapezoidal sections, Problems on most economical sections, Most economical circular channels derivations and problems.	10 Hours	L2,L3,L4
Module -5:		
HYDRAULIC TURBINES: Introduction, Types and classifications, Pelton Wheel, theory, equation for work done and efficiency, design parameters, Problems on Pelton Wheel, Francis Turbine – Theory, equation for work done and efficiency, design parameters, Problems on Francis turbine. CENTRIFUGAL PUMPS: Definition of pump, classification, Description & general principle of working, priming & methods, Work done & efficiencies of a centrifugal pump, Minimum starting speed, cavitation in centrifugal pumps, Multistage pumps, Problems on Centrifugal pumps.	10 Hours	L2,L3,L4
Course outcomes:		
After studying this course, students will be able to;		
1. Describe the concepts of fluid, Energy concepts of fluid in open channel, Energy dissipation, Water surface profiles at different conditions.		
2. Select suitable type of hydraulic machines for the given data and determine the		

performance of turbines for various design data.

3. Construct open channels of various cross sections including design of economical sections.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi & Seth., Standard Book House, New Delhi.
2. Fluid Mechanics & Machinery, Raghunath. H M., CBS Publishers.
3. Text Book on Fluid mechanics & Hydraulic Machines, Bansal R.K., Laxmi publications

Reference Books:

1. Fluid Mechanics and Hydraulic Machines, S.C. Gupta, Pearson Education, India
2. Elementary Hydraulics' (1st Edition) James F Cruise, Vijay P. Singh, Mohsan M. Sherif, Thomson Learning.
3. Hydraulics & Fluid Mechanics, K.R. Arora, Standard Book house, New Delhi.

Course Title: Construction Planning and Control

[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VI			
Subject Code	15CT64	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. To study and understand construction planning and scheduling for successful completion of projects. 2. To comprehend the concepts of construction planning for proper organizational management of construction projects. 3. To apply the procedural knowledge of planning and scheduling for execution and cost control of inventory in construction. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>Constructing Planning:</p> <p>Introduction: Phase of project, project management and its relevance, stakeholders of a project, structure of project organization, management levels, and traits of a project manager.</p> <p>Basic concepts in the Development of Construction Plans, Planning Process – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships Among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.</p>		10 Hours	L1,L2
Module -2:			
<p>Scheduling Procedures and Techniques</p> <p>Project Organization, Bar Charts, Work Breakdown Structure, Time estimates, Applications of CPM and PERT- Scheduling, Monitoring and Updating. Line of Balance Scheduling.</p>		10 Hours	L2,L3,L4
Module-3:			

Crashing and Time/Cost Tradeoffs – Scheduling in Poorly Structured Problems – Improving and Scheduling Process, work breakdown structure. Project scheduling and resource leveling: Introduction, Resource allocation and leveling for unlimited resources, Resource allocation for limited resources, Multi resource allocation, Optimal scheduling.	10 Hours	L2,L3,L4
Module -4:		
Cost Control, Monitoring and Accounting The Cost Control Problem – The Project Budget – Forecasting for Activity Cost Control – Financial Accounting Systems and Cost Accounts – Control of Project Cash Flows – Schedule Control – Schedule and Budget Updates – Relating Cost and Schedule Information.	10 Hours	L2,L3,L4
Module -5:		
Organization and Use of Project Information: Types of Project Information – Accuracy and Use of Information – Computerized Organization and Use of Information – Organizing Information in Databases – Relational Model of Databases – Other Conceptual Models of Databases – Centralized Database Management Systems – Databases and Applications Programs – Information Transfer and Flow.	10 Hours	L1,L2
Course outcomes: After studying this course, students will be able to; <ol style="list-style-type: none"> 1. Recall the concepts in construction planning and scheduling for successful completion of projects. 2. Review the elements in construction planning for proper organizational management of construction projects. 3. Prepare planning and scheduling structure for execution and cost control of inventory in construction. 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Project Management by Ahuja H.N., John Wiley, New York, 1999.
2. Construction Project Management – Planning, Scheduling and Controlling by Chitkara K.K., Tata McGraw Hill, New Delhi, 2000.

Reference Books:

1. Critical Path Methods in Construction Practice by Antil J.M. and Woodhead R.W., John Wiley, Canada, 1999.
2. Project Management in Construction by Levy Sidney, McGraw Hill Professional, New York, 2000.
3. CPM in Construction Management by O'brien James, McGraw Hill, New York, 1999.

Course Title: Infrastructure Valuation

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

Subject Code	15CT651	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. Understand the importance of Infrastructure valuation in construction. 2. Determine special techniques in Infrastructure valuation. 3. Apply structured phases of value engineering as analytical and decision-making skills in the valuation job. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Valuation- Definitions of various terms, Purpose of valuation, types of property- Depreciation, sinking fund, Lease hold and free hold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and year's purchase (Simple Problems).		08 Hours	L1,L2,L3
Module -2:			
Rental Method, Profit based method, cost based method, development based method, depreciation method and value, plinth area method, capital value comparison method. Numerical problems on above.		08 Hours	L2,L4
Module-3:			
General Techniques in Infrastructure Valuation: The Gordon Technique, Feasibility Ranking, the Morphological Analysis Technique, ABC Analysis, EOQ Analysis, Make or Buy Technique, Case Study Discussions.		08 Hours	L2,L3,L4
Module -4:			
Special Techniques in Infrastructure Valuation: Function – Cost – Worth Analysis, Function Analysis System Technique - Technically oriented FAST and Customer-oriented FAST, Weighted Evaluation		08 Hours	L2,L3,L4

Method - Equal Importance Method.		
Module -5:		
Applications of Infrastructure Valuation: Value Engineering: Introduction, History of value engineering, Value, Function, Cost, Worth, Case Study Discussions., Definition of the creative and structured phases of value engineering, The workshop approach to achieving value, Target setting, Time management, Case Study Discussions.	08 Hours	L2,L3
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Describe the significance of Infrastructure valuation in construction. 2. Demonstrate special techniques in Infrastructure valuation. 3. Illustrate structured phases of value engineering as analytical and decision-making skills in the valuation job. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Estimating & Costing, B. N. Dutta, Chand Publisher 2. Text book of Estimating & Costing- G.S. Birde, Dhanpath Rai and sons : New Delhi. 		

Reference Books:

1. Anil Kumar Mukhopadhyaya, Value Engineering Concepts, Techniques and Applications, Response Books, 2013.
2. Anil Kumar Mukhopadhyaya, Value Engineering Mastermind from Concept to Value Engineering Certification, Response Books, 2009.
3. Banerjee D.N (1998) " Principles and Practice of Valuation ". Eastern law house
4. Roshan H. Namavathi,(2001) "Professional Practice " Lakhani Book Depot.
5. Mitra A.K., (1986)"Theory and Practice of Valuation " Eastern law house Rao Gopinath C H,(2002) "Valuation Practices of Immovable Properties." Edition 12, Publisher, C H Gopinath Rao, Chennai.

<p align="center">Course Title: Ground Improvement Techniques [As per Choice Based Credit System (CBCS) scheme] SEMESTER – VI</p>			
Subject Code	15CT652	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> Remember the fundamental concepts of ground improvement techniques Understand the concepts of chemical compaction, grouting, geo synthetics, vibration, grouting and other miscellaneous methods. Apply factual knowledge to solve problems in the field for modification of ground required for construction of civil engineering structures. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>GROUND IMPROVEMENT: Definition, Objectives of ground improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique. Ground modification for Black Cotton soil.</p>		08 Hours	L1,L2
Module -2:			
<p>COMPACTION: Effect of grain size distribution on compaction for various soil types like lateritic soil, coarse-grained soil and micaceous soil. Effect of compaction on engineering behavior like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type. Specification of compaction. Tolerance of compaction. Shallow and deep compaction, Dynamic Compaction, Vibrofloatation.</p>		08 Hours	L1,L2,L4

Module-3:		
<p>HYDRAULIC MODIFICATION: Definition, Principle and techniques. gravity drain, lowering of water table, multistage well point, vacuum dewatering. Discharge equations. Design of dewatering system including pipe line effects of dewatering</p> <p>DRAINAGE & PRELOADING: Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.</p>	08 Hours	L1,L2,L4
Module -4:		
<p>CHEMICAL MODIFICATION-I: Definition, cement stabilization, sandwich technique, admixtures. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage and strength and deformation characteristics. Criteria for cement stabilization. Stabilization using Fly ash.</p> <p>CHEMICAL MODIFICATION-II: Lime stabilization – suitability, process, criteria for lime stabilization. Other chemicals like chlorides, hydroxides, lignin and hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.</p>	08 Hours	L1,L2
Module -5:		
<p>GROUTING: Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.</p> <p>MISCELLANEOUS METHODS (ONLY CONCEPTS & USES): Soil reinforcement, Thermal methods, Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing. Stone Column, Micro piles.</p>	08 Hours	L1,L2
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Define the fundamental concepts of ground improvement techniques. 2. Select suitable technique such as chemical compaction, grouting, geo synthetics, vibration, grouting and other miscellaneous methods for improving ground conditions. 3. Solve problems in the actual field conditions for modification of ground required for construction of civil engineering structures 		

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Ground Improvement Techniques- Purushothama Raj P. (1999) Laxmi Publications, New Delhi.
2. Construction and Geotechnical Method in Foundation Engineering- Koerner R.M. (1985) - Mc Graw Hill Pub. Co., New York.

Reference Books:

1. Engineering principles of ground modification- Manfred Hausmann (1990) - Mc Graw Hill Pub. Co., New York.
2. Methods of treatment of unstable ground- Bell, F.G. (1975) Butterworths, London.
3. Expansive soils- Nelson J.D. and Miller D.J. (1992) -, John Wiley and Sons.
4. Soil Stabilization; Principles and Practice- Ingles. C.G. and Metcalf J.B. (1972) - Butterworths, London.

Course Title: Water Supply and Sanitation			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VI			
Subject Code	15CT653	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. Evaluate the sources and conveyance systems for raw and treated water. 2. Study drinking water quality standards and to illustrate qualitative analysis of water. 3. Analyze the variation of water demand and to estimate water requirement for a community. 4. Design physical, chemical and biological treatment methods to ensure effective treatment of sewage 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>Introduction: Requirement of water for various beneficial uses, need for protected water supply.</p> <p>Demand of Water: Types of water demands - domestic demand in detail, institutional and commercial, public uses, fire demand. Per-capita consumption - factors affecting per-capita demand, population forecasting, different methods with merits and demerits - variations in demand of water. Fire demand. Design periods and factors governing the design period.</p> <p>Quality of Water: Objectives of water quality management. Concept of safe water wholesomeness, palatability and potable, waterborne diseases. Examination of water: - Objectives – Physical, Chemical and Microbiological Examinations, (IS:3025 and IS:1622).</p>		08Hours	L1,L2
Module -2:			
<p>Drinking water standards- BIS & WHO standards, Health significance of Fluoride, Nitrates.</p> <p>Water Treatment: Objectives - Treatment flowchart. Aeration - Principles, types of aerators.</p> <p>Sedimentation: Theory, settling tanks, types and design. Aided s</p> <p>Filtration: Mechanism - theory of filtration, types of filters, slow</p>		08 Hours	L2,L4

sand, rapid sand and pressure filters including construction, operation, cleaning.		
Module-3:		
<p>Disinfection: Theory of disinfection, methods of disinfection, Chlorination, chlorine demand, residual chlorine.</p> <p>Softening: Definition, methods of removal of hardness by lime soda-process and zeolite process. Removal of color, odour, taste with methods like aeration, use of copper sulfate, activated carbon treatment, oxidizing organic matters, removal of iron and manganese, fluoridation and de-fluoridation.</p> <p>Methods of Distribution Systems: System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems. -</p> <p>Miscellaneous: pipe fittings, location of water supply pipes in buildings</p>	08 Hours	L1,L2
Module -4:		
<p>Waste water disposal - Necessity for sanitation, methods of sewage disposal, types of sewerage systems and their suitability.</p> <p>Quantity of Sewage: Dry weather flow, factors affecting dry weather flow, flow variations and their effects on design of sewerage system, Estimation of storm flow, Rational method and Empirical formulae of design of storm water drain, Time of concentration.</p> <p>Sewer Appurtenances: Catch basins, Manholes, Flushing tanks, oil and grease traps,</p> <p>Drainage traps, Basic principles of house drainage, Typical layout plan showing house drainage connections, maintenance of house drainage. Sewage Pumps - Need, Types of pumps and pumping stations.</p> <p>Analysis of Sewage: Physical, chemical and Biological characteristics, concepts of Aerobic and Anaerobic activity, more emphasis on BOD and COD</p>	08 Hours	L1,L2
Module -5:		

<p>Treatment of Sewage: Flow diagram of municipal sewage treatment plant</p> <p>Primary treatment: screening, grit chambers, skimming tanks and design of primary sedimentation tanks.</p> <p>Secondary treatment: Trickling filter (introduction only) Activated sludge process - Principle and flow diagram, methods of aeration, modifications. Methods of sludge disposal: Sludge digestion and Sludge drying beds.</p>	<p>08 Hours</p>	<p>L1,L2</p>
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Evaluate available sources of water, quantitatively and qualitatively and make appropriate choice for a community. 2. Determine water quality and environmental significance of various parameters and plan suitable treatment system. 3. Estimate average and peak water demand for a community. 4. Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Garg, S.K., “Water Supply Engineering”, Khanna Publishers, 5th Edn, 1992 2. Garg. S.K, “Waste Water Treatment” - Khanna Publishers, 4th Ed., 1992 3. Punmia B.C. and Ashok Kumar Jain, “Environmental Engineering- I / II”, Arihant Publications, 3rd Edn, 1995 		

Reference Books:

1. Hammer and Hammer, "Water Technology", Mc Graw Hill Publications
2. Metcalf and Eddy, "Wastewater Treatment- Disposal and Reuse", Tata McGraw Hill Publications 2003
3. Howard S. Peavy, Donald R. Rowe. George Techno Bano Glous, "Environmental Engineering" - McGraw Hill International Ed

<p align="center">Course Title: Landscape Design and Planning [As per Choice Based Credit System (CBCS) scheme] SEMESTER – VI</p>			
Subject Code	15CT654	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> To understand the components and types in landscape design and construction. To apply the factual knowledge of design and construction of landscaping for improving aesthetic quality of the structure. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Man and the landscape: Landscape Development in Historical perspective – brief review of development of garden styles. Importance and role of landscape in Architecture. Contemporary approach to landscape design-a brief review of evolution of concepts in landscape design after industrial revolution and increasing awareness of ecological variable in landscape design.		12 Hours	L1,L2
Module -2:			
Site studies and site planning Understanding different site characteristics and evaluation of their potential for development. Philosophical and design issues related to site development – i.e., siting of buildings, spatial and con-textural relationships of built and outdoor spaces, site and its relationship to its surroundings, Importance of climatic, social factors in development of site. Process of design development, identifying functional requirements of site, development of site by mutual exploitation of forms and use of grading principles. (Study should includes at least two exercises in site planning).		08 Hours	L1,L2

Module-3:		
<p>Elements in Landscape Design: Use of landform, water, vegetation as elements Landscape design. Design and types of garden furniture, lighting and water feature. Pavement types and patterns and hard landscapes.</p> <p>Sculptures and architectural features as elements. Design concept related to use of landscape elements in outdoor design – Grouping of elements, visual effects etc.</p>	08 Hours	L1,L2
Module -4:		
<p>Plants and design Botanical nomenclature, anatomy and physiology. Plant growth and development, plant communities and their environments in Indian Context. Plants and landscape – Basic principles, Appearance of plants, functional and visual effects with plants in landscape. Landscape layout and planting techniques. Planting design in practice.</p>	08 Hours	L1,L2
Module -5:		
<p>Landscape Construction Elementary knowledge of grading, cut and fill, shaping the site. Use of materials use in landscape and their details. Laying paths with different materials like pebble paving slabs stone etc. Construction of garden steps. Construction of detailing of drain inlets, curbs and gutter details. Fountain and pool construction. Elementary knowledge of irrigation systems, and water supply, lighting systems.</p>	08 Hours	L1,L2
Course outcomes:		
<p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Describe the components and types in landscape design and construction. 2. Practise knowledge of design and construction of landscaping for improving aesthetic quality of the structure. 		

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Site Planning – Kevin Lynch
2. An Introduction to Landscape Architecture – Michael Laurie.
3. Landscape Construction and detailing – Alan Blanc

Reference Books:

1. T.S.S. for Landscape Architecture.
2. Planting Design – Bian Hacheat.
3. Land and Landscape Brenda Colise
4. Common trees – Santapaer
5. Beautiful Shrubs – Pratibha Devi

Course Title: OPERATION RESEARCH			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VI			
Subject Code	15CT661	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. To understand the basic concepts of optimization techniques in construction industry. 2. To apply the techniques for different operations for successful completion of construction projects 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>INTRODUCTION: Linear programming, Definition, scope of Operations Research (O.R) approach and limitations of OR Models, Characteristics and phases of OR Mathematical formulation of L.P. Problems. Graphical solution methods.</p> <p>LINEAR PROGRAMMING PROBLEMS: The simplex method - slack, surplus and artificial variables. Concept of duality, two phase method, dual simplex method, degeneracy, and procedure for resolving degenerate cases.</p>		08 Hours	L1,L2,L3,L4
Module -2:			

<p>TRANSPORTATION PROBLEM: Formulation of transportation model, Basic feasible solution using different methods, Optimality Methods, Unbalanced transportation problem, Degeneracy in transportation problems, Applications of Transportation problems. Assignment Problem: Formulation, unbalanced assignment problem, Traveling salesman problem.</p>	<p>08 Hours</p>	<p>L2,L3,L4</p>
<p>Module-3:</p>		
<p>SEQUENCING: Johnsons algorithm, n - jobs to 2 machines, n jobs 3 machines, n jobs m machines without passing sequence. 2 jobs n machines with passing. Graphical solutions priority rules.</p> <p>QUEUING THEORY: Queuing system and their characteristics. The M/M/1 Queuing system, Steady state performance analyzing of M/M/ 1 and M/M/C queuing model.</p>	<p>08 Hours</p>	<p>L2,L3,L4</p>
<p>Module -4:</p>		
<p>PERT-CPM TECHNIQUES: Network construction, determining critical path, floats, scheduling by network, project duration, variance under probabilistic models, prediction of date of completion, crashing of simple networks.</p>	<p>08 Hours</p>	<p>L2,L3,L4</p>
<p>Module -5:</p>		
<p>GAME THEORY: Formulation of games, Two Person-Zero sum game, games with and without saddle point, Graphical solution (2x n, m x 2 game), dominance property.</p> <p>INTEGER PROGRAMMING: Gomory's technique, branch and bound logarithm for integer programming problems, zero one algorithm.</p>	<p>08 Hours</p>	<p>L2,L3,L4</p>
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Describe the concepts of optimization techniques in construction industry. 2. Demonstrate the techniques for different operations for successful completion of construction projects. 		

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Text Books:

1. Operations Research and Introduction, Taha H. A. – Pearson Education edition
2. Operations Research, S. D. Sharma – Kedarnath Ramnath & Co 2002.
3. Recommended Reference Materials
4. “Operation Research” AM Natarajan, P. Balasubramani, A Tamilaravari Pearson 2005.
5. Introduction to Operation Research, Hillier and Liberman, McGraw Hill. 5th edition 2001.
6. Operations Research: Principles and practice: Ravindran, Phillips & Solberg, Wiley India Ltd, 2nd Edition 2007.
7. Operations Research, Prem Kumar Gupta, D S Hira, S Chand Pub, New Delhi, 2007.

Course Title: Environmental Impact Assessment			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VI			
Subject Code	15CT662	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. To study the concepts of EIA study for different types of developmental activities. 2. To understand the environmental attributes, methodology of EIA study. 3. To apply the knowledge of EIA to find the impact of development activities on environment. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Development Activity and Ecological Factors EIA, Rapid and Comprehensive EIA, EIS, FONSI. Need for EIA Studies, Baseline Information, Step-by-step procedures for conducting EIA, Limitations of EIA.		08 Hours	L1,L2
Module -2:			
Frame work of Impact Assessment. Development Projects-Environmental Setting, Objectives and Scope, Contents of EIA, Methodologies.		08 Hours	L1,L2

Module-3:		
Techniques of EIA. Assessment and Prediction of Impacts on Attributes Air, Water, Noise, Land Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for Development Projects, Rapid and Comprehensive EIA.	08 Hours	L1,L2
Module -4:		
Public Participation in Environmental Decision making. Practical Considerations in preparing Environmental Impact Assessment and Statements. Salient Features of the Project Activity-Environmental Parameter Activity Relationships- Matrices.	08 Hours	L2,L4
Module -5:		
EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.	08 Hours	L1,L2
Course outcomes:		
<p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Recall the concepts of EIA study to be followed for developmental activities. 2. Identify the environmental attributes, methodology to implement in EIA study. 3. Formulate EIA plans to predict the impact of development activities on environment. 		
Program Objectives (as per NBA)		
<ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
Question paper pattern:		
<ul style="list-style-type: none"> ● The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks ● There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. ● Each full question shall cover the topics as a module ● The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		

Reference Books:

1. Environmental Impact Analysis-Jain R.K.-Van Nostrand Reinhold Co.
2. Environment Impact Assessment.- Anjaneyalu. Y.
3. Guidelines for EIA of developmental Projects Ministry of Environment and Forests, GOI.
4. Environment Impact Assessment - Larry W. Canter - McGraw Hill Publication

Course Title: Human Resource Management			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VI			
Subject Code	15CT663	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students;			
<ol style="list-style-type: none"> 1. Understand current issues, trends, practices, and processes in planning and managing key human resource functions within organizations 2. Contribute to employee performance management and organizational effectiveness to improve employability skills. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Organizational Behaviour: Nature of organizational behaviour: Definition key elements, scope, model. Stages of evolution of OB, Researches in OB. Foundations of Individual Behaviour: Personality, Perception, Learning Attitudes, Values and Job satisfaction, Concepts of motivation. Foundations of Group Behaviour: Small groups in an organization, Leadership, Power and Politics, Communication, Conflict. Organization:		08 Hours	L1,L2

Organization culture, work stress, organizational changes and development.		
Module -2:		
<p>Introduction to Human Resource Management: Introduction, Concept of Human Resource Management, Scope of Human Resource Management, History of Human Resource Management, Function of Human Resource Management, Role of HR Executives</p> <p>HRM in India: Introduction, Changing Role of Human Resource in India, Globalization, Its Impact on HR.</p>	08 Hours	L1,L2
Module-3:		
<p>Human Resource Planning: Process of Human Resource Planning, Need for Human Resource Planning, HR Forecasting Techniques, Successful Human Resource Planning</p> <p>Recruitment and Selection: Concept of Recruitment, Factors Affecting Recruitment, Sources of Recruitment, Recruitment Policy, Selection, Selection Process, Application Forms, Selection Test, Interviews, Evaluation, Placement, Induction</p>	08 Hours	L1,L2
Module -4:		
<p>Training and Management Development: Meaning of Training, Area of Training, Methods of Training, Concept of Management Development, Management Development Methods, Differences Between Training and Development, Evaluation of Training and Management Development</p> <p>Employee Career Planning and Growth: Concept of Employee Growth, Managing Career Planning, Elements of a Career Planning Programme, Succession Planning</p> <p>Performance Appraisal: Concept and Need for Performance, Reviews, Overview of Performance Appraisal, Types of Appraisal Methods, 360 degree appraisal, Benefits</p>	08 Hours	L1,L2
Module -5:		

<p>Compensation Management: Wage and salary Administration, Managing wages, concept of rewards and incentives, Managing</p> <p>Benefits in Organizations Job Evaluation: Concept of Job Evaluation, Objectives, Techniques, Advantages and Limitations, Introduction to Competency Human Resource Information System: Introduction, Concept, Components, Types, Application, Implementation, Benefits, Impact</p> <p>Employee Misconduct and Disciplinary Procedure: Meaning and Objectives of Discipline, Principles for Maintenance of Discipline, Basic Guidelines of a Disciplinary Policy, Disciplinary Action – Penalties, Procedure for Disciplinary Action</p>	<p>08 Hours</p>	<p>L1,L2</p>
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Identify current issues, trends, practices, and processes in planning and managing key human resource functions within organizations. 2. Practise techniques foremployee performance management and organizational effectiveness to develop employability skills. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> ● The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks ● There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. ● Each full question shall cover the topics as a module ● The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Aswathappa A., (2000) "Organizational Behaviour: Texts and cases Himalaya Publishing House, Mumbai. 		

2. Hersey Paul, Kenneth Blanchard H., "Management of Organizational Behaviour: Utilising Human Resources", Prentice Hall India Ltd. Edition, New Delhi.
3. Davis Keith, "Human Behaviour at work: Organizational Behavior", Tata-McGraw Hill, New Delhi.
4. Gupta N.S., "Organization: Theory and Behaviour", Himalaya Publishing House, Mumbai.
5. Pareek Uday, Rao T.V., Pestonji D.M., (1996) "Behavioral Process in Organisations", Oxford-IBH Publishing Company.
6. Tyagi Archana, "Organisational Behaviour", Excel Books, New Delhi.
7. Aswathappa K., (1997) "Human Resource and Personnel Management", Tata - McGraw Hill, New Delhi.
8. Mirza S. Sayadin, (1988) "Human Resource Management", Tata McGraw Hill Book Company, New Delhi.
9. Suri S.K. (1988) "Human Resource Development and Productivity: New Perspective", National Productivity Council, Delhi.
10. Rao Subba P, (1999) Essential of HRM and Industrial Relations, "Text cases and Games", Himalaya Publishing house, II Edition.
11. 11. Gupta C.B., (2003) "Human Resource Management", Sultan Chand and Sons, New Delhi

Course Title: CONSTRUCTION TECHNOLOGY LABORATORY

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

Subject Code	15CTL67	I.A. Marks	20
Number of Lecture Hours/Week	03 (1hr I + 2hr P)	Exam. Marks	80
Total Number of Lecture Hours	42	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <p>Apply the procedural knowledge of construction activities to adhere to quality and good workmanship in works such as masonry, concreting and bar bending.</p>			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Construction of Masonry: Bonding patterns (Joints Alignment, Level and Plumb maintenance) Constructing wall panels, New CBR method standard Procedure.		10 Hours	L1,L2,L3,L4
Module -2:			
Plastering: Mixing Technique of applying plaster using trowel, float etc, Plastering vertical surface to plumb.		06 Hours	L2,L3,L4

Module -3:		
Concreting: Batching mixing and placing concrete Strength Tests- Compression, Split Tensile and Flexure Strength NDT of Concrete Specimen- Rebound Hammer & Ultrasonic Pulse Velocity Test	10 Hours	L1,L2,L3,L4,L5
Module -4:		
Mortar: Flow table test of mortar, Compressive strength of mortar cubes	06 Hours	L2,L3,L4,
Module -5:		
Bar bending: Straightening, bending, hooking demo for slab, beam and column construction, Lapping. Bar bending Schedule preparation (Slab, Beam& Lintel)	10 Hours	L2,L3,L4
Course outcomes: After studying this course, students will be able to; Practise the procedural knowledge of construction activities to adhere to quality and good workmanship in works such as masonry, concreting and bar bending.		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
Question paper pattern: <ul style="list-style-type: none"> ● The question paper will two questions from any module. ● There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. ● Each full question shall cover the topics as a module. ● Module-1: 40 Marks, Module-2: 40 Marks. ● The students shall answer two full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
Text Books: 1. MOHAN RAJ AND JAI SINGH, “Advanced Building Materials and Construction”, CBRI Publications, Roorkee. 2. B.C. PUNMIA, “Building Construction”, Lakshmi Publications, New Delhi.		

Course Title: COMPUTER APPLICATION LABORATORY

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VI

Subject Code	15CTL68	I.A. Marks	20
Number of Lecture Hours/Week	03 (1hr Instructions + 2hr Drawing)	Exam. Marks	80
Total Number of Lecture Hours	42	Exam. Hours	03
CREDITS – 03		Total Marks-100	

Course objectives: This course will enable students;

Understand the software required for estimating the quantities of different works and scheduling of different works for successful completion of construction projects.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
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Module -1:

MS Excel: Use basic Windows operations such as how to view toolbars, Spell Check, Open, New, Save, Save As, Print, Print Preview, Page Setup, Headers, Footers, Undo, etc. Enter data and formulas to create an accurate spreadsheet Update and format an existing spreadsheet (Editing--Cut, Paste, Copy, Paste, Font, Borders And Shading, Number Format, Column Width, Center Across Columns, Alignment, Indent, Format Painter, etc.) Use templates, wizards, Work with data bases and use data sort or filters to manipulate information in a spreadsheet. Create graphs for reports and presentations (column, bar, pie, three-dimensional, etc.). Development of spreadsheet for Estimation and Design of basic structural elements	12 Hours	L1,L2,L4
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Module -2:		
MICROSOFT PROJECT SCHEDULING 1. INTRODUCTION TO PROJECT MANAGEMENT 2. CREATING CALENDER 3. TASK AND ITS RELATIONSHIP 4. WORK BREAKDOWN STRUCTURES 5. CONSTRAINTS & RECURRING TASK 6. DEFING AND ASSIGN RESOURCES 7. RESOURCE ANALYSIS & LEVELLING 8. TRACKING 9. EARNED VALUE ANALYSIS 10. MULTIPLE PROJECTS 11. CUSTOMISATION & FORMATTING 12. REPORTS	30 Hours	L2,L3,L4,L5
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <p>Use the software required for estimating the quantities of different works and scheduling of different works for successful completion of construction projects.</p>		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> ● The question paper will two questions from any module. ● There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. ● Each full question shall cover the topics as a module. ● Module-1: 30 Marks, Module-2: 50 Marks. ● The students shall answer two full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>Text Books:</p> <ul style="list-style-type: none"> ● Microsoft Office Excel, Microsoft Corporation. ● MS Project - User manual, Microsoft Corporation. 		

Course Title: BUILDING SERVICES-II

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT71	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	

Course objectives: This course will enable students;

1. To gain the knowledge of concepts of different services in buildings.
2. To comprehend concepts of Elevators & Escalators, their types, working principle & design principles and type of energy conservation technologies suitable for buildings.
3. To determine factors of building services like ventilation, thermal comfort & illumination in buildings.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
Ventilation: Definition, Necessity, Functional Requirements of Ventilation, Types of Ventilation- Natural Ventilation and Artificial Ventilation Sound Amplification Equipments- Necessity, Factors affecting, Mechanism of sound amplification, Types of sound amplification equipments	10 Hours	L1,L2,L4
Module -2:		
Thermal comfort in buildings- factors affecting, heat transfer through buildings, thermal properties of building materials, insulation materials for buildings Communication systems- terminologies, necessity, systems of communication.	10 Hours	L2,L4
Module-3:		
Illumination of buildings- definition, laws of illumination, principles of illumination, artificial lighting, day lighting, flood lighting, Introduction to various types of lamps	10 Hours	L2,L4
Module -4:		

<p>Elevators – Components of an typical elevator, types, working principle, principles of design of an elevator</p> <p>Escalator- necessity, Components of a typical escalator, working principle, design considerations</p>	10 Hours	L2,L3,L4
Module -5:		
<p>Energy conservation in buildings</p> <ul style="list-style-type: none"> - Necessity - Advantages and Limitations - Introduction to Zero Energy Buildings& Green Buildings - Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. - LEED Certification for buildings 	10 Hours	L2,L4
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Describe the basic concepts of different services , their components & types used in buildings 2. Choose & suggest type of elevators & escalators based on working principle & design principles and type of energy conservation technologies suitable for buildings 3. Prepare the design factors for providing ventilation, thermal comfort & illumination in construction of buildings. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		

Text Books:

1. Mechanical and Electrical Systems in Buildings, by Tao, Prentice Hall publications
2. Building construction by B.C.Punmia, Laxmi Publications.
3. A Text Book on Building Construction by P.C.Varghese, Prentice Hall of India publications
4. Architectural Lighting by Bran David.

Reference Books:

1. Mechanical Services for Buildings by Eastop, Longman Publications.
2. IS SP41 and SP32-hand book on functional requirements of buildings

Course Title: DESIGN OF STEEL STRUCTURES			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VII			
Subject Code	15CT72	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
Course objectives: This course will enable students to;			
<ol style="list-style-type: none"> 1. Gain the knowledge of specifications and various types of connections in steel structures 2. Be able to design the different of types of connections in steel structures. 3. Be capable to apply the design concepts in design of steel structural members as per relevant IS codes. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
INTRODUCTION: Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method of design, Failure criteria for steel, Codes, Specifications and section classification.		10 Hours	L1,L2,L3
BOLTED CONNECTIONS: Introduction, Behaviour of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Pin Connections, Simple Connections, Moment resistant connections, Beam to Beam			

connections, Beam and Column splices, Semi rigid connections		
Module -2:		
WELDED CONNECTIONS: Introduction, Welding process, Welding electrodes, Advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of welds, Simple joints, Moment resistant connections, Continuous Beam to Column connections, Continuous Beam to Beam connections, Beam Column splices, Tubular connections.	10 Hours	L2,L3
Module-3:		
Plastic Behaviour of Structural Steel: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis, Plastic analysis of continuous beams. Design of Tension Members: Introduction, Types of tension members, Design of strands, Slenderness ratio, Behaviour of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, other sections, Design of tension member, Lug angles, Splices, Gussets.	10 Hours	L2,L3
Module -4:		
Design of Compression Members: Introduction, Failure modes, Behaviour of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members, built up compression members.	10 Hours	L1,L2,L3
Module -5:		
Design of Column Bases: Design of simple slab base and gusseted base Design of Beams: Introduction, Beam types, , Lateral stability of beams, factors affecting lateral stability, Behaviour of simple and built-up beams in bending(without vertical stiffeners), Design strength of laterally supported beams in Bending, Design strength of laterally unsupported beams, Shear strength of steel beams, Maximum deflection, Design of beams and purlins.	10 Hours	L2,L4
Course outcomes:		
After studying this course, students will be able to;		
<ol style="list-style-type: none"> 1. Select the required IS specification in steel structural design. 2. Demonstrate the procedural knowledge to design a system, component or process as per 		

- needs and specifications of various steel elements subjected to various load combinations.
3. Design of tension and compression members by following codal provisions in the analysis, design and detailing of steel elements.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
- The designs are as per IS-800 and SP-6(Steel tables)to be provided in the question paper.

Reference Books:

1. Design of Steel Structures, N.Subramanian, Oxford, 2008
2. Limit State Design of Steel Structures. Duggal TATA Megra Hill 2010
3. Bureau of Indian Standards, IS800-2007, IS875-1987
4. Steel Tables

Course Title: ESTIMATION & COSTING			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VII			
Subject Code	15CT73	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> 1. To gain the procedural knowledge of rate analysis & specifications for the various items of works in buildings. 2. To compute quantity of earthwork for road works. 3. To solve engineering problems in estimation of quantities of buildings & RCC structures by understanding drawing details with procedural knowledge of long wall- short wall & center line method. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
PART-A			
Module -1:			
<p>Introduction</p> <p>Definition of estimation, necessity, Types of estimate and Data required. Overhead charges, contingencies, water charges, day work. General rules for the measurements and its units of different items of civil engineering work.</p> <p>Administrative approval – Technical sanction. Nominal muster roll, measurement books – procedure for recording and checking measurements – preparation of bills</p>		10 Hours	L1,L2,L4
Module -2:			
<p>Specifications: Definition of specifications, objective of writing specifications, essentials in specifications, general and detail specifications of common item of works in buildings.</p> <p>Rate Analysis: Definition and purpose. Working out quantities and rates for the following standard items of works – earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items, wood and steel works for doors,</p>		10 Hours	L2,L4

windows and ventilators.		
PART-B		
Module-3:		
Detailed Estimation Methods of taking out quantities and cost – center line method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components	10 Hours	L1,L2,L4
Module -4:		
Detailed Estimation: Methods of taking out quantities and cost – long and short wall method or crossing method. Preparation of detailed and abstract estimates for the following Civil Engineering works – Buildings – RCC framed structures with flat, sloped RCC roofs with all Building components	10 Hours	L1,L2,L4
<u>PART-C</u>		
Module -5:		
Estimates: Steel truss (Fink and Howe truss), manhole and septic tanks, RCC Culverts. Measurement of Earthwork for Roads: Methods for computation of earthwork – cross sections – mid section formula or average end area or mean sectional area, trapezoidal & prismatic formula with and without cross slopes.	10 Hours	L1,L2,L4
Course outcomes: After studying this course, students will be able to; <ol style="list-style-type: none"> 1. Have the procedural knowledge of rate analysis & specifications of various items of works in buildings. 2. Determine the quantity of earthwork for road works. 3. Estimate the quantities of buildings & RCC structures by procedural knowledge of long wall-short wall method & center line method. 		

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have **3 parts (Part-A, Part-B & Part-C)** comprising of total **seven** questions. There will be two full questions (with a maximum of three subdivisions, if necessary) from each Module 1, Module 2(Part-A) and from Module 5(Part-C). There will be **one compulsory question** from combined Module 3 and Module 4(Part-B). Total comprising of **seven** questions
- Module 1, Module 2 and Module 5, each full question carries 16 Marks. Module 4 and Module 5-combined question carry 32 marks
- Each full question shall cover the topics as a module.
- The students shall answer **four** full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. Estimating & Costing, B. N. Dutta, Chand Publisher
2. Quantity Surveying-P.L. Basin S. Chand: New Delhi.
3. Estimating & Specification - S.C. Rangwala: Charotar publishing house, Anand.
4. Text book of Estimating & Costing- G.S. Birde, Dhanpath Rai and sons, New Delhi.
5. A text book on Estimating, Costing and Accounts- D.D. Kohli and R.C. Kohli S. Chand: New Delhi.
6. Contracts and Estimates, B. S. Patil, University Press, 2006

Course Title: Construction Methods and Equipments

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT74	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	

Course objectives: This course will enable students to;

1. Understand the significance of construction equipments used for construction activities.
2. Use the suitable type of construction equipment for executing construction works.
3. Apply the knowledge of trenchless technologies in construction works.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
Construction Equipment Management Identification, construction economy, construction planning, importance of planning, lack of planning, types of planning, equipment management in projects, classification of equipments, selection of construction equipments, cost of owning and operating, economic life of equipments, cost control of equipments, depreciation analysis.	10 Hours	L1,L2
Module -2:		
Equipment for Earthwork Fundamentals of Earth Work Operations, Machines for preliminary work, types of Earth Work Equipments Tractors – Basic parts and operation Scrapers – types, construction, operation and applications. Motor Graders – construction, operation and safety Power Shovel – types, basic parts, operation of shovel, selection of type, size of power shovel and factors affecting the output of power shovel, methods of improving the output of power shovel. Dragline – types, basic parts and operation. Clamshells - Classification	10 Hours	L2,L2

Hoe – basic parts, operation and application.		
Bulldozer – Classification, selection of type of bulldozer and out of bulldozer.		
Module-3:		
Other Construction Equipment	10 Hours	L2,L2
Equipment for Dredging- Classification, construction and operation		
Trenching – types, operation, selecting suitable equipment and trench safety.		
Tunnelling - aspects for construction of tunnels		
Drilling – types of drills (operation), factors affecting selection of drilling equipments.		
Blasting – general terms, explosives (type of explosives), blasting operation, Transporting, handling and storing of explosives.		
Module -4:		
Equipment for Compaction – Introduction, specification and types of compacting equipments. Foundation grouting – purpose, exploring the need of grouting, rate of grouting, materials used for grouting, equipments of cement grouting and effectiveness of grouting.	10 Hours	L1,L2
Dewatering – types, Pumping Equipments – factors in selecting construction pump and classification		
Module -5:		
Introduction to Trenchless Technology: Box pushing technology, micro tunnelling, moling, cured-in-place pipe (CIPP), Pipe Bursting, Pipe Jacking - Case Studies	10 Hours	L2,L4
Course outcomes:		
After studying this course, students will be able to;		
<ol style="list-style-type: none"> 1. Describe the knowledge of construction equipment used in construction activities. 2. Identify the suitable construction equipment for completing the task in construction works 3. Practise the trenchless technologies to execute construction works. 		
Program Objectives (as per NBA)		
<ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. B.Satyanarayana and S.C.Saxena., Constructin, Planning and Equipements, Standard Publishers New Delhi. 1985.
2. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., Construction. Planning, Equipment and Methods, 5th Edition, McGraw Hill, Singapore, 1995.
3. Sharma S.C. Construction Equipment and Management, Khanna Publishers, New Delhi, 1988
4. Deodhar, S.V. Construction Equipment and Job Planning, Khanna Publishers, New Delhi, 1988
5. Dr. Mahesh Varma, Construction Equipment and its planning and Application, Metropolitan Book Company, New Delhi, 1983.

Course Title: Design of Prestressed Concrete Structures

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT751	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	

Course objectives: This course will enable students to;

1. Understand the effectiveness of the design of PSC elements based on various losses of PSC.
2. Be capable to design PSC elements for different requirements as per codal provisions
3. Be capable to analyze the PSC element, its efficiency and stresses encountered in PSC element during transfer and at working.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
MATERIALS: High strength concrete and steel, Stress-Strain characteristics and properties. BASIC PRINCIPLES OF PRESTRESSING: Fundamentals, Load balancing concept, Stress concept, centre of Thrust. Pre-tensioning and post tensioning systems, tensioning methods and end anchorages.	08 Hours	L1,L2
Module -2:		

<p>ANALYSIS OF SECTIONS FOR FLEXURE: Stresses in concrete due to pre-stress and loads, stresses in steel due to loads, Cable profiles.</p> <p>LOSSES OF PRE-STRESS: Various losses encountered in pre-tensioning and post tensioning methods, determination of jacking force.</p>	<p>08 Hours</p>	<p>L2,L3</p>
<p>Module-3:</p>		
<p>DEFLECTIONS: Deflection of a pre-stressed member – Short term and long term deflections, Elastic deflections under transfer loads and due to different cable profiles. Deflection limits as per IS 1343. Effect of creep on deflection, load verses deflection curve, methods of reducing deflection</p> <p>LIMIT STATE OF COLLAPSE: Flexure -IS Code recommendations – Ultimate flexural strength of sections.</p>	<p>08 Hours</p>	<p>L1,L2,L3</p>
<p>Module -4:</p>		
<p>LIMIT STATE OF COLLAPSE (Continued....); Shear - IS Code recommendations, shear resistance of sections, shear reinforcement. Limit state of serviceability – control of deflections and cracking.</p> <p>DESIGN OF END BLOCKS: Transmission of prestress in pretensioned members, transmission length, Anchorage stress in post-tensioned members.</p>	<p>08 Hours</p>	<p>L1,L2,L3</p>
<p>Module -5:</p>		
<p>DESIGN OF END BLOCKS (Continued....);Bearing stress and bursting tensile force-stresses in end blocks-Methods, I.S. Code, provision for the design of end block reinforcement.</p> <p>DESIGN OF BEAMS: Design of pre-tensioned and post-tensioned symmetrical and asymmetrical sections. Permissible stress, design of prestressing force and eccentricity, limiting zone of pre-stressing force cable profile</p>	<p>08 Hours</p>	<p>L1,L2,L3</p>

Course outcomes:

After studying this course, students will be able to;

1. Define the concepts of various losses for design of PSC elements.
2. Compute the loads of PSC elements for suitable requirements as per codal provisions
3. Examine the PSC element, its efficiency and stresses encountered in PSC element during transfer and at working.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
- The designs are as per IS-1343 to be provided in the question paper.

Reference Books:

1. Pre-stressed Concrete- N. Krishna Raju - Tata Mc. Grawn Publishers.
2. Pre-stressed Concrete- P. Dayarathnam : Oxford and IBH Publishing Co.
3. Design of pre-stressed concrete structures- T.Y. Lin and Ned H. Burns - John Wiley & Sons, New York.
4. Fundamental of pre-stressed concrete- N.C. Sinha & S.K. Roy
5. IS: 1343: 1980
6. Pre-stressed Concrete- N. Rajgopalan

Course Title: Bridge Engineering

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT752	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students to; <ol style="list-style-type: none">1. Understand the significance of bridges, types and uses in construction.2. Comprehend the constructional procedure of bridges and its elements3. Apply the design concepts in designing of bridges as per the IRC codal provision.			
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level	
Module -1:			
INTRODUCTION: Classification of Bridges – Masonry, Arches, RCC, Prestressed Concrete Steel and Composite Brief Description of different types of bridges – preliminary Design principles. INVESTIGATIONS: Selection of sites, Design data to be followed, Hydraulic design, linear waterway afflux – Economic span.	08 Hours	L1,L2	
Module -2:			
FOUNDATIONS: Depth of scour – Depth of foundation – Types of foundation (Pie, Raft, Well and Caisson – Brief Description only)	08 Hours	L1,L2	

cofferdam, Design criteria – load bearing capacity of well caissons. SUBSTRUCTURE: Types of Abutment, piers, wing walls – Forces action on them Stability consideration and empirical designs – Bank connection and protection works		
Module-3:		
STANDARD LOADS: IRC and Railway Loadings – Equivalent Loading for preliminary design – Impact effect. CONSTRUCTION AND MAINTENANCE OF BRIDGES: Form work and False work for concrete Bridges – Maintenance of bridges – Maintenance.	08 Hours	L1,L2
Module -4:		
BEARINGS, JOINTS AND APPURTENANCES Importance of bearings, bearings for slab bridges, bearings for girder bridges, expansion bearings, fixed bearings, elastomeric bearings, elastomeric pot bearings, bearings for skew bridges, joints and appurtenances.	08 Hours	L1,L2
Module -5:		
TEMPORARY AND MOVABLE BRIDGES Temporary bridges, timber bridges, temporary causeways, military bridges, floating bridges, pontoon bridges, movable bridges	08 Hours	L1,L2
Course outcomes: After studying this course, students will be able to; <ol style="list-style-type: none"> 1. Recall the suitable requirements, types, its elements in construction. 2. Translate the procedural knowledge of bridge construction & its elements in actual field conditions. 3. Analyze the design factors in bridge construction as per the IRC codal provision. 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module.
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.
- IRC 6 – 2000 Standard Specifications And Code Of Practice For Road Bridges Section II Loads and Stresses, The Indian Road Congress New Delhi.

Reference Books:

1. A Text Book of Bridge Engineering by Victor Oxford and IBH Pub. Co. New Delhi.
2. Introduction to Bridge Engineering by BindraDhanpat Rai Pub. New Delhi.
3. Design of RCC Bridges by Vazirani
4. IRC Codes 5 Bridges, 6 Bridges – Rangwala
5. Design of Steel Structures by Krishnamachar and Sharma
6. Design of Bridge by Dr. N. Krishna Raju

Course Title: Alternate Building Materials and Technologies

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT753	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students to; 1. To gain the knowledge about the basic building materials, properties and their applications. 2. To understand different types of masonries and their applications.			
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level	
Module -1:			
INTRODUCTION: Energy in building materials, Environmental issues concerned to building materials, Global warming and construction industry, Environmental friendly and cost effective building technologies., Requirements for building of different climatic regions, Traditional building methods and vernacular architecture. ALTERNATIVE BUILDING MATERIALS: Characteristics of building blocks for walls, Stones and Laterite	08 Hours	L1,L2	

blocks, Bricks and hollow clay blocks, Concrete blocks, Stabilized blocks: Mud Blocks, Steam Cured Blocks, Fal-G Blocks and Stone Masonry Blocks.		
Module -2:		
<p>LIME-POZZOLANA CEMENTS-Raw materials, Manufacturing process& Properties and uses</p> <p>Fibre reinforced concretes- Matrix materials, Fibers : metal and synthetic, Properties and applications, Fibre reinforced plastics, Matrix materials, Fibers: organic and synthetic, Properties and applications</p> <p>Building materials from agro and industrial wastes- Types of agro wastes, Types of industrial and mine wastes, Properties and applications, Field quality control test methods</p>	08 Hours	L1,L2
Module-3:		
<p>ALTERNATIVE BUILDING TECHNOLOGIES</p> <p>Alternative for wall construction- Types, Construction method</p> <p>Masonry mortars- Types, Preparation and Properties</p> <p>Ferrocement and Ferro concrete building components- Materials and specifications, properties.</p>	08 Hours	L1,L2
Module -4:		
<p>ALTERNATIVE BUILDING TECHNOLOGIES</p> <p>Alternative roofing systems-Introduction, Concepts of</p> <p>Cool Roofs System- Construction Procedures, material specifications, uses.</p> <p>Filler slabs- Construction Procedures, material specifications, uses.</p> <p>Composite beam panel roofs- Construction Procedures, material specifications, uses.</p> <p>Masonry vaults and domes- Construction Procedures, material specifications, uses.</p>	08 Hours	L1,L2
Module -5:		
<p>COST EFFECTIVE BUILDING DESIGN</p> <p>Cost concepts in buildings</p> <p>Cost saving techniques in planning, design and construction</p> <p>Cost Analysis: Case studies using alternatives.</p>	08 Hours	L1,L2

<p>EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS</p> <p>Machines for manufacture of concrete</p> <p>Equipments for production of stabilized blocks</p> <p>Moulds and methods of production of precast elements.</p>		
<p>Course outcomes:</p> <p>After studying this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Memorize the basic building materials, properties and their applications. 2. Identify different types of masonries, their applications and types of cost-effective constructions. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Alternative building methodologies for engineers and architects, lecture notes edited: K.S. Jagadish and B.V. Venkatarama Reddy, Indian Institute of Science, Bangalore. 2. Structural Masonry by Arnold W. Hendry. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Relevant IS Codes. 2. Alternative building materials and technologies. 3. Proceedings of workshop on Alternative building material and technology, 19th to 20th December 2003 		

@ BVB College of Engineering. & Tech., Hubli.

Course Title: Pre-Fabrication Construction Techniques

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT754	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	

Course objectives: This course will enable students to;

1. Gain the knowledge of prefab system, component or process as per the needs and specifications of different variety of prefab elements construction.
2. Comprehend the culture of professional and ethical responsibilities by following codal provisions in the analysis, design and detailing of prefab structures for strength and durability.
3. Analyze design of various types of prefab structures in actual field conditions.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
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Module -1:		
Prefabricated construction, necessity, advantages disadvantages, Mass Produced steel, reinforced concrete and masonry system, industrialized buildings. Modular coordination, basic module, planning and design modules, modular grid systems	08 Hours	L1,L2
Module -2:		
National Building Code specifications, standardization, dimensioning of products, preferred dimensions and sizes, tolerances and deviations, layout and processes Prefabricates classification, foundation, columns, beams, roof and floor panels, wall panels, clay units, box prefabricates, erection and assembly	08 Hours	L1,L2
Module-3:		
Design of prefabricated elements, lift points, beams, slabs, columns, wall panels, footings	08 Hours	L2,L3
Module -4:		
Design of joints to transfer axial forces, moments and shear forces	08 Hours	L1,L2,L3
Module -5:		
Construction techniques, large panel construction, lift slab system, Glover system, Constains's jack- block system, Constain V- plate system, Bison system, Silber – Kuhi system, control of construction processes. Equipments- horizontal and vertical transportation.	08 Hours	L1,L2
Course outcomes:		
After studying this course, students will be able to;		
<ol style="list-style-type: none"> 1. Describe prefab system, component or process as per the needs and specifications of different variety of prefab elements construction. 2. Practise the culture of professional and ethical responsibilities by following codal provisions in the analysis, design and detailing of prefab structures for strength and durability. 3. Provide factual knowledge on analysis and design of various types of prefab structures. 		

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. Hass A.M. – Precast Concrete – Design and applications Applied Science, 1983.
2. David Shepperd – “Plant cast, Precast and Prestressed concrete – McGraw Hill, 1989.
3. Dyachenko and Mirtousky – Prefabrication of reinforced concrete – MIR Publishers.

Course Title: SOLID WASTE MANAGEMENT

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT761	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	

Course objectives:

1. Student will be able to understand components of solid waste management and the laws governing it.
2. Students will analyse the solid waste collection systems and propose route optimization techniques and processing of solid wastes.
3. Students will be able to design, operate and maintain of landfills and composting units and

categorize the techniques of operation and maintenance of incinerators.		
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
<p>INTRODUCTION: Definition, Land Pollution – scope and importance of solid waste management, functional elements of solid waste management. Policy Framework in India for solid waste management</p> <p>SOURCES: Classification and characteristics – municipal, commercial & industrial. Methods of quantification</p>	08 Hours	L1,L2
Module -2:		
<p>COLLECTION AND TRANSPORTATION: Systems of collection, collection equipment, garbage chutes, transfer stations – bailing and compacting, route optimization techniques and problems.</p> <p>TREATMENT / PROCESSING TECHNIQUES: Components separation, volume reduction, size reduction, chemical reduction and biological processing problems.</p>	08 Hours	L1,L2
Module-3:		
<p>INCINERATION: Process – 3 T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolysis, design criteria for incineration.</p>	08 Hours	L1,L2
Module -4:		
<p>COMPOSTING: Aerobic and anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes, Vermi composting</p> <p>SANITARY LAND FILLING: Different types, trench area, Ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate & gas collection and control methods, geosynthetic fabrics in sanitary land fills</p>	08 Hours	L1,L2
Module -5:		
<p>DISPOSAL METHODS: Open dumping – selection of site, ocean disposal, feeding to hogs, incineration, pyrolysis, composting, sanitary land filling, merits and demerits, biomedical wastes and disposal.</p> <p>RECYCLE AND REUSE:Material and energy recovery operations, reuse in other industries, plastic wastes, environmental significance and reuse.</p>	08 Hours	L1,L2,L4

Course outcomes:

After studying this course, students will be able to;

1. Describe the components of solid waste management and the laws governing it.
2. Distinguish the solid waste collection systems and prepare route optimization techniques and processing of solid wastes.
3. Develop landfills and composting units and evaluate the techniques of operation and maintenance of incinerators.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module
- The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. Integrated Solid Waste Management: Tchobanoglous : M/c Graw Hill.
2. Solid Waste Management in developing countries. Bhide and Sunderashan
3. Hand book on Solid Waste Disposal.: Pavoni J.L.
4. Environmental Engineering.: Peavy and Tchobanoglous
5. Environmental Engineering – Vol II.: S.K. Garg
6. Biomedical waste handling rules – 2000.
7. Solid Waste Engineering by Vesilind.Pa Worrell &Reinhart.D. – 2009, Cengage Learning India Private Limited, New Delhi

Course Title: Pavement Materials & Construction

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT762	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students to; 1. Remember the materials, types & components of pavement construction for road works. 2. Understand the specifications & requirements of different types of pavements as per IS codal provisions.			
		Teaching	Revised Bloom's

Modules	Hours	Taxonomy (RBT) Level
Module -1:		
<p>AGGREGATES: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation – design gradation, maximum aggregate size, aggregate blending by different methods to meet specification.</p> <p>BITUMEN AND TAR: Origin, preparation, properties and chemical constitution of bituminous road binders; requirements.</p>	08 Hours	L1,L2
Module -2:		
<p>BITUMINOUS EMULSIONS AND CUTBACKS: Preparation, characteristics, uses and tests. Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion.</p>	08 Hours	L1,L2
Module-3:		
<p>BITUMINOUS MIXES: Mechanical properties, dense and open textured mixes, flexibility and brittleness, (no HveemStabilometer&Hubbar – Field Tests) bituminous mix, design methods using Rothfuch’s Method only and specification, Marshal mixed design criteria- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen.</p>	08 Hours	L1,L2
Module -4:		
<p>SUBGRADE: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests.</p> <p>EQUIPMENT IN HIGHWAY CONSTRUCTION: Various types of equipment for excavation, grading and compaction – their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction.</p>	08 Hours	L1,L2
Module -5:		

<p>FLEXIBLE PAVEMENTS: Specifications of materials, construction method and field control checks for various types of flexible pavement layers.</p> <p>CEMENT CONCRETE PAVEMENTS: Specifications and method of cement concrete pavement construction (PQC Importance of providing DLC as sub-base and polythene thin layer between PQC and sub-base); Quality control tests; Construction of various types of joints.</p>	<p>08 Hours</p>	<p>L1,L2</p>
<p>Course outcomes:</p> <p>After studying this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the materials, types & components of pavement construction for road works. 2. Identify the specifications & requirements of different types of pavements as per IS codal provisions. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. • The designs are as per IRC and relevant charts to be provided in the question paper. 		
<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Peurifoy, R.L., and Clifford, JS “Construction Planning Equipment and Method”- McGraw Hill Book Co. Inc. 2. Sharma S.C., “Construction Equipment and its Management”- Khanna Publishers 		

Reference Books:

1. Freddy L Roberts, Prithvi S Kandhal et al, “Hot Mix Asphalt Materials, mixture design and construction”- (2nd Edition), National Asphalt Pavement Association Research and Education Foundation, Maryland, USA
2. National Asphalt Pavement Association “Hot Mix Asphalt Paving Hand book”- 5100 Forbes Boulevard, Lanham, Mary Land, USA
3. “Hand Book on Cement Concrete Roads”- Cement Manufacturers Association, New Delhi
4. MoRTH “Specifications for Roads and Bridge Works”- 2001, fourth revision, Indian Roads Congress
5. MoRTH “Manual for Construction and Supervision of Bituminous Works”- 2001, Indian Roads Congress
6. MoRTH “Manual for Maintenance of Roads”- 1989, Indian Roads Congress
7. IRC: 42-1994, IRC:15-2002, IRC SP :11-1988, , 55-2001, 57-2001,58-2001, IRC 19-1977, 27-1967, 29-1988, 34-1970, 36-1970,48-1972,61-1976, 63-1976, 68-1976, 81-1997,82-1982, 84-1983,93-1985, 94-1986, 95-1987, 98-1997, 105- 1988.

Course Title: Urban Planning and Modern Architecture

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT763	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	

<p>Course objectives: This course will enable students to;</p> <ol style="list-style-type: none"> 1. To remember the basic components for planning of urban areas. 2. To understand the physical and aesthetic experience of buildings in order to appreciate the complexity of the influences bearing on modern architecture, as reflected by contemporary architects. 		
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
<p>Urban Planning</p> <p>Introduction: evolution of planning, objects, principles and necessity of town planning, growth of towns, requirements of new towns, present position of planning in India, land use planning and neighbourhood planning.</p>	08 Hours	L1,L2
Module -2:		
<p>Zoning: meaning of the term zoning, objectives, principles, importance, aspects and advantages of zoning, zoning powers, transition zones</p> <p>Housing: importance, demand, requirements, low cost housing, slums-causes and effects,' clearance of slums, building bye laws</p>	08 Hours	L1,L2
Module-3:		
<p>Development of master plan-objectives, necessity and features of master plan, data collected, drawings prepare, stages of preparation and method of execution of development plan</p>	08 Hours	L1,L2
Module -4:		
<p>Modern Architecture</p> <p>Introduction: aim and importance of architecture, role of an engineer and an architect.</p> <p>Principles and qualities of architecture: the aesthetic and the functional components in architecture</p>	08 Hours	L1,L2
Module -5:		

<p>Vernacular architecture in India-post independent buildings, planning of new capitals</p> <p>Study of works of contemporary architects like Le Corbusier, rohe, Kahn, Charles Correa, B.V.Doshi-CASE STUDIES</p>	08 Hours	L1,L2
<p>Course outcomes:</p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> 1. Describe the basic components required for planning of urban areas. 2. Distinguish the physical and aesthetic experience of buildings in order to appreciate the complexity of the influences bearing on modern architecture globally. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Town Planning by Rangwala, Charotar Publishing House Pvt.Ltd 2. Building Planning, Designing, and Scheduling, Gurucharan Singh and Jagadish Singh-Standard Publishers, New Delhi 3. Principles o architecture, MuthuShoba Mohan, Oxford University Press New Delhi 4. Bran David-Architectural Lighting 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Town and Country Planning by K.S.Ramegowda. 2. Urban Design by Gallion& Eisner 3. History of Architecture by Fletc 		

Course Title: Computer Applications in Construction Engineering and planning

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CT764	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students to;			

<ol style="list-style-type: none"> 1. Understand the use of computer software and applications in construction industry 2. Comprehend the knowledge of computer software and applications for execution of construction related activities and works. 		
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
Introduction Introduction to System Hardware – Languages – Data Base Management – Spread Sheets – Applications Optimization Techniques Modern Information System – System Development Life Cycle – Structured Methodologies	08 Hours	L1,L2
Module -2:		
Designing Computer Based Methods, Procedures, Control – Designing Structured Programs. Information System Integrated Construction Management Information System – Project Management Information System.	08 Hours	L1,L2
Module-3:		
Functional Areas, Finance, Marketing, Production, Personnel – Levels, DSS, EIS, ES – Comparison, Concepts and Knowledge Representation – Managing International Information System	08 Hours	L1,L2
Module -4:		
Implementation and Control Control – Testing Security – Coding Techniques – Defection of Error Validating – Cost Benefit Analysis – Assessing the value and risk of Information System.	08 Hours	L1,L2
Module -5:		

System Audit Software Engineering qualities – Design, Production, Service, Software specification, Software Metrics, Software quality assurance – Software life cycle models – Verification and Validation.	08 Hours	L1,L2
Course outcomes: After studying this course, students will be able to: <ol style="list-style-type: none"> 1. Recall the knowledge of computer software and applications for execution of construction related activities and works. 2. Identify the suitable software and applications required in construction industry. 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
Question paper pattern: <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
Reference Books: <ol style="list-style-type: none"> 1. Kenneth C. Laudon and Jane Price Laudon, Management Information Systems –Organization and Technology, Prentice Hall, 1996 2. Gordon B. Davis, Management Information System: Conceptual Foundations, Structure and Development, McGraw Hill, 1996. 3. Joyce J. Elam, Case series for Management Information Systems, Simon and Schuster, Custom Publishing, 1996. 4. Ralph H. Sprague and Huge J. Watson, Decision Support for Managers, Prentice Hall, 1996. 5. Micheal W. Evans and John J. Marciniak, Software Quality assurance and Management, John Wiley and Sons, 1987 6. Card and Glass, Measuring Software Design quality, Prentice Hall, 1990 		

<p align="center">Course Title: Building Services Laboratory [As per Choice Based Credit System (CBCS) scheme] SEMESTER – VII</p>			
Subject Code	15CTL77	I.A. Marks	20
Number of Lecture Hours/Week	03(1I+2P)	Exam. Marks	80
Total Number of Lecture Hours	42	Exam. Hours	03
CREDITS – 02		Total Marks-100	
<p>Course objectives: This course will enable students to;</p> <ol style="list-style-type: none"> 1. To understand drawings of building services like water supply, plumbing and electrical layouts 2. To determine the intensity of sound, light, moisture of wood, velocity and quality of air at indoors & AC load for building design and construction. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
<p>MODULE 1</p> <ol style="list-style-type: none"> 1. Experiments on measurement of intensity of light in various location in buildings. 2. Experiments on measurement of intensity of sound. 3. Experiments on measurement of moisture content in different building materials. 4. Experiments to measure the velocity and quality of air at indoors 		21 HOURS	L1,L2,L3,L4,L5
<p>MODULE 2</p> <ol style="list-style-type: none"> 1. Preparing draft layout by AUTO CADD software <ol style="list-style-type: none"> a. Water supply/Sanitary service building details b. Plumbing details (Sanitary line assembly and fittings) c. Electrical details 2. Demonstration of electrical, Plumbing and sanitary materials as per the layout. 3. Air conditioning system-load calculations 		21 HOURS	L1,L2,L3,L4,L5

Course outcomes:

After studying this course, students will be able to:

1. Draw and demonstrate drawings of building services like water supply, plumbing and electrical layouts in actual site conditions.
2. Measure & analyse the intensity of sound, light, moisture of wood, velocity and quality of air at indoors & AC load for building design and construction.

Program Objectives (as per NBA)

- *Engineering Knowledge.*
- *Problem Analysis.*
- *Interpretation of data.*

Question paper pattern:

- The question paper will have 2 modules comprising of 4 questions.
- There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.
- Each full question shall cover the topics as a module.
- Module-1: 40 Marks, Module-2: 40 Marks.
- The students shall answer two full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.

Reference Books:

1. Building Services for Water Supply and Sanitation by Panchdhare.
2. Water Supply and Sanitary Engineering, by Rangawala
3. Architectural Acoustics and Noise Control – Theory, Design, Practice – Allied Publishers.
4. Mechanical and Electrical Systems by McGrainess and Stein, John Willey and Sons, 1977.

Course Title: Project Work Phase I + Seminar

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VII

Subject Code	15CTL78	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	42	Exam. Hours	03
CREDITS – 02		Total Marks-100	
<p>Project Phase-I + Seminar: The problem (analytical/ computational / experimental / design oriented / statically) shall be selected after detailed discussion with guide and H.O.D. The project shall have following features:</p> <p>Literature Survey, Problem Identification, Objectives and Methodology, Submission of synopsis and seminar</p> <p>The Project Phase-I report shall be submitted in the prescribed standard format shall be submitted after certification by the Guide and H.O.D.</p>			

Course Title: CONTRACTS MANAGEMENT [As per Choice Based Credit System (CBCS) scheme] SEMESTER – VIII			
Subject Code	15CT81	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
Course objectives: This course will enable students to;			
<ol style="list-style-type: none"> 1. Gain knowledge of contracts management in construction industry 2. Understand the tendering process for awarding of contract in India & all over the world. 3. Apply the knowledge of resolution technique in resolving disputes in construction industry. 			
Modules		Revised Bloom's Taxonomy (RBT) Level	
Module -1:			
Introduction to contracts Definitions, Essentials for a legally valid contract, Salient features of a contract, Discharging of a contract, Documents for an Engineering Contract; Types of contracts: Classification Based on – Tendering Process, Economic Consideration, Tasks Involved; Main and Sub Contracts, Features, Merits, Demerits.		10 Hours	L1,L2
Module -2:			
Tendering process Definitions, List of Documents, EMD, SD, Preparation of Enquiry Documents, Invitation for Tenders, Preparation of Tender Documents and its submission, Receipt of Tender Documents and its opening, Evaluation of Tender and Award of contract – Letter of Award, Letter of Intent, Issues in tendering process: Pre - Registration, Pre – Qualification, Nominated Tendering, Rejection of Tenders.		10 Hours	L1,L2,L4
Module-3:			
Administration/Performance of contract Responsibilities (Duties and Liabilities) of Principal & Contractor, Settlement of claims – Advances, Bills, Extension for time, Extras & Variations, Cost Escalations. Security Deposit, Retention Money, Performance Bond. Breach of contract Definition and Classification, Common Breaches by – Principal, Contractor, Damage Assessment, Claims for Damages, Quantum Meruit, Force Majeure or Frustration.		10 Hours	L1,L2,L4

Module -4:		
Dispute resolution General, Methods for dispute resolution – Negotiations, Mediation, Conciliation, Dispute Resolution Boards, Arbitration, Litigation/Adjudication by courts. Conciliation – Appointment of Conciliator, Role of Conciliator. Arbitration – Arbitration Agreement, Terms of Reference, Arbitrator’s Powers, Revocation of Arbitrator – Misconduct of Arbitrator. Case Studies	10 Hours	L1,L2,L4
Module -5:		
International contracts / contracts with international funding International Competitive Bidding, Domestic Preference, FIDIC Documents, Conditions, Currency of Bid and Payment, Escalation in Foreign Currency, Financing of projects, Applicable Law and Settlement of Disputes, International Arbitration.	10 Hours	L1,L2
Course outcomes: After studying this course, students will be able to: <ol style="list-style-type: none"> 1. Recall the procedural knowledge of construction contracts. 2. Select the tendering process for awarding of construction contracts. 3. Practise the resolution technique for resolving disputes in construction industry. 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
Question paper pattern: <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
Text Books: <ol style="list-style-type: none"> 1. Prakash V. A.,(1997) “Contracts Management in Civil Engineering Projects”, NICMAR 2. Patil B. S.,(2009) “Civil Engineering Contracts and Estimates”, University Press. 		

Reference Books:

1. John G. Betty(1993/ Latest Edition) “Engineering Contracts”, McGraw Hills.
2. Gt Gajria's “Law Relating to Building and Engineering Contracts in India” 2000
3. Albett Robert W., (1961/ Latest Edition) "Engineering Contracts and Specifications”, John Willey and Sons, New York.
4. Vaid K.N., (1998)"Global perspective on International Construction Contracting Technology and Project Management", NICMAR, Mumbai.

Course Title: CONSTRUCTION SAFETY MANAGEMENT

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VIII

Subject Code	15CT82	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 04		Total Marks-100	
Course objectives: This course will enable students to; <ol style="list-style-type: none">1. Understand the concepts of safety management relevant to construction industry.2. Describe the safety practises to be followed to prevent common hazards in construction sites.3. Apply the knowledge for designing safety management to a construction site.			
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level	
Module -1:			
Safety Management Introduction, salient features of safety programs, general safety programs for construction. Safe working environment, Safety clauses in contract documents, Safety programme, Safety policy, Safety department, safety officers, safety records, safety training. Safety lacunae in Indian Construction Industry SAFETY STANDARDS Indian standards for safety in construction, BIS standards, American National Standards.	10 Hours	L1,L2	
Module -2:			
DESIGNING FOR SAFETY Safety clause in a typical contract document, Scheme for safety, Breach of safety regulations, General safety condition, Safety culture, Company activities and safety, Project co-ordination and safety procedures, Workers compensation.	10 Hours	L1,L2	
Module-3:			
CONSTRUCTION ACCIDENTS AND SAFETY Accident- Causes, Effects and Safety measures, Legal requirements, Responsibility of the employers. Reporting occurrence of accidents, Reporting occurrence of hazards, Action to be taken by the Site-in-charge in case of accidents.	10 Hours	L1,L2	
Module -4:			
FIRE PREVENTION AND CONTROL Understanding fire chemistry, Behaviour of fuels in fire, Fire causes, Types of extinguishers and use, Fire prevention planning, Check list for fire prevention. Emergency Escape-Means of Escape, Evacuation, Occupant fire fighting.	10 Hours	L1,L2	

Module -5:		
COMMON HAZARDS Dust, Impregnated timber, Lead poisoning, Toxic fumes, Noise, Code of practice for reducing noise, Vibration, Power supply, Lighting, Maintenance, House-keeping, Materials, Movement, Drowning, Openings, Weight.	10 Hours	L1,L2
Course outcomes: After studying this course, students will be able to: <ol style="list-style-type: none"> 1. Define the safety concepts pertaining to safety management in construction industry. 2. Illustrate the safety practises to mitigate common hazards in construction site. 3. Prepare a safety management framework for implementing in construction site. 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
Question paper pattern: <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
Text Books: <ol style="list-style-type: none"> 1. Construction Safety Management, NICMAR Publications, Hyderabad, October 2003. 		
Reference Books: <ol style="list-style-type: none"> 1. Jimmy W. Hinze, construction safety, Prentice hall Inc 1997 2. Richard.J.Coble, Jimmoe and TheoeHampt, Construction Safety and Health Management, Prentice Hall Inc 2001. 		

Course Title: REPAIR & REHABILITATION OF STRUCTURES

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VIII

Subject Code	15CT831	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students to;			
<ol style="list-style-type: none">1. Gain knowledge of NDT techniques for condition assessment of structures for identifying damages in structures.2. Understand the use of repair material and retrofitting strategy suitable for distress.3. Predict causes for distress and deterioration of structures & prepare guidelines for repair management of deteriorated structures.			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
Assessment of Structural Strength – Need and approach, Testing methodology, Insitu testing of Structures – Methods. Nondestructive testing of concrete structures – Schmidt hammer, Ultrasonic sounding, core drilling, probes. Assessment of carbonation and permeability testing of steel, masonry and wooden structures.		08 Hours	L1,L2
Module -2:			
Diagnosis, damage assessment parameters for repair / restoration strategies, specification and detailing. Repair methods for concrete structures - slabs, beams, columns and foundations. Chemicals and materials for repair and restoration – classification – Bonding agents, adhesives Grout fillers, reinforcements polymer infrastructure fibres, etc., Tools for repairs.		08 Hours	L1,L2
Module-3:			
Earthquake and dynamic load induced damages. Bracing foundation isolation, dampers and Ductility provisions. Repair strategies- Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.		08 Hours	L1,L2
Module -4:			
Fire resistance – Fire rating – Fire damage assessment and restoration measures for concrete and steel structures, Retrofitting and Strengthening of Structures, Need, Strategies		08 Hours	L1,L2

and Techniques Retrofitting – steel and concrete bridges. Retrofitting of buildings of earthquake resistance.		
Module -5:		
Special topics – Architectural Restoration – Cracks and waterproofing, Demolition of Structures. Deconstruction of Structures, Case Studies.	08 Hours	L1,L2
<p>Course outcomes: After studying this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Describe NDT techniques for condition assessment of structures for identifying damages in structures. 2. Select repair material and retrofitting strategy suitable for distress. 3. Estimate causes for distress and deterioration of structures & formulate guidelines for repair management of deteriorated structures. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Repair of Concrete Structures by R.T.L. Allen & S.C. Edwards (Ed), Blackie, 1987. 2. Testing during Concrete Construction by Releur Workshop, Chapman & Hall, 1991, Rexom&Maihaganom – Et FN Spon, 1986. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. The Testing of Concrete in Structures by John M. Bungey, Survey Univ Press (Dh & Hall) 1982, 2. Structural Renovation of Buildings Details & Design Examples by Newman P.E., Methods, McGraw Hill, 2001. 3. Rehabilitation of Renovation and Reconstruction Bedle by R. Jagadeesh, ASCE /ACI Journal. 		

Course Title: Urban Transportation & Planning

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VIII

Subject Code	15CT832	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	

Course objectives: This course will enable students to;

1. Know the land use pattern, transportation needs and forecast present conditions for future years for the development of urban transport system.
2. To generate transportation inventories and develop to solution for the trip generation using various trip distribution models.
3. To characterize the modal split and assign the trips generated of transportation means for various categories to cities and apply the latest computerial for transportation planning.

Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:		
INTRODUCTION: Scope of Urban transport planning – Inter dependency of land use and traffic – System Approach to urban planning. URBAN TRANSPORT SURVEY - Definition of study area- Zoning-Types of Surveys – Inventory of transportation facilities – Expansion of data from sample.	08 Hours	L1,L2
Module -2:		
STAGES IN URBAN TRANSPORT PLANNING: Trip generation – Trip production - Trip distribution – Modal split – Trip assignment. TRIP GENERATION: Trip purpose – Factors governing trip generation and attraction – Category analysis – Problems on above	08 Hours	L1,L2
Module-3:		
TRIP DISTRIBUTION Methods – Growth factors methods – Synthetic methods – Fractor and Furness method and problems on the above.	08 Hours	L1,L2,L3
Module -4:		
MODAL SPLIT Factors affecting – characteristics of split – Model split in urban transport planning – problems on above TRIP ASSIGNMENT Assignment Techniques – Traffic fore casting – Land use transport models – Lowry Model – Garin Lowry model –	08 Hours	L1,L2,L3

Applications in India – (No problems on the above)		
Module -5:		
URBAN TRANSPORT PLANNING FOR SMALL AND MEDIUM CITIES Introduction – Difficulties in transport planning – Recent Case Studies.	08 Hours	L1,L2
<p>Course outcomes: After studying this course, students will be able to:</p> <ol style="list-style-type: none"> 1. Describe the land use pattern, transportation needs and forecast future development of urban transport system. 2. Summarize transportation inventories and develop to solution for the trip generation using various trip distribution models. 3. Develop the modal split and assign the trips generated of transportation means for various categories to cities and apply the latest computerial for transportation planning. 		
<p>Program Objectives (as per NBA)</p> <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Traffic Engineering and Transport Planning- L.R. Kadiyali - Khanna Publishers. 2. Principles of Urban Transport System Planning - B.G. Hutchinson - Scripta Book Co., Washington D.C. & McGraw Hill Book Co. 3. Introduction to transportation engineering- JotinKristey and Kentlal - PHI, New Delhi. 		
<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Urban Transport planning- Black John - Croom Helm ltd, London. 2. Urban and Regional models in geography and planning- Hutchison B G - John Wiley and sons London. 3. Entropy in urban and regional modeling- Wilson A G - Pion ltd, London. 		

Course Title: ADVANCED FOUNDATION ENGINEERING

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VIII

Subject Code	15CT833	I.A. Marks	20
Number of Lecture Hours/Week	03	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
Course objectives: This course will enable students ; 1. To understand the significance of foundation types in different types of structures. 2. To apply the behavioural knowledge of foundations in the actual field conditions in different types of soil conditions.			
Modules	Teaching Hours	Revised Bloom's Taxonomy (RBT) Level	
Module -1:			
BEARING CAPACITY & SETTLEMENT Presumptive bearing capacity according to BIS, Factors affecting bearing capacity, Factors influencing selection of depth of foundation, types of shallow foundations, Settlement of Shallow Foundations: Immediate, consolidation, & differential settlements, Factors influencing settlement, Safe Bearing Capacity and Allowable Bearing Pressure. SHALLOW FOUNDATIONS Principles of Design of foundation, Definition for Shallow and Deep foundation, Requirements for geotechnical and structural aspects of design, Proportioning of isolated footing, combined footing- rectangular & trapezoidal and Strap footing.	08 Hours	L1,L2	
Module -2:			
PILE FOUNDATIONS – SINGLE PILE Historical Development, Necessity of pile foundations, Classification, Load bearing capacity of single pile by Static formula, Dynamic formula, Pile load test and Penetration tests, Laterally Loaded Pile. PILE FOUNDATIONS – GROUP EFFECT Pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, under reamed piles.	08 Hours	L1,L2	

Module-3:		
WELL FOUNDATIONS Historical Development, Different shapes and characteristics of wells, Components of well foundation. Types of well foundation, Forces acting on well foundation. Sinking of wells. Causes and remedies for tilts and shifts. DRILLED PIERS & CAISSONS Construction, advantages and disadvantages of drilled piers. Design concepts and Advantages & disadvantages of open, pneumatic and floating caissons.	08 Hours	L1,L2
Module -4:		
FOUNDATIONS ON EXPANSIVE SOILS Definition, Identification, Mineral Structure, Index properties of expansive soils, Swell potential and Swell pressure, Free swell, Tests on expansive soils, foundation treatment for structures in expansive soil, CNS layer.	08 Hours	L1,L2
Module -5:		
MACHINE FOUNDATIONS Basic definitions in vibration, free and forced vibrations, determination of natural frequency, types of Machine foundations, general criteria for design of machine foundation., vibration analysis of a machine foundation, degrees of freedom of a block foundation, vibration isolation and control.	08 Hours	L1,L2
Course outcomes: After studying this course, students will be able to: <ol style="list-style-type: none"> 1. Recall the significance of foundation types in different types of structures. 2. Identify the suitable type of foundation based upon its behaviour in the actual field conditions in different types of soil conditions. 		
Program Objectives (as per NBA) <ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis</i> ○ <i>Interpretation of data.</i> 		
Question paper pattern: <ul style="list-style-type: none"> ● The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks ● There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. ● Each full question shall cover the topics as a module ● The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		

Text Books:

1. Soil Mechanics & Foundation Engineering - V.N.S. Murthy - Pub: Sai Tech.
2. Foundation Engineering - Braja M. Das – Cengage Learning.
3. Soil Mechanics Foundations - Dr. B.C. Punmia - Pub: Laxmi publications, pvt. Ltd.

Reference Books:

1. Foundation Engineering - Dr. P.C. Varghese: - Pub: Prentice Hall of India.
2. Foundation Analysis and Design - Bowles J.E. (1996) - 5th Ed, McGraw Hill Pub. Co., New York.
3. Advanced Foundation Engineering - V.N.S. Murthy - Pub : Sai Tech.
2. Pile Foundation.- Chellies
3. Geotechnical Engineering.- P. Purushotham Raj
4. Geotechnical Engineering - Dr. C. Venkataramaiah - Pub: New age Publications.

<p align="center">Course Title: STRUCTURAL MASONRY [As per Choice Based Credit System (CBCS) scheme] SEMESTER – VIII</p>			
Subject Code	15CT834	I.A. Marks	20
Number of Lecture Hours/Week	04	Exam. Marks	80
Total Number of Lecture Hours	40	Exam. Hours	03
CREDITS – 03		Total Marks-100	
<p>Course objectives: This course will enable students;</p> <ol style="list-style-type: none"> To understand procedural knowledge to design a system, component or process as per needs and specifications of masonry system subjected to various load combinations with different boundary conditions. To follow the culture of professional and ethical responsibilities by following codal provisions in the analysis, design and detailing masonry. To analyze the impact of engineering solutions on the society and will be aware of contemporary issues regarding failure of structures due to wrong design. 			
Modules		Teaching Hours	Revised Bloom's Taxonomy (RBT) Level
Module -1:			
<p>Introduction, Masonry units, materials and types:</p> <p>History of masonry Characteristics of Brick, stone, clay block, concrete block, stabilized mud block masonry units – strength, modulus of elasticity and water absorption. Masonry materials – Classification and properties of mortars, selection of mortars.</p>		08 Hours	L1,L2
Module -2:			
<p>Strength of Masonry in Compression:</p> <p>Behaviour of Masonry under compression, strength and elastic properties, influence of masonry unit and mortar characteristics, effect of masonry unit height on compressive strength, influence of masonry bonding patterns on strength, Failure theories of masonry under compression. Effects of slenderness and eccentricity, effect of rate of absorption, effect of curing, effect of ageing, workmanship on compressive strength</p>		08 Hours	L1,L2
Module-3:			
<p>Flexural and shear bond, flexural strength and shear strength:</p> <p>Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength, effect of bond strength on compressive strength, orthotropic strength properties of masonry in flexure, shear strength of masonry, test procedures</p>		08 Hours	L1,L2

Module -4:		
Design of load bearing masonry buildings: Permissible compressive stress, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses, Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels; Wall carrying axial load, eccentric load with different eccentricity ratios, wall with openings, freestanding wall.	08 Hours	L1,L2
Module -5:		
Earthquake resistant masonry buildings: Behaviour of masonry during earthquakes, concepts and design procedure for earthquake resistant masonry, BIS codal provisions. Masonry arches, domes and vaults: Components and classification of masonry arches, historical buildings, construction procedure	08 Hours	L1,L2
Course outcomes: After studying this course, students will be able to:		
<ol style="list-style-type: none"> 1. Describe procedural knowledge to design a system, component or process as per needs and specifications of masonry system subjected to various load combinations with different boundary conditions. 2. Practice the culture of professional and ethical responsibilities by following codal provisions in the analysis, design and detailing masonry. 3. Evaluate the impact of engineering solutions on the society and will be aware of contemporary issues regarding failure of structures due to wrong design 		
Program Objectives (as per NBA)		
<ul style="list-style-type: none"> ○ <i>Engineering Knowledge.</i> ○ <i>Problem Analysis.</i> ○ <i>Interpretation of data.</i> 		
Question paper pattern:		
<ul style="list-style-type: none"> • The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks • There will be two full questions (with a maximum of three subdivisions, if necessary) from each module. • Each full question shall cover the topics as a module • The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module. 		

Text Books:

1. Hendry A.W., "Structural masonry"- Macmillan Education Ltd., 2nd edition
2. Sinha B.P & Davis S.R., "Design of Masonry structures"- E & FN Spon
3. Dayaratnam P, "Brick and Reinforced Brick Structures"- Oxford & IB

Reference Books:

1. Curtin, "Design of Reinforced and Prestressed Masonry"- Thomas Telford
2. Sven Sahlin, "Structural Masonry"-Prentice Hall
3. Jagadish K S, Venkatarama Reddy B V and Nanjunda Rao K S, "Alternative Building Materials and Technologies"-New Age International, New Delhi & Bangalore
4. IS 1905, BIS, New Delhi.
5. SP20(S&T),New Delhi

Course Title: CONSTRUCTION STUDY PROJECT(Internship)

[As per Choice Based Credit System (CBCS) scheme]

SEMESTER – VIII

Subject Code	15CT84	I.A. Marks	50
		Exam. Marks	50
		Exam. Hours	03
CREDITS – 02		Total Marks-100	

Course objectives: This course will enable students to;

1. Apply classroom and laboratory concepts and principles in an industry work environment.
2. To demonstrate the ability to work as a team member to successfully complete the assigned work objectives in an assigned company work group with proper work ethic.

Course Details: Study of a construction project by selecting a on-going construction site, studying and reporting various aspects of construction such as:

1. Tendering process and awarding the contract.
2. Estimation of the project.
3. Scheduling of various events of the construction project.
4. Geotechnical investigation of the site and report.
5. Study of the structural details (wherever feasible).
6. Study of the constructional process.
7. Quality control measures pertaining to the project under consideration.

Construction safety measures pertaining to the project under consideration

Period of study: 2 months

Candidates has to be officially deputed to a construction site. Student shall be evaluated both by site supervisor from construction company and teaching staff from the college. Equal weightage being given to both the valuator.

Course outcomes:

After studying this course, students will be able to:

On Completion of the internship, students will be in a position to express the ability to work as a team member to successfully complete the assigned work objectives in an assigned company work group with proper work ethic.

Course Title: PROJECT WORK
 [As per Choice Based Credit System (CBCS) scheme]
 SEMESTER – VIII

Subject Code	15CTP85	I.A. Marks	100
		Exam. Marks	100
		Exam. Hours	03
CREDITS – 04		Total Marks-200	

Course objectives: This course will enable students;

1. To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
2. To train the students in preparing project reports and to face reviews and viva voce examination.

The problem (analytical/ computational / experimental / design oriented / statically) shall be selected after detailed discussion with guide and H.O.D. The project shall have following features:

- i. Definition of the problem
- ii. Exhaustive literature survey
- iii. Analysis based on type of problem (as given above)
- iv. Conclusions, scope for further work
- v. References.

The Project shall be submitted in the prescribed standard format and four copies shall be submitted after certification by the Guide and H.O.D.

Course outcomes:

After studying this course, students will be able to:

On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

Course Title: SEMINAR			
[As per Choice Based Credit System (CBCS) scheme]			
SEMESTER – VIII			
Subject Code	15CTS86	I.A. Marks	100
Number of Lecture Hours/Week	04		
Total Number of Lecture Hours	50	Exam. Hours	03
CREDITS – 01		Total Marks-100	
<p>Student can choose any topic, of his/her choice, pertaining to Construction Technology and Management. Topic should be a relevant and currently researched one. Students are advised to refer articles published in current journals in the area of Construction Technology and Management for choosing their seminar topics. Student should review minimum of 8 to 10 research papers relevant to the topic chosen, in addition to standard textbooks, handbooks, etc. Students are required to prepare a seminar report, in the standard format and give presentation to the departmental seminar committee.</p>			
Evaluation Pattern:			
Report Evaluation : 50 Marks (by Guide)			
Presentation : 50 Marks.			
Presentation to be evaluated by departmental seminar committee.			
Departmental Seminar Committee : Head of the Department			
:Guide			
: One Subject expert from the department			