S Y L L A B U S
For B.E. CIVIL V & VI Semester (2016-17)
## V Semester

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Credits</th>
<th>Hrs Per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td>Lecture</td>
</tr>
<tr>
<td>1</td>
<td>UMA501C</td>
<td>Design of RC structures</td>
<td>04</td>
<td>04</td>
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<tr>
<td>2</td>
<td>UCV502C</td>
<td>Structural Analysis II</td>
<td>04</td>
<td>04</td>
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<tr>
<td>3</td>
<td>UCV503C</td>
<td>Geotechnical Engg –I</td>
<td>04</td>
<td>04</td>
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<tr>
<td>4</td>
<td>UCV514C</td>
<td>Hydraulic Engineering</td>
<td>04</td>
<td>04</td>
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<tr>
<td>5</td>
<td>UHS515H</td>
<td>Management and Entrepreneurship</td>
<td>03</td>
<td>03</td>
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<tr>
<td>6</td>
<td>UCV53XE</td>
<td>Elective - I</td>
<td>03</td>
<td>03</td>
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<tr>
<td>7</td>
<td>UCV516L</td>
<td>Computer Aided Design Laboratory</td>
<td>01</td>
<td>00</td>
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<td>8</td>
<td>UCV517L</td>
<td>Fluid Mechanics Lab</td>
<td>01</td>
<td>00</td>
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<tr>
<td>9</td>
<td>UCV518L</td>
<td>Highway material Testing Lab</td>
<td>01</td>
<td>00</td>
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<tr>
<td>10</td>
<td>UMA002A*</td>
<td>Advanced Mathematics- II</td>
<td>04</td>
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**Total Credits**: 25 22 0 0

## ELECTIVES-I

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Credits</th>
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<tbody>
<tr>
<td>01</td>
<td>UCV531E</td>
<td>Air Pollution and Control</td>
<td>03</td>
</tr>
<tr>
<td>02</td>
<td>UCV532E</td>
<td>Railway &amp; Airport Engineering</td>
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## VI Semester

<table>
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<tr>
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<tbody>
<tr>
<td></td>
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<td></td>
<td>Lecture</td>
</tr>
<tr>
<td>1</td>
<td>UMA601C</td>
<td>Design and Drawing of RC structures</td>
<td>04</td>
<td>03</td>
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<tr>
<td>2</td>
<td>UCV612C</td>
<td>Environmental Engg - I</td>
<td>04</td>
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<td>3</td>
<td>UCV603C</td>
<td>Geotechnical Engg –II</td>
<td>04</td>
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<td>UCV615C</td>
<td>Hydrological and Irrigation Engg</td>
<td>04</td>
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<td>5</td>
<td>UCV625C</td>
<td>Elective - II</td>
<td>04</td>
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<td>6</td>
<td>UCV6XXE</td>
<td>Elective - III</td>
<td>03</td>
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<td>7</td>
<td>UCV617L</td>
<td>Geotechnical Engg Lab</td>
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<td>8</td>
<td>UCV618L</td>
<td>Environmental Lab</td>
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**Total Credits**: 26 22 0 0

## ELECTIVES-II

<table>
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<tr>
<th>Sl. No.</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Credits</th>
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<tbody>
<tr>
<td>01</td>
<td>UCV623E</td>
<td>Matrix Method of Structural Analysis</td>
<td>04</td>
</tr>
<tr>
<td>02</td>
<td>UCV625E</td>
<td>Ground Water Hydrology</td>
<td>04</td>
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<tr>
<td>03</td>
<td>UCV642E</td>
<td>Environment Impact Assessment</td>
<td>04</td>
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## ELECTIVES-III

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>UCV621E</td>
<td>Alternative Building Materials &amp; Technologies</td>
<td>03</td>
</tr>
<tr>
<td>02</td>
<td>UCV631E</td>
<td>Geographic Information Systems</td>
<td>03</td>
</tr>
<tr>
<td>03</td>
<td>UCV633E</td>
<td>Highway geometric Design</td>
<td>03</td>
</tr>
</tbody>
</table>
UCV 501C: DESIGN OF RC STRUCTURES
4 Credits (4-0-0)

UNIT-I

1. GENERAL FEATURES OF REINFORCED CONCRETE
   1.1. Introduction
   1.2. Design loads
   1.3. Materials for reinforced concrete
   1.4. Code requirements of reinforcements
   1.5. Elastic theory of RC sections
   1.6. Moment of resistance of section
   1.7. Balanced, under reinforced and over reinforced section

2. PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF RC SECTION
   2.1. Philosophy of limit state design
   2.2. Principles of limit states
   2.3. Factor of safety
   2.4. Characteristic and design loads
   2.5. Characteristic and design strength
   2.6. General aspects of ultimate strength
   2.7. Stress block parameters for limit state of collapse
   2.8. Ultimate flexural strength of rectangular sections
   2.9. Ultimate flexural strength of flanged sections
   2.10. Ultimate flexural strength of doubly reinforced sections
   2.11. Ultimate shear strength of RC sections
   2.12. Ultimate torsional strength of RC sections
   2.13. Concepts of development length and anchorage
   2.14. Analysis examples for rectangular sections, flanged sections, doubly reinforced sections, shear strength and development length

UNIT-II

3. SERVICEABILITY LIMIT STATE
   3.1. General aspects
   3.2. Deflection limits in IS: 456-2000
   3.3. Calculation of deflection (Theoretical method)
   3.4. Cracking in structural concrete members

UNIT-III

4. DESIGN OF BEAMS
   4.1. Practical requirements of an RCC beam
   4.2. Size of the beam
   4.3. Cover to the reinforcement
   4.4. Spacing of bars
   4.5. Design procedure
   4.5.1. Critical sections for moments and shear
   4.5.2. Anchorage of bars: check for development length
   4.5.3. Reinforcement requirements
   4.5.4. Slenderness limits for beams to ensure lateral stability
   4.6. Design examples for simply supported and cantilever beams (rectangular and flanged sections)

UNIT-IV

5. DESIGN OF SLABS
   5.1. Introduction
   5.2. General consideration of design of slabs
   5.3. Rectangular slabs spanning in one direction
   5.4. Rectangular slabs spanning in two directions for various boundary conditions
   5.5. Design of simply supported slabs, cantilever slabs and continuous slabs

6. DESIGN OF COLUMNS
   6.1. General aspects
   6.2. Effective length
   6.3. Loads on columns
   6.4. Slenderness limits for columns
   6.5. Minimum eccentricity
   6.6. Design of short axially loaded columns
   6.7. Design of column subject to combined axial load and uniaxial moment using SP16

UNIT-V

7. DESIGN OF FOOTINGS
   7.1. Introduction
   7.2. Load for foundation
   7.3. Design basis (limit state method)
   7.4. Design of isolated rectangular footing for axial load and uniaxial moment
   7.5. Design of pedestal.

8. DESIGN OF STAIR CASE
   8.1. General features
   8.2. Types of stair case
   8.3. Loads on stair cases
   8.4. Effective span as per IS codal provisions
   8.5. Distribution of loading on stairs
   8.6. Design of stair cases
TEXT BOOKS:

REFERENCE BOOKS:
1. Unnikrishnan and Devadas Menon, "Design of reinforced concrete structures," PHI, New Delhi
4. Park and Paulay,” Reinforced Concrete.” John Wiley & Sons
(Note: Use of IS: 456-2000 is permitted and SP-16 to be used in design of columns only)

Question Paper Pattern for SEE:
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.
UCV503C GEOTECHNICAL ENGINEERING-I
4 Credits (4-0-0)

UNIT - I

INTRODUCTION:
History of soil mechanics, Definition, origin and formation of soil. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their inter relationships. 6 Hrs

INDEX PROPERTIES OF SOILS AND THEIR DETERMINATION:
Index Properties of soils- Water content, Specific Gravity, Particle size distribution, Relative Density, Consistency limits and indices, in-situ density, Activity of Clay, Laboratory methods of determination of index properties of soils: Moisture content, Specific gravity, Particle size distribution (Sieve analysis and Hydrometer analysis only), Liquid Limit-Casagrande and cone penetration methods, Plastic limit and shrinkage limit determination. 7 Hrs

UNIT II

CLASSIFICATION OF SOILS:
Purpose of soil classification, basis for soil classification, Particle size classification MIT classification and IS classification, Textural classification. Unified soil classification and IS classification - Plasticity chart and its importance, Field identification of soils. 4 Hrs

CLAY MIERALOGY AND SOILSTUCTURE:
Single grained, honey combed, flocculent and dispersed structures, Valence bonds Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphus substitution. Common clay minerals in soil and their structures - Kaolinite, Illite and Montmorillonite. 7 Hrs

UNIT - III

FLOW OF WATER 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, effective stress concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena. 7 Hrs

COMPACATION OF SOILS:
Definition, Principle of compaction, Standard and Modified proctor's

Course Title With Code: STRUCTURAL ANALYSIS-II(UCV502C)

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Course Objectives</th>
<th>Course Outcomes</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction to definitions, basic concepts associated with parabolic three, two hinged arches and cables. Analysis under point loads and udl.</td>
<td>Knowledge of definitions, basic concepts associated with arches and cables. Classification and comparison with beams. Evaluation of member forces.</td>
</tr>
<tr>
<td>2</td>
<td>Introduction to definitions and basic concepts associated with slope deflection method and moment distribution method. Analysis of continuous beams and rigid frames.</td>
<td>Knowledge of definitions, basic concepts associated with slope deflection method and moment distribution method. Drawing SFD and BMD for continuous beams and rigid frames.</td>
</tr>
<tr>
<td>3</td>
<td>Introduction to definitions and basic concepts associated with kani’s method and matrix methods using system approach. Analysis of continuous beams and rigid frames.</td>
<td>Knowledge of definitions and basic concepts associated with kani’s method and matrix methods by system approach. Drawing SFD and BMD for continuous beams and rigid frames.</td>
</tr>
<tr>
<td>4</td>
<td>Introduction to definitions and basic concepts associated with influence lines, rolling loads, unsymmetrical bending. Analysis of simply supported beams under rolling loads. Stresses in beams due to unsymmetrical bending.</td>
<td>Knowledge of basic definitions and basic concepts associated with influence lines and using them to draw SFD and BMD for SS beam due to rolling loads. Determination of stresses for beams subjected to unsymmetrical bending. Knowledge of shear centre.</td>
</tr>
</tbody>
</table>
compaction tests, factors affecting compaction, effect of compaction on soil properties, Field compaction control, Proctor needle. Compacting equipments, Dynamic compaction, vibroflotation. 6 Hrs
CONSOLIDATION OF SOILS:
Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations (no derivation). Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagande's method. Consolidation characteristics of soil (Cc, av, mv and Cv), Time rate of consolidation. Determination of coefficient of consolidation by square root of time fitting method, logarithmic time fitting method

UNIT IV
SHEAR STRENGTH OF SOILS:
Concept of shear strength, Mohr’s strength theory, Mohr-coulomb theory, conventional and modified failure envelops, Total and effective shear strength parameters, Concept of pore pressure, factors affecting shear strength of soils, Sensitivity and Thixotropy of clay. Measurement of shear parameters- Direct shear test, unconfined compression test, triaxial compression test and vane shear test, Test under different drainage conditions.

TEXTBOOKS:

REFERENCE BOOKS:

Question Paper Pattern for SEE:
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.

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<tbody>
<tr>
<td>1.</td>
<td>Students are exposed to study the index properties and classification of soil and</td>
<td>In a position to identify &amp; classify the soil. And to understand the permeability</td>
</tr>
<tr>
<td></td>
<td>to assess the quantity of seepage in ground &amp; embankments.</td>
<td>characteristics.</td>
</tr>
<tr>
<td>2.</td>
<td>Also to analyze the compaction consolidation for shear strength characteristics</td>
<td>Can inspect the quality control during compaction embankments and Can determine</td>
</tr>
<tr>
<td></td>
<td>of soils.</td>
<td>the shear parameters.</td>
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</table>
UNIT I
Viscous Flow: Reynolds’s experiments-Reynolds's number Laminar flow through circular pipes. Hagen Poiseuille's equation Relation between pipe friction factor and Reynolds number. 06 hrs Elements of Boundary layer theory-Thickness of boundary layer. Laminar and turbulent boundary layer-Boundary layer growth along smooth plate. Total drag force on a flat plate due to laminar and turbulent boundary layer. Force exerted a flowing fluid on a stationary body- Drag and Lift. 06 hrs

UNIT II.
Flow in Open Channels: Difference between pipe flow and open channel flow Type of open channel flow - Uniform and non- Uniform flow. Chezy's and Manning's formulae. Most economical rectangular, trapezoidal and circular channel sections. 06 hrs Flow in Open Channels: Specific energy, specific energy curve, critical depth, alternate depths. Froude's number and its significance. Hydraulic jump in horizontal rectangular channels and Energy losses due to the jump 05 hrs

UNIT III
Dimensional Analysis and Model Similitude: Introduction, Units and dimensions - Dimensional homogeneity - Rayleigh’s method - Buckingham's pi-theorem and its application. Model studies: Introduction, Similitude’s, Dimensionless parameters. 06 hrs

Water Hammer in Pipes: Definition and principle, Equation for pressure rise due to gradual closure of valves in rigid and elastic pipes and problems Pressure due to water hammer in Elastic pipes and rigid pipe material and problems, Surge Tanks: principle and types
Pipe Network Analysis: Hardy-cross method of analysis Newton Rap son method problem on hardy cross method. 06 hrs

UNIT IV
Impulse Momentum Principal and Applications: Momentum equation, impact of jet, Force exerted by a jet on stationary and moving flat and curved plates. Force exerted by jet on series of vanes, work done and efficiency. Concept of inlet and outlet velocity triangles, work done and efficiencies. Hydraulic Turbines: General layout of hydroelectric plants, classification and working principles.
Centrifugal Pumps: Definition, Classification, description and general principles of working -Work done and efficiencies. Priming and its methods Minimum starting speed. 08 hrs

Text Books:

Reference Books:

Question Paper Pattern for SEE :
1. Total ofEight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.

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<tbody>
<tr>
<td>1.</td>
<td>Students are made to understand viscous effect and to know the loss due to viscosity, for the flow which takes place through pipe.</td>
<td>Utilize principles of FM that are appropriate to produce the design component related to hydraulic structures.</td>
</tr>
<tr>
<td>2.</td>
<td>This knowledge can be used to calibrate the different hydraulic equipments.</td>
<td>The graduate will learn importance of FM, its functional elements and characteristics so as to use for design of structures against hydraulic forces.</td>
</tr>
<tr>
<td>3.</td>
<td>To analyze the boundary layer effect, development and growth of boundary layer due to viscous fluid.</td>
<td>Students will be exposed to engineering work that regulate the convergence of water in the pipes as well as open channels.</td>
</tr>
<tr>
<td>4.</td>
<td>To understand the dynamics of flow through open channel. Also to know the efficiency of different types of turbines and centrifugal pump due to the impact of jet.</td>
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</tr>
<tr>
<td>5.</td>
<td>Also to analyze the models for the behavior of prototype structures in the field. To inculcate the knowledge of the water hammer effect due to valve closure for sudden and gradual closure in a pipe line.</td>
<td></td>
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</tbody>
</table>
UHS515H: MANAGEMENT & ENTREPRENEURSHIP
03 Credits (3-0-0)

UNIT - I

UNIT - II
Leading: Human Factors in Managing, Motivation and Motivators, Motivation: Content and Process Theories, Motivational Techniques, A Systems and Contingency Approach to Motivation, Leadership, Ingredients of Leadership, Trait Approaches to Leadership, Leadership Behaviour and Styles, Contingency Approaches to Leadership. 05 Hrs

UNIT - III
Communication Communication, The Communication Function in Organizations, The Communication Process, Communication in the Enterprise, Barriers and Breakdowns in Communication, Toward Effective Communication, Case studies. 05 Hrs
Controlling: The System and Process of Controlling, Control as a Feedback System, Feed forward Control, Requirements for Effective Controls, Control Techniques and Information Technology Control Techniques: The Budget, Traditional Non-budgetary Control, Information Technology, Productivity and Operations, Direct Control versus Preventive Control, Case studies. 05 Hrs

Making, The Importance and Limitations of Rational Decision Making. Types of Decision making. Case studies. 04 Hrs
UNIT-IV

ENTREPRENEURSHIP

Entrepreneur: Meaning of an Entrepreneur, Evolution of the Concept, Functions of an Entrepreneur, Types of Entrepreneurs, Intrapreneur - an Emerging Class. Concept of Entrepreneurship - steps in entrepreneurial process, Role of entrepreneurs in Economic Development; Entrepreneurship in India; Entrepreneurship - Barriers 03 Hrs

Micro Small & Medium Enterprises (MSME): Definition; Characteristics; Need and rationale; Objectives; Scope; role of MSME in Economic Development. Advantages of MSME, Steps to start an MSME - Government policy towards MSME; Impact of Liberalization, Privatisation, Globalization on MSME, Effect of WTO/GATT. 03 Hrs

Institutional Support: Different Schemes; TECSOK, KIADB, KSSIDC, KSIMC, DIC single Window Agency; MSME, NSIC; SIDBI; KSFC. 02 Hrs

Preparation of Project: Meaning of Project, Project Identification, Project Selection, Project Report - Contents; Formulation; Project Appraisal. Identification of Business Opportunities; Market Feasibility studies; Technical Feasibility Studies; Financial Feasibility Studies and Social Feasibility studies (in brief). 02 Hrs

Reference Books:
5. Entrepreneurship Development - S S Khanka - S Chand & Co.

Question Paper Pattern for SEE:
* Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
* Each Question should not have more than four sub divisions.
* Any Five Full questions are to be answered choosing at least one from each unit.

CE516L: COMPUTER APPLICATIONS IN CIVIL ENGINEERING
1 Credit (0-0-2)

INTRODUCTION TO AUTOCAD
Basics of drafting: How to use AUTOCAD for drafting, Basic commands, Draw Modify Tool bars, Coordinate systems, GUI familiarization. (06)

AUTOCAD: APPLICATION TO CIVIL ENGINEERING DRAWINGS

ANALYSIS AND DESIGN SOFTWARES: Analysis and Design of structural Engineering components using commercially available Software's: Cantilevers, Simply supported beams, Propped Cantilevers, Fixed and Continuous Beams. 2D Portal frames - Single and Multistoried. (06)

MICROSOFT EXCEL: APPLICATION TO CIVIL ENGINEERING PROBLEMS
SFD and BMD for cantilever and simply supported beams subjected to UDL throughout the span. Design of singly and doubly reinforced beams, Computation of Earthwork, Design of Horizontal Curve by Offset method and Design of Super Elevation. (10)

LABORATORY ASSESSMENT:
1. Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE).
2. Allocation of 50 marks for CIE
   * Performance and journal write - up:
     Marks for each experiment = 30 marks/ No. of proposed experiments.
   * One Practical test for 20 Marks. (5write-ups, 10 conduction, calculation, results etc., 5viva-voce)
3. Allocation of 50 marks for SEE.
   * 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.
UCV517L FLUID MECHANICS LABORATORY
1 Credit (0-0-2)

2. Calibration of mouth piece.
5. Calibration of trapezoidal notches.
6. Calibration of weirs (Broad and Ogee).
7. Calibration of Venturimeter and Orificemeter.
8. Experiments on major and minor losses in the pipes.
9. Impact of jet on to the flat and hemispherical vanes.

Text books:

1. Fluid mechanics by R.K. Bansal
2. Fluid mechanics and Hydraulic Machines by Modi and Seth.

Laboratory Assessment Each Labrotary Subject is evaluated for 100 marks (50 CIE and 50 SEE)

1. Allocation of 50 marks for CIE "Performance and Journal write-up: Marks for each experiment = 30 marks / No. of proposed experiments. "One Practical test for 20 marks. (5 write-up, 10 conduction, calculation, results etc 5 viva-voice).
2. Allocation of 50 marks for SEE
"25% write-up, 50% conduction, calculation, results etc 25 % viva-voice.

UCV518L HIGHWAY MATERIALS LAB
1 Credit (0-0-2)

1. AGGREGATES: Crushing, abrasion, impact and Shape tests (Flaky, Elongation, Angularity number) Specific gravity and water absorption

2. BITUMINOUS MATERIALS AND MIXES: Specific Gravity, Penetration, Ductility, Softening point, Flash and fire point, Viscosity Marshall Stability tests

3. SUBGRADE SOIL: CBRTest

REFERENCE BOOKS:
1. Relevent IS Codes & IRC Codes
2. High way Material Testing Lab Manual By New Chand & Brothers Note:
1. Minimum Ten Experiments are to be completed.
2. Candidate has to perform two experiments in the Semester Eng Examination

LABORATORY ASSESSMENT:
1. Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE).
2. Allocation of 50 marks for CIE
   * Performance and journal write up:
     Marks for each experiment = 30 marks/ No. of proposed experiments.
   * One Practical test for 20 Marks. (5 write-up, 10 conduction, calculation, results etc., 5 viva-voce)
3. Allocation of 50 marks for SEE
   * 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.
UNIT-I

Introduction: Definition- Classification and Characterization of Air Pollutants, Emission Sources, Behavior and Fate of air Pollutants, Chemical Reactions in the Atmosphere, Photo-chemical Smog, Coal-induced smog. Air Pollution Inventories. 05 Hrs

Effects of Air Pollution: On Human Health, Animals, Plants and Materials- Major Environmental Air Pollution Episodes- London Smog, Los Angeles Smog & Bhopal Gas Tragedy. 05 Hrs

UNIT-II

Meteorology: Meteorological Variables, Primary and Secondary Lapse Rate, Inversions, Stability Conditions, Wind rose, General Characteristics of Stack Plumes, Meteorological Models. Industrial Plant Location and Planning 10 Hrs

UNIT-III


UNIT IV

Air pollution due to automobiles: Air Pollution due to Gasoline Driven and Diesel Driven Engines, Effects, Direct and Indirect Methods of control. 04 Hrs

Burning environmental issues: Acid Rain, Global Warming, Ozone Depletion in Stratosphere, Indoor Air Pollution 03 Hrs

Standards And Legislation: Air Quality and Emission Standards Legislation and Regulation, Air Pollution Index. 03 Hrs

Reference Books:
2. AirPollu8tion Sampling and Analysis APHA

Scheme of Examination: Student has to answer any five full questions out eight, selecting at least one question from each section.
UNIT-I
Railways: of railways in transportation - Historical development of railways in India - Selection of routes, preliminary and location surveys. 02 hrs

Permanent way - Gauges in railways - railway track, cross sections, coning of wheels, rails, rail sections, ballast, sleepers, wear on rails, rail joints, welding of rails, creep of rails, rail fixtures, calculation of quantity of materials needed for laying of tracks. 8 hrs

UNIT-II
Traction and tractive resistances, tractive power, Hauling capacity (Problems on above). 02 hrs

Geometric design of track-grade, ruling grade, minimum gradient, pusher grade, speed of train, super elevation, cant deficiency, negative cant speed calculation based on IR formulae for high speed tracks only (Problems on above). 8 hrs

UNIT-III
Points and Crossing - turnout, design of turnout, Stations and yards, signalling and interlocking, track defects, maintenance of permanent way, track maintenance, level crossing, Indian railway standards. 10 hrs

UNIT-IV
Airport planning - site selection-Aircraft characteristics -Regional planning-A brief description of visibility, Wind characteristics and noise nuisance, High way maintenance and Drainage. 03 hrs

Runway Design: Analysis of wind data by wind rose diagram to find out the best direction of runway.

Basic Patterns of runway: Length of runway - Correction to runway length by ICAO and FAA specifications. Length of runway 05hrs

Taxiway Design: Factors affecting layout of taxiway Geometric of Taxiway, turning radius of taxiways as per ICAO Design of exit taxiways. 03 hrs

Text Books:
3. Khanna, Arora and Jain - Airport Planning and Design- Nemchand Roorkee Scheme of Examination: Students has to answer five questions out of eight selecting at least one question from each part.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Objectives</th>
<th>Course Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>To give brief information’s to the students regarding Railway surveys.</td>
<td>After studying the course the student is able to Getting brief information regarding, rail surveys, different types of rails, sleepers, ballasts etc.</td>
</tr>
<tr>
<td>2.</td>
<td>Types of gauges, rails, rail fastenings, sleepers, Ballast.</td>
<td>Information regarding various types of stations, yards, points and crossings, signals and inter loading etc.</td>
</tr>
<tr>
<td>3.</td>
<td>Curvature of the track, stations and yards. Airport planning.</td>
<td>Select a proper location for an airport.</td>
</tr>
<tr>
<td>4.</td>
<td>Points and crossing, signals and inter loading. Runway and taxiway designing.</td>
<td>Design the runways and taxiways.</td>
</tr>
</tbody>
</table>
### UCV601C: DESIGN & DRAWING OF RC STRUCTURES

**4 CREDITS (3-0-2)**

#### UNIT-A
1. Layout Drawing: General layout of building showing, position of columns, footings, beams and slabs with notations and abbreviations.
2. Beam and Slab floor system, continuous beams.
3. Staircase: Dog legged and Open well.
4. Column footing: Column and footing (Square and Rectangle).

#### UNIT-B
1. Rectangular Combined footing slab and beam type.
2. Retaining walls (Cantilever and counter fort type).
4. Design and detailing of Circular and Rectangular water tanks resting on ground and free at top (Flexible base and Rigid base), using IS: 3370 (Part IV) only.

#### REFERENCE BOOKS:

### CIE Marks
10 marks for term work (Drawing Sheets)
40 marks for conducting 2 test of 4 hrs duration on the line of syllabus mentioned above

#### Term Works Details

- **Sheet No**: 1 to 8 from Unit A
- **Sheet No**: 9 to 14 from Unit B

#### Question paper pattern:
- 3 questions of 20 marks each from Unit-A & 2 questions of 60 marks from Unit-B
- Answer any two questions from Unit A & one question from Unit B

<table>
<thead>
<tr>
<th>Sl. No.</th>
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<tbody>
<tr>
<td>1.</td>
<td>To make the student to develop the knowledge of design and drawing of R.C structures.</td>
<td>Student will have the knowledge of detailing.</td>
</tr>
<tr>
<td>2.</td>
<td>Preparing all structural drawing</td>
<td>Student will develop the skill of preparation of structural drawing and study prepared drawings.</td>
</tr>
<tr>
<td>3.</td>
<td>Students are exposed to know the requirement of the fulfillment of the basics of the design and drawing of RC structures along with the basics learnt in the previous semester.</td>
<td>Student will have the knowledge of design of different R.C. Structures.</td>
</tr>
<tr>
<td>4.</td>
<td>To make the student to develop the knowledge of design and drawing of R.C structures.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Also to train the students to prepare all structural drawings and detailing along with bar bending schedule as per SP-34.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>This knowledge can be utilized for their further professional field.</td>
<td></td>
</tr>
</tbody>
</table>
Unit-I
Introduction: Necessity, planning and execution of modern water supply scheme.

Water Demand and Quantity:

Unit-II
Sources, Collection and Conveyance of water:
Factors governing the selection of source for water supply, suitability of surface and subsurface source (quality and quantity). Intake structures submerged intake, intake towers, river intake, canal intake, dam intake. Pumps- necessity, power and selection of a pump, economical diameter of rising main.

Quality of Water
Potable and palatable water, waterborne diseases, Physical, Chemical and Microbiological water quality parameters using analytical and instrumental techniques. Health significance of all the quality parameters. Indicator organism, MPN, BIS and WHO drinking water standards 13 Hrs

Unit-III
Water Treatment

Unit-IV
Miscellaneous Treatment Methods:
Removal of Iron and Manganese, Colour, odour and Taste removal, Activated carbon treatment, Use of copper sulphate, Fluoridation, Defluoridation and Desalination.

Distribution Systems:
System of supply, service reservoirs and their capacity determination, methods of layout of distribution systems.

Others: Pipe appurtances, various values, types of fire hydrants, pipefitting. Layout of water supply pipes in buildings. 12 Hrs

Text Books:

Reference Books:

Question Paper Pattern for SEE:
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.

<table>
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<tbody>
<tr>
<td>1.</td>
<td>To impart the basic knowledge about the necessity, planning and execution of modern water supply schemes. To expose the students on the types of water demand, fire demand.</td>
<td>Learn about the necessity, planning and execution of modern water supply schemes. Learn to compute the water demand and fire demand.</td>
</tr>
<tr>
<td>2.</td>
<td>To expose the students to the methods of population forecasting and the design period.</td>
<td>Learn about methods of Population Forecasting and the design period/factors governing.</td>
</tr>
<tr>
<td>3.</td>
<td>To make the students understand about the sources, collection and conveyance of water. To bring the awareness regarding the necessity.</td>
<td>Learn about the sources, collection and conveyance of water and the necessity, power/selection of</td>
</tr>
</tbody>
</table>
4. To make the students familiar with various aspects of physical, chemical and biological quality of water. Testing of water quality. Health significance and drinking water standards.

5. To provide information regarding different types of water treatment unit and processes.

6. To expose the students to the methods of removal of iron, manganese, color, taste and odor, fluoridation/defluoridation and desalination and layout of water supplies in buildings.

UCV603C: GEOTECHNICAL ENGINEERING-II
4 Credits (4-0-0)

UNIT - I

SUBSURFACE EXPLORATION:
Importance of exploration program, Methods of exploration: Boring, sounding tests, geophysical methods- Electrical resistivity and Seismic refraction methods. Types of samples- undisturbed, disturbed and representative samples Samplers, sample disturbance, area ratio, Recovery ratio, clearance Stabilisation of boreholes - Typical bore log. Number and depth of borings for various civil engineering structures, soil exploration report.

DRAINAGE AND DEWATERING:
Location of ground water table in fine and coarse grained soils. Determination of ground water level by Hvorselev's method. Control of ground water during excavation: Dewatering- Ditches and sumps, well point system, Shallow well system, Deep well system, Vacuum method, Electro- Osmosis method.

UNIT - II

STRESSES IN SOILS:
Boussinesq's and Westergaard's theories for concentrated, circular, rectangular, line and strip loads. Comparison of Boussinesq's and westergaard's analysis. Pressure distribution diagrams, contact pressure, Newmark's chart.

FLOWNETS:
Laplace equation (no derivation) assumptions and limitations only, characteristics and uses of flownets, Methods of drawing flownets for Dams and sheet piles. Estimating quantity of seepage and Exit gradient. Determination of phreatic line in earth dams with and without filter. Piping and protective filter, graded filter.

UNIT - III

LATERAL EARTH PRESSURE:
Active and Passive earth pressures, Earth pressure at rest, Earth pressure coefficient. Earth pressure theories - Rankine's and Coulomb's assumptions and limitations, Graphical solutions for active earth pressure (cohesionless soil only) Culmann's and Rebhann's methods Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution.

STABILITY OF EARTH SLOPES:
UNIT - IV

BEARING CAPACITY:
Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure, Terzaghi's and Brinch Hansen's bearing capacity equations-assumptions and limitations Bearing capacity of footing subjected to eccentric loading. Effect of ground water table on bearing capacity. Plate load test, Standard penetration test, cone penetration test.

8 Hrs

FOUNDATION SETTLEMENT:
Settlement Analysis, Data for settlement analysis, computation of settlement, Concept, immediate, consolidation and secondary settlements (no derivations), Tolerance. BIS specifications for total and differential settlements of footings and rafts.

5 Hrs

TEXT BOOKS:

REFERENCES BOOKS:

Question Paper Pattern for SEE:
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.
UNIT-I

Introduction: Practical application of hydrology and water resources. Hydrological cycle, Concept of catchments and need for plan utilization of water resources.

Precipitation: Definition and forms of precipitation. Types of precipitation, seasons in India. Measurements of precipitation, non recording and recording types of rain gauges. Computation of average depth of precipitation over an area. Estimation of missing precipitation record.


11 Hrs

UNIT-II


UNIT-III


UNIT-IV


Definition, investigation for reservoir site, storage zones determination of storage capacity using mass curves, economical height of dam.

Definitions, Forces acting on gravity dam, methods of stability analysis, functions of drainage gallery.

Types of earthen dams, reason for failure of earthen dams( no problems), drainage arrangements(no problems), definition, types of spill ways, ogee spillway, types of energy dissipaters. 11 Hrs

TEXT BOOKS

REFERENCE BOOKS:
5. A. B. Mical, Irrigation Engineering.
<table>
<thead>
<tr>
<th></th>
<th>Students will obtain an understanding of hydrological process, particularly the process of precipitation, evaporation, infiltration and surface run-off, stream flow and their measurement and estimation. Students will learn about hydrological analysis including hydrograph theory.</th>
<th>Learn about the systems of irrigation and design.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Students are introduced to different types of irrigation, canal systems, types of dams and their stability aspects.</td>
<td>Learn about the different canals and their design aspects.</td>
</tr>
<tr>
<td>4.</td>
<td>Students should understand application of theory to experimental and field data.</td>
<td>Learn about different types of dams, their stability and design.</td>
</tr>
</tbody>
</table>

UCV621E : ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGIES  
3 credits (3-0-0)

UNIT I

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. 6 Hrs

Alternative Building Materials:
Characteristics of building blocks for walls, Stones and Laterite blocks, Bricks and hollow clay blocks, Concrete blocks, Stabilized blocks: mud blocks, steam cured blocks, Fal-G Blocks, stone masonry block. 7 Hrs

UNIT -II

Lime-Pozzolana Cements:
Raw materials, Manufacturing process, Properties and uses, Fibre reinforced concretes, Matrix materials, Fibers: metal and synthetic, Properties and applications, Fibre reinforced plastics, Matrix materials, Fibers: organic and synthetic, Properties and applications, Building materials from agro and industrial wastes, Types of agro wastes ,Types of industrial and mine wastes, Properties and applications 6 Hrs

Alternative Building Technologies:
Alternative for wall construction, Types, Construction method, Masonry mortars, Types, Preparation, Properties, Ferrocement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. 7 Hrs

UNIT -III

Alternative Roofing Systems:
Alternative roofing systems, Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes 6 Hrs

Structural Masonry:
Compressive strength of masonry elements, Factors affecting compressive strength, Strength of units, prisms / wallettes and walls, Effect of brick work bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry 7 Hrs
UNIT -IV

Cost Effective Building Design:
Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives. 6 Hrs

Equipment For Production of Alternative Materials:
Machines for manufacture of concrete-Hand mixing, automatic mixing, Concrete pumps. RMC Equipments for production of stabilized blocks, Moulds and methods of production of precast elements. 7 Hrs

TEXTBOOKS:
2. Structural Masonry by Arnold W. Hendry.

REFERENCE BOOKS:
1. Relevant IS Codes.
2. Alternative building materials and technologies.
3. Proceedings of workshop on Alternative building material and technology@BVB College of Engineering, &Tech.,Hubli.

Question Pattern:
Answer any five full questions choosing at least one from each unit.

<table>
<thead>
<tr>
<th>SL. No.</th>
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</tr>
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<tbody>
<tr>
<td>1.</td>
<td>To learn- Energy in building materials, global warming and construction industry, alternative building materials.</td>
<td>The student would cores to know the different alternative building materials and techniques involved in planning, design and construction.</td>
</tr>
<tr>
<td>2.</td>
<td>Lime puzzulona cement, FRC, FRP alternative building techniques, alternative root systems. Structural masonry, cost effective building design, equipments for the production of alternative building materials.</td>
<td>Alternative techniques while construction of foundation, wall construction and slab construction.</td>
</tr>
</tbody>
</table>
Sensors: characteristics and types, Landsat Thematic mapper, LIDAR.

**Digital Image processing:** Introduction, Rectification and Restoration, Enhancement, Manipulations, Classification, Data merging and GIS Integration, Hyperspectral Image analysis, Biophysical modelling, Scale effects, Image Transmission and Compression and Visualization

**GPS System:** Global Navigation satellite System, Functional segments and working principles of GPS, Differential GPS and applications of GNSS. 10 hrs

**Textbooks:**
1. Peter ABurrough Reachael AMcDonnel, Principles of GIS (oxford)
2. Kang-tsung chang Introduction to Geographic Information systems, (Tata MCgrowHill)
3. Tor Bernhardsen, Geographic Information Systems An Introduction (Wiley India)
4. Lillesand, Remote sensing and Image interpretation (John Wiley and Sons)

**Question Paper Pattern for SEE:**
1. Total of Eight Questions with two from each unit are set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.
UCV623E: MATRIX METHOD OF STRUCTURAL ANALYSIS
4 Credits (4-0-0)

UNIT I

Definitions and Concepts
Comparison of classical, matrix and approximate methods of structural analysis, Flexibility and displacement methods, System approach versus Element approach, degrees of freedom, coordinate systems, stiffness and flexibility coefficients.

Flexibility Method by element approach. Introduction:
Element flexibility matrix, Principle of contragradience, Equilibrium matrix, Construction of member and structure flexibility matrix, matrix determination of displacement vector, determination of member forces. Procedure for analysis of indeterminate structures: analysis of plane trusses, continuous beams and plane frames. 13 Hrs

UNIT II
Stiffness Method by element approach Contd.....
Introduction, member stiffness matrix, Principle of contragradience, Global or system stiffness matrix, member transformation, system stiffness matrix Analysis of indeterminate structures: continuous beams 13 Hrs

UNIT III
Stiffness Method by Element approach Contd....
Analysis of interminate structures: Plane frames and plane trusses 13 Hrs

Direct Stiffness Method
Introduction, transformation of variables, transformation of stiffness matrix of the member of a truss and rigid frame. Overall stiffness, boundary conditions, computation of internal forces, analysis of plane trusses and continuous beams. 13 Hrs

Note:
Three questions from Unit-I, Three questions from Unit-II and Two questions from Unit-III to be set. Any FIVE questions to be answered choosing at least one from each Unit.

TEXT BOOKS:

Reference Books:

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Students to understand the basic concepts, structure and application of matrix analysis of structures.</td>
<td>This class will help the students develop an ability to apply knowledge of mathematics science and engineering.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Develops an ability to formulate stiffness and flexibility matrices &amp; hence analyze structures. Develops ability to carry out force analysis &amp; deformation analysis of beams, frame &amp; trusses.</td>
</tr>
<tr>
<td>2.</td>
<td>To work from the bases of mechanics and energy principle to formula of the stiffness and flexibility matrices.</td>
<td>Students develop an ability to identify formulate and solve an engineering problem.</td>
</tr>
<tr>
<td>3.</td>
<td>To work on matrix based mathematical models of variety of structural elements and structural systems.</td>
<td>Students develop an ability to use the techniques skills, modern engineering tools necessary for engineering practice.</td>
</tr>
<tr>
<td>4.</td>
<td>To utilize these models to analyze structural response to variety of wads.</td>
<td>This helps the students in using modern structure analysis software &amp; forms a basis for learning finite element method.</td>
</tr>
</tbody>
</table>
UNIT -I

INTRODUCTION: Importance, vertical distribution of sub surface water, Occurrence in different types of rocks and soils. Definition aquifers, aquifuge, aquitard and aquiclude. Confined and unconfined aquifer 7 Hrs

Fundamentals of ground water flow: Aquifer parameters-specific yield and specific retention, porosity, storage coefficient: derivation of the expression. 6 Hrs

UNIT -II

Darcy’s law. Hydraulic conductivity, coefficient of permeability and intrinsic permeability. Transmissibility. Permeability isotropic unisotropic layered soils. Steady one dimensional flow-different cases with recharge 7 Hrs

Well Hydraulics

Steady flow: Radial flow in confined and unconfined aquifers. Pumping tests. 6 Hrs

UNIT -III

Well Hydraulics Un-Steady flow: General equations- derivation; theiss method, Cooper and Jacob method, Chow’s method. Solution of unsteady flow equation. Leaky aquifers (only introduction); Interference of well- Image well theory. 13 Hrs

UNIT -III

Ground Water Development: Types of wells. Methods of construction. Tube well design. Dug wells. Pumps for lifting water-working principles, power requirements. Conjunctive use- necessity techniques and economics. 09 Hrs

Ground water exploration: Seismic method. Electrical resistivity method-principles 4 Hrs

Text Books:

5. R Vaidyanathan P Perumal, Structural Analysis vol I, Laxmi Publisher New Delhi.
Tests for determination of specific gravity and moisture content.
2. Grain size analysis of soil sample (sieve analysis).
3. In situ density by core cutter and sand replacement methods.
4. Consistency Limits Liquid Limit (Casagrande and Cone Penetration Methods), plastic limit and shrinkage limit
6. Coefficient of permeability by constant head and variable head methods.
7. Strength Tests
   a. Unconfined Compression Test
   b. Direct Shear Test
   c. Triaxial Compression Test (undrained)
8. Consolidation Test-Determination of compression index and coefficient of consolidation.
9. Laboratory vane shear test
10. Determination of CBR value
11. a) Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor's needle.
    b) Demonstration of Hydrometer Test.
    c) Demonstration of Free Swell Index and Swell Pressure Test
Performance and journal write up:
   * Marks for each experiment = 30 marks/ No. of proposed experiments.
   * One Practical test for 20 Marks. (5 write-up, 10 conduction, calculation, Results etc., 5 viva-voce)
3. Allocation of 50 marks for SEE.
   *25% write-up, 50% conduction, calculation, results etc., 25% viva

REFERENCES BOOKS:

LABORATORY ASSESSMENT:
1. Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE).
2. Allocation of 50 marks for CIE
I) Tests on Water Quality
   A) Physical Parameters
      1) Colour
      2) Turbidity
      3) Conductivity
      4) Temperature
   B) Chemical Parameters
      1) Solids-Total, dissolved and suspended
      2) Ph
      3) Acidity
      4) Alkalinity
      5) Chlorides
      6) Hardness- Carbonate and Non carbonate
      7) Sulphate
      8) Fluoride
      9) Iron
      10) Chlorine demand & Residual chlorine
      11) Nitrate
   C) Bacteriological Parameters
      1) MPN
      2) Membrane Filter Technique
II) Tests on Sewage
   1) Solids-Total, dissolved, suspended, volatile and fixed
   2) Biochemical oxygen Demand
   3) Chemical oxygen Demand
III) Other Tests
   1) Optimum Alum dose (Jar Test)
   2) Percentage of chlorine in Bleaching Powder

Reference:
1. Manual of Water and Wastewater Analysis- NEERI Publication
2. Standard methods for Examination of Water and Wastewater Analysis APHA, AWWA.

Laboratory assessment:
1. Each Laboratory subject is evaluated for 100 marks (50 CIEand50 SEE).
2. Allocation of 50 marks for CIE
   * Performance and journal write up:
     Marks for each experiment = 30 marks/ No. of proposed experiments.
   * One Practical test for 20 Marks. (5 write-up, 10 conduction, calculation, results etc., 5 viva-voce)
3. Allocation of 50 marks for SEE.
   * 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.
1 Solid Geometry:
Distance formula (without proof), Division formula, direction cosines and
direction ratios, planes and straight lines angle between the planes.

2 Vector Difference:
Velocity, Acceleration of particle moving on a space curves. Vector point
function. Directional derivative, Gradient, Curl ND Divergence. Solenoidal and
Irrotational vector-simple problems.

3 Laplace Transforms:
Definition- Transform of elementary functions. Derivatives and integrals of
transforms-problems. Periodic functions. Inverse transforms-properties,
Solutions of linear differential equations. Applications to engineering problems.

Resources:
1. Elementary Mathematics by B. S. Grewal.

Question paper pattern for SEE:
1. Total of eight question to be set, covering the entire syllabus
2. Each question should not have more than 4 sub divisions.
3. Any five full questions are to be answered.