

| <b>Course Title: Construction Quality Management</b>  |        |                 |                                      |
|---|--------|-----------------|--------------------------------------|
| [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><b>Course objectives:</b> This course will enable students;</p> <ol style="list-style-type: none"> <li>1. To facilitate the understanding of Quality Management principles and process.</li> <li>2. To remember quality control processes for different works in construction industry.</li> <li>3. To apply the knowledge of Total Quality Management for quality certification of construction projects.</li> </ol>  |        |                 |                                      |
| Modules   |        | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>   |        |                 |                                      |
| <p><b>QUALITY:</b> 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>  |        | <b>10 Hours</b> | <b>L1,L2</b>                         |
| <b>Module -2:</b>   |        |                 |                                      |
| <p><b>TOTAL QUALITY MANAGEMENT:</b> 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> |        | <b>10 Hours</b> | <b>L1,L2,L4</b>                      |

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

**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 Manjural, Satish, Raj Publishing House, Jaipur, 1999.

| <b>Course Title: Building Services-I</b>   |        |                 |                                      |
|--|--------|-----------------|--------------------------------------|
| [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 |                                      |
| <p><b>Course objectives:</b> This course will enable students;</p> <ol style="list-style-type: none"> <li>1. To gain the knowledge of different building services and their types used in buildings.</li> <li>2. To comprehend requirements and constraints in providing building services suitable for buildings.</li> <li>3. To determine design factors of building services suitable for buildings.</li> </ol> |        |                 |                                      |
| Modules  |        | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>  |        |                 |                                      |
| <p><b>Introduction:</b> requirements and necessity of services for buildings.<br/>Types of Building services.<br/>Water supply in buildings- systems of water supply, types of distribution system, appurtenances, Fire water supply system.</p>   |        | <b>10 Hours</b> | <b>L1,L2,</b>                        |
| <b>Module -2:</b>  |        |                 |                                      |
| <p><b>Drainage system of buildings-</b> systems of drainage, methods of carrying refuse from buildings, House Drainage- General Principles, Traps- Classification of Traps and Sanitary Fittings<br/><br/>Air conditioning of buildings- essentials of air-conditioning systems, classification based on function &amp; season, systems, design- AC load calculations, installation and maintenance cost.</p>      |        | <b>10 Hours</b> | <b>L2,L3,L4</b>                      |

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

**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.

| <b>Course Title: Fluid Mechanics and Hydraulic Structures</b>   |        |                 |                                      |
|---|--------|-----------------|--------------------------------------|
| [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><b>Course Objectives:</b> The objectives of this course is to make students to learn:</p> <ol style="list-style-type: none"> <li>1. Basic concepts of fluid, Energy concepts of fluid in open channel, Energy dissipation, Water surface profiles at different conditions.</li> <li>2. The working principles of the hydraulic machines for the given data and analyzing the performance of turbines for various design data.</li> <li>3. Design the open channels of various cross sections including design of economical sections.</li> </ol>   |        |                 |                                      |
| Modules   |        | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>   |        |                 |                                      |
| <p><b>BASIC PROPERTIES OF FLUIDS:</b> Introduction, Definition of Fluid, Systems of units and properties of fluid: Mass density, Specific weight, Specific gravity, Specific volume, Viscosity, Cohesion, Adhesion, Surface tension, &amp; Capillarity. Newton's law of viscosity (theory &amp; problems). Capillary rise in a vertical tube and between two plane surfaces (theory &amp; problems).</p> <p><b>PRESSURE AND ITS MEASUREMENT:</b> 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 &amp; inclined manometer (theory &amp; problems). Introduction to Mechanical and electronic pressure measuring devices.</p> |        | <b>10 Hours</b> | <b>L1,L2,L3</b>                      |
| <b>Module -2:</b>   |        |                 |                                      |
| <p>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.</p> <p><b>DYNAMICS OF FLUID FLOW:</b> 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.</p>  |        | <b>10 Hours</b> | <b>L2,L3,L4</b>                      |

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|--|-----------------|-----------------|
| Momentum equation problems on pipe bends.  |                 |                 |
| <b>Module-3:</b>   |                 |                 |
| 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.<br><br><b>DISCHARGE MEASUREMENTS:</b> Introduction, Venturimeter, Orifice meter, Triangular notch, Rectangular notch, Cipolletti notch.  | <b>10 Hours</b> | <b>L2,L3,L4</b> |
| <b>Module -4:</b>  |                 |                 |
| <b>IMPACT OF JET ON VANES:</b> 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.<br><br><b>FLOW IN OPEN CHANNELS:</b> 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. | <b>10 Hours</b> | <b>L2,L3,L4</b> |
| <b>Module -5:</b>  |                 |                 |
| <b>HYDRAULIC TURBINES:</b> 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.<br><br><b>CENTRIFUGAL PUMPS:</b> 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.   | <b>10 Hours</b> | <b>L2,L3,L4</b> |
| <b>Course outcomes:</b>  |                 |                 |
| 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' (1<sup>st</sup> 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><b>Course objectives:</b> This course will enable students;</p> <ol style="list-style-type: none"> <li>1. To study and understand construction planning and scheduling for successful completion of projects.</li> <li>2. To comprehend the concepts of construction planning for proper organizational management of construction projects.</li> <li>3. To apply the procedural knowledge of planning and scheduling for execution and cost control of inventory in construction.</li> </ol>  |        |                 |                                      |
| Modules   |        | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>   |        |                 |                                      |
| <p><b>Constructing Planning:</b></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                                |
| <b>Module -2:</b>   |        |                 |                                      |
| <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                             |
| <b>Module-3:</b>  |        |                 |                                      |

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|--|-----------------|-----------------|
| Crashing and Time/Cost Tradeoffs – Scheduling in Poorly Structured Problems – Improving and Scheduling Process, work breakdown structure.<br><br>Project scheduling and resource leveling: Introduction, Resource allocation and leveling for unlimited resources, Resource allocation for limited resources, Multi resource allocation, Optimal scheduling.   | <b>10 Hours</b> | <b>L2,L3,L4</b> |
| <b>Module -4:</b>  |                 |                 |
| Cost Control, Monitoring and Accounting<br><br>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.   | <b>10 Hours</b> | <b>L2,L3,L4</b> |
| <b>Module -5:</b>  |                 |                 |
| <b>Organization and Use of Project Information:</b><br><br>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.   | <b>10 Hours</b> | <b>L1,L2</b>    |
| <b>Course outcomes:</b><br><br>After studying this course, students will be able to;<br><br><ol style="list-style-type: none"> <li>1. Recall the concepts in construction planning and scheduling for successful completion of projects.</li> <li>2. Review the elements in construction planning for proper organizational management of construction projects.</li> <li>3. Prepare planning and scheduling structure for execution and cost control of inventory in construction.</li> </ol> |                 |                 |
| <b>Program Objectives (as per NBA)</b><br><br><ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of data.</i></li> </ul>  |                 |                 |

**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 |    |

**Course objectives:** This course will enable students;

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.

| <b>Modules</b>   | <b>Teaching Hours</b> | <b>Revised Bloom's Taxonomy (RBT) Level</b> |
|--|-----------------------|---|
| <b>Module -1:</b>  |                       |   |
| 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). | <b>08 Hours</b>       | <b>L1,L2,L3</b>                             |
| <b>Module -2:</b>  |                       |   |
| 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.  | <b>08 Hours</b>       | <b>L2,L4</b>                                |
| <b>Module-3:</b>   |                       |   |
| 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.  | <b>08 Hours</b>       | <b>L2,L3,L4</b>                             |
| <b>Module -4:</b>  |                       |   |
| Special Techniques in Infrastructure Valuation: Function – Cost – Worth Analysis, Function Analysis System Technique - Technically oriented FAST and Customer-oriented FAST, Weighted Evaluation   | <b>08 Hours</b>       | <b>L2,L3,L4</b>                             |

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| Method - Equal Importance Method.  |                 |              |
| <b>Module -5:</b>  |                 |              |
| 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.  | <b>08 Hours</b> | <b>L2,L3</b> |
| <p><b>Course outcomes:</b></p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> <li>1. Describe the significance of Infrastructure valuation in construction.</li> <li>2. Demonstrate special techniques in Infrastructure valuation.</li> <li>3. Illustrate structured phases of value engineering as analytical and decision-making skills in the valuation job.</li> </ol>   |                 |              |
| <p><b>Program Objectives (as per NBA)</b></p> <ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of data.</i></li> </ul>  |                 |              |
| <p><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks</li> <li>• There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics as a module</li> <li>• 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.</li> </ul> |                 |              |
| <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Estimating &amp; Costing, B. N. Dutta, Chand Publisher</li> <li>2. Text book of Estimating &amp; Costing- G.S. Birde, Dhanpath Rai and sons : New Delhi.</li> </ol>  |                 |              |

**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"><b>Course Title: Ground Improvement Techniques</b></p> <p align="center">[As per Choice Based Credit System (CBCS) scheme]</p> <p align="center">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><b>Course objectives:</b> This course will enable students;</p> <ol style="list-style-type: none"> <li>1. Remember the fundamental concepts of ground improvement techniques</li> <li>2. Understand the concepts of chemical compaction, grouting, geo synthetics, vibration, grouting and other miscellaneous methods.</li> <li>3. Apply factual knowledge to solve problems in the field for modification of ground required for construction of civil engineering structures.</li> </ol>   |                       |   |    |
| <b>Modules</b>   | <b>Teaching Hours</b> | <b>Revised Bloom's Taxonomy (RBT) Level</b> |    |
| <b>Module -1:</b>  |                       |   |    |
| <b>GROUND IMPROVEMENT:</b> 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.   | <b>08 Hours</b>       | <b>L1,L2</b>                                |    |
| <b>Module -2:</b>  |                       |   |    |
| <b>COMPACTION:</b> 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. | <b>08 Hours</b>       | <b>L1,L2,L4</b>                             |    |



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|---|-----------------|-----------------|
| <b>Module-3:</b>  |                 |                 |
| <p><b>HYDRAULIC MODIFICATION:</b> 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><b>DRAINAGE &amp; PRELOADING:</b> Importance, Vertical drains, Sand drains, Drainage of slopes, Electro kinetic dewatering, Preloading.</p>   | <b>08 Hours</b> | <b>L1,L2,L4</b> |
| <b>Module -4:</b>   |                 |                 |
| <p><b>CHEMICAL MODIFICATION-I:</b> 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><b>CHEMICAL MODIFICATION-II:</b> 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> | <b>08 Hours</b> | <b>L1,L2</b>    |
| <b>Module -5:</b>   |                 |                 |
| <p><b>GROUTING:</b> Introduction, Effect of grouting. Chemicals and materials used. Types of grouting. Grouting procedure, Applications of grouting.</p> <p><b>MISCELLANEOUS METHODS (ONLY CONCEPTS &amp; USES):</b> Soil reinforcement, Thermal methods, Ground improvement by confinement – Crib walls, Gabions and Mattresses, Anchors, Rock bolts and soil nailing. Stone Column, Micro piles.</p>  | <b>08 Hours</b> | <b>L1,L2</b>    |
| <p><b>Course outcomes:</b></p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> <li>1. Define the fundamental concepts of ground improvement techniques.</li> <li>2. Select suitable technique such as chemical compaction, grouting, geo synthetics, vibration, grouting and other miscellaneous methods for improving ground conditions.</li> <li>3. Solve problems in the actual field conditions for modification of ground required for construction of civil engineering structures</li> </ol>   |                 |                 |

**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.

| <b>Course Title: Water Supply and Sanitation</b>  |         |                 |                                      |
|---|---------|-----------------|--------------------------------------|
| [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><b>Course objectives:</b> This course will enable students;</p> <ol style="list-style-type: none"> <li>1. Evaluate the sources and conveyance systems for raw and treated water.</li> <li>2. Study drinking water quality standards and to illustrate qualitative analysis of water.</li> <li>3. Analyze the variation of water demand and to estimate water requirement for a community.</li> <li>4. Design physical, chemical and biological treatment methods to ensure effective treatment of sewage</li> </ol>  |         |                 |                                      |
| Modules   |         | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>   |         |                 |                                      |
| <p><b>Introduction:</b> Requirement of water for various beneficial uses, need for protected water supply.</p> <p><b>Demand of Water:</b> 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><b>Quality of Water:</b> 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> |         | <b>08Hours</b>  | <b>L1,L2</b>                         |
| <b>Module -2:</b>   |         |                 |                                      |
| <p>Drinking water standards- BIS &amp; WHO standards, Health significance of Fluoride, Nitrates.</p> <p><b>Water Treatment:</b> Objectives - Treatment flowchart. Aeration - Principles, types of aerators.</p> <p><b>Sedimentation:</b> Theory, settling tanks, types and design. Aided s</p> <p><b>Filtration:</b> Mechanism - theory of filtration, types of filters, slow</p>   |         | <b>08 Hours</b> | <b>L2,L4</b>                         |

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| sand, rapid sand and pressure filters including construction, operation, cleaning.   |                 |              |
| <b>Module-3:</b>   |                 |              |
| <p><b>Disinfection:</b> Theory of disinfection, methods of disinfection, Chlorination, chlorine demand, residual chlorine.</p> <p><b>Softening:</b> 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><b>Methods of Distribution Systems:</b> System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems. -</p> <p><b>Miscellaneous:</b> pipe fittings, location of water supply pipes in buildings</p>  | <b>08 Hours</b> | <b>L1,L2</b> |
| <b>Module -4:</b>  |                 |              |
| <p>Waste water disposal - Necessity for sanitation, methods of sewage disposal, types of sewerage systems and their suitability.</p> <p><b>Quantity of Sewage:</b> 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><b>Sewer Appurtenances:</b> 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> | <b>08 Hours</b> | <b>L1,L2</b> |
| <b>Module -5:</b>  |                 |              |

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|--|------------------------|---------------------|
| <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><b>08 Hours</b></p> | <p><b>L1,L2</b></p> |
| <p><b>Course outcomes:</b></p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> <li>1. Evaluate available sources of water, quantitatively and qualitatively and make appropriate choice for a community.</li> <li>2. Determine water quality and environmental significance of various parameters and plan suitable treatment system.</li> <li>3. Estimate average and peak water demand for a community.</li> <li>4. Design a comprehensive water treatment and distribution system to purify and distribute water to the required quality standards.</li> </ol>  |                        |                     |
| <p><b>Program Objectives (as per NBA)</b></p> <ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of data.</i></li> </ul>  |                        |                     |
| <p><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks</li> <li>• There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics as a module</li> <li>• 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.</li> </ul> |                        |                     |
| <p><b>Text Books:</b></p> <ol style="list-style-type: none"> <li>1. Garg, S.K., “Water Supply Engineering”, Khanna Publishers, 5<sup>th</sup> Edn, 1992</li> <li>2. Garg, S.K, “Waste Water Treatment” - Khanna Publishers, 4<sup>th</sup> Ed., 1992</li> <li>3. Punmia B.C. and Ashok Kumar Jain, “Environmental Engineering- I / II”, Arihant Publications, 3<sup>rd</sup> Edn, 1995</li> </ol>  |                        |                     |

**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

| <b>Course Title: Landscape Design and Planning</b>   |         |                 |                                      |
|--|---------|-----------------|--------------------------------------|
| [As per Choice Based Credit System (CBCS) scheme]  |         |                 |                                      |
| SEMESTER – VI  |         |                 |                                      |
| 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><b>Course objectives:</b> This course will enable students;</p> <ol style="list-style-type: none"> <li>1. To understand the components and types in landscape design and construction.</li> <li>2. To apply the factual knowledge of design and construction of landscaping for improving aesthetic quality of the structure.</li> </ol>  |         |                 |                                      |
| Modules  |         | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>  |         |                 |                                      |
| 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.  |         | <b>12 Hours</b> | <b>L1,L2</b>                         |
| <b>Module -2:</b>  |         |                 |                                      |
| Site studies and site planning<br>Understanding different site characteristics and evaluation of their potential for development.<br>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.<br>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). |         | <b>08 Hours</b> | <b>L1,L2</b>                         |

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



**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 – Brian Hacheat.
3. Land and Landscape Brenda Colise
4. Common trees – Santapaer
5. Beautiful Shrubs – Pratibha Devi

| <b>Course Title: OPERATION RESEARCH</b>   |         |                 |                                      |
|---|---------|-----------------|--------------------------------------|
| [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><b>Course objectives:</b> This course will enable students;</p> <ol style="list-style-type: none"> <li>To understand the basic concepts of optimization techniques in construction industry.</li> <li>To apply the techniques for different operations for successful completion of construction projects</li> </ol>   |         |                 |                                      |
| Modules   |         | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>   |         |                 |                                      |
| <p><b>INTRODUCTION:</b> 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><b>LINEAR PROGRAMMING PROBLEMS:</b> 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> |         | <b>08 Hours</b> | <b>L1,L2,L3,L4</b>                   |
| <b>Module -2:</b>   |         |                 |                                      |

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|--|------------------------|------------------------|
| <p><b>TRANSPORTATION PROBLEM:</b> 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><b>08 Hours</b></p> | <p><b>L2,L3,L4</b></p> |
| <p><b>Module-3:</b></p>  |                        |                        |
| <p><b>SEQUENCING:</b> 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><b>QUEUING THEORY:</b> 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><b>08 Hours</b></p> | <p><b>L2,L3,L4</b></p> |
| <p><b>Module -4:</b></p>   |                        |                        |
| <p><b>PERT-CPM TECHNIQUES:</b> 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><b>08 Hours</b></p> | <p><b>L2,L3,L4</b></p> |
| <p><b>Module -5:</b></p>   |                        |                        |
| <p><b>GAME THEORY:</b> 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><b>INTEGER PROGRAMMING:</b> Gomory's technique, branch and bound logarithm for integer programming problems, zero one algorithm.</p>   | <p><b>08 Hours</b></p> | <p><b>L2,L3,L4</b></p> |
| <p><b>Course outcomes:</b></p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> <li>1. Describe the concepts of optimization techniques in construction industry.</li> <li>2. Demonstrate the techniques for different operations for successful completion of construction projects.</li> </ol>                                  |                        |                        |

**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. 5<sup>th</sup> edition 2001.
6. Operations Research: Principles and practice: Ravindran, Phillips & Solberg, Wiley India lts, 2<sup>nd</sup> Edition 2007.
7. Operations Research, Prem Kumar Gupta, D S Hira, S Chand Pub, New Delhi, 2007.

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

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|--|-----------------|--------------|
| <b>Module-3:</b>   |                 |              |
| 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.  | <b>08 Hours</b> | <b>L1,L2</b> |
| <b>Module -4:</b>  |                 |              |
| 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.  | <b>08 Hours</b> | <b>L2,L4</b> |
| <b>Module -5:</b>  |                 |              |
| EIA for Water resource developmental projects, Highway projects: Nuclear-Power plant projects, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities.   | <b>08 Hours</b> | <b>L1,L2</b> |
| <b>Course outcomes:</b>  |                 |              |
| <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> <li>1. Recall the concepts of EIA study to be followed for developmental activities.</li> <li>2. Identify the environmental attributes, methodology to implement in EIA study.</li> <li>3. Formulate EIA plans to predict the impact of development activities on environment.</li> </ol>  |                 |              |
| <b>Program Objectives (as per NBA)</b>   |                 |              |
| <ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of data.</i></li> </ul>  |                 |              |
| <b>Question paper pattern:</b>   |                 |              |
| <ul style="list-style-type: none"> <li>● The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks</li> <li>● There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.</li> <li>● Each full question shall cover the topics as a module</li> <li>● 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.</li> </ul> |                 |              |

**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

| <b>Course Title: Human Resource Management</b>   |         |                 |                                      |
|--|---------|-----------------|--------------------------------------|
| [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 |                                      |
| <b>Course objectives:</b> This course will enable students;  |         |                 |                                      |
| <ol style="list-style-type: none"> <li>1. Understand current issues, trends, practices, and processes in planning and managing key human resource functions within organizations</li> <li>2. Contribute to employee performance management and organizational effectiveness to improve employability skills.</li> </ol>  |         |                 |                                      |
| Modules  |         | Teaching Hours  | Revised Bloom's Taxonomy (RBT) Level |
| <b>Module -1:</b>  |         |                 |                                      |
| 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: |         | <b>08 Hours</b> | <b>L1,L2</b>                         |

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|--|-----------------|--------------|
| Organization culture, work stress, organizational changes and development.   |                 |              |
| <b>Module -2:</b>  |                 |              |
| <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>   | <b>08 Hours</b> | <b>L1,L2</b> |
| <b>Module-3:</b>   |                 |              |
| <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>   | <b>08 Hours</b> | <b>L1,L2</b> |
| <b>Module -4:</b>  |                 |              |
| <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> | <b>08 Hours</b> | <b>L1,L2</b> |
| <b>Module -5:</b>  |                 |              |



|  |                        |                     |
|--|------------------------|---------------------|
| <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><b>08 Hours</b></p> | <p><b>L1,L2</b></p> |
| <p><b>Course outcomes:</b></p> <p>After studying this course, students will be able to;</p> <ol style="list-style-type: none"> <li>1. Identify current issues, trends, practices, and processes in planning and managing key human resource functions within organizations.</li> <li>2. Practise techniques foremployee performance management and organizational effectiveness to develop employability skills.</li> </ol>  |                        |                     |
| <p><b>Program Objectives (as per NBA)</b></p> <ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of data.</i></li> </ul>  |                        |                     |
| <p><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks</li> <li>• There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics as a module</li> <li>• 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.</li> </ul>               |                        |                     |
| <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Aswathappa A., (2000) "Organizational Behaviour: Texts and cases Himalaya Publishing House, Mumbai.</li> </ol>  |                        |                     |

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. Gupta C.B., (2003) "Human Resource Management", Sultan Chand and Sons, New Delhi

| <b>Course Title: CONSTRUCTION TECHNOLOGY LABORATORY</b>   |                    |                                      |    |
|---|--------------------|--------------------------------------|----|
| [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                      |    |
| <b>Course objectives:</b> This course will enable students;   |                    |                                      |    |
| Apply the procedural knowledge of construction activities to adhere to quality and good workmanship in works such as masonry, concreting and bar bending. |                    |                                      |    |
| Modules   | Teaching Hours     | Revised Bloom's Taxonomy (RBT) Level |    |
| <b>Module -1:</b>   |                    |                                      |    |
| Construction of Masonry: Bonding patterns (Joints Alignment, Level and Plumb maintenance) Constructing wall panels, New CBR method standard Procedure.    | <b>10 Hours</b>    | <b>L1,L2,L3,L4</b>                   |    |
| <b>Module -2:</b>   |                    |                                      |    |
| Plastering: Mixing Technique of applying plaster using trowel, float etc, Plastering vertical surface to plumb.   | <b>06 Hours</b>    | <b>L2,L3,L4</b>                      |    |

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

**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                             |    |
| <b>Course objectives:</b> This course will enable students;<br>Understand the software required for estimating the quantities of different works and scheduling of different works for successful completion of construction projects.  |                                     |   |    |
| <b>Modules</b>  | <b>Teaching Hours</b>               | <b>Revised Bloom's Taxonomy (RBT) Level</b> |    |
| <b>Module -1:</b><br><b>MS Excel:</b> 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.<br>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.)<br>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.).<br><br>Development of spreadsheet for Estimation and Design of basic structural elements | <b>12 Hours</b>                     | <b>L1,L2,L4</b>                             |    |

|  |                 |                    |
|--|-----------------|--------------------|
| <b>Module -2:</b>  |                 |                    |
| MICROSOFT PROJECT SCHEDULING<br>1. INTRODUCTION TO PROJECT MANAGEMENT<br>2. CREATING CALENDER<br>3. TASK AND ITS RELATIONSHIP<br>4. WORK BREAKDOWN STRUCTURES<br>5. CONSTRAINTS & RECURRING TASK<br>6. DEFING AND ASSIGN RESOURCES<br>7. RESOURCE ANALYSIS & LEVELLING<br>8. TRACKING<br>9. EARNED VALUE ANALYSIS<br>10. MULTIPLE PROJECTS<br>11. CUSTOMISATION & FORMATTING<br>12. REPORTS  | <b>30 Hours</b> | <b>L2,L3,L4,L5</b> |
| <p><b>Course outcomes:</b></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><b>Program Objectives (as per NBA)</b></p> <ul style="list-style-type: none"> <li>○ <i>Engineering Knowledge.</i></li> <li>○ <i>Problem Analysis.</i></li> <li>○ <i>Interpretation of data.</i></li> </ul>  |                 |                    |
| <p><b>Question paper pattern:</b></p> <ul style="list-style-type: none"> <li>• The question paper will <b>two</b> questions from any module.</li> <li>• There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics as a module.</li> <li>• Module-1: 30 Marks, Module-2: 50 Marks.</li> <li>• 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.</li> </ul> |                 |                    |
| <p><b>Text Books:</b></p> <ul style="list-style-type: none"> <li>• Microsoft Office Excel, Microsoft Corporation.</li> <li>• MS Project - User manual, Microsoft Corporation.</li> </ul>   |                 |                    |