B. E. SYLLABUS

CIVIL ENGINEERING

V & VI SEMESTER

With
Scheme of Teaching
& Examination
## DEPARTMENT: CIVIL ENGINEERING

<table>
<thead>
<tr>
<th></th>
<th>Name</th>
<th>Degree</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. I. Ramesh Mithantaya</td>
<td>Ph.D</td>
<td>Prof/ Vice Principal/Dean(Aca)</td>
</tr>
<tr>
<td>2</td>
<td>Dr. N. Bhavani Shankar Rao</td>
<td>Ph.D</td>
<td>Professor</td>
</tr>
<tr>
<td>3</td>
<td>Dr. Udaya Kumar G.</td>
<td>Ph.D</td>
<td>Professor</td>
</tr>
<tr>
<td>4</td>
<td>Dr. Srinath Shetty K.</td>
<td>Ph.D</td>
<td>Prof. &amp; Head</td>
</tr>
<tr>
<td>5</td>
<td>Dr. Radhakrishnan K.</td>
<td>Ph.D</td>
<td>Professor</td>
</tr>
<tr>
<td>6</td>
<td>S.K. Mahadeve Gowda</td>
<td>M.Tech</td>
<td>Asso. Prof</td>
</tr>
<tr>
<td>7</td>
<td>J.K. Lokesh</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>8</td>
<td>Y. Umashankar Shetty</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>9</td>
<td>Y.R. Suresh</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>10</td>
<td>Purushotham C.T.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd III</td>
</tr>
<tr>
<td>11</td>
<td>Sundip Shenoy R.</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
<tr>
<td>12</td>
<td>Leeladhar Pammar</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
<tr>
<td>13</td>
<td>Pushparaj</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
<tr>
<td>14</td>
<td>T.N. Shridharan</td>
<td>M.Tech</td>
<td>Asst. Prof Gd I</td>
</tr>
<tr>
<td>15</td>
<td>Gururaj Aharya</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>16</td>
<td>Prashanth Kumar</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>17</td>
<td>Akshay N.K</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>18</td>
<td>Rakshith Kumar Shetty</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>19</td>
<td>Manjunath M.</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>20</td>
<td>Roshan Rai</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>21</td>
<td>Anil Kumar</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>22</td>
<td>Thangamani R.</td>
<td>M.Sc.</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>23</td>
<td>Joel Santkosh</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
<tr>
<td>24</td>
<td>Akshatha Shetty</td>
<td>M.Tech</td>
<td>Asst Prof Gd I</td>
</tr>
</tbody>
</table>
Department of Civil Engineering, NMAMIT, Nitte

Vision:
To uphold the Department as a leader in innovation and excellence in the field of Civil Engineering by offering world class curricula, training for students and research and consultancy services to meet the global challenges and market demands.

Mission:
The Department of Civil Engineering will strive hard to

- Provide the students a strong theoretical knowledge to understand the basic concept in each stream
- Highlight the significance of the Civil Engineering subjects through practical applications
- Prepare the students to face the scholastic competitions to upgrade their knowledge
- Encourage the students to develop professional ethics through discipline and principles

Programme Educational Objectives (PEO’s):
Students will be guided to

- Acquire both theoretical and practical knowledge to solve Civil Engineering problems
- Gain potentiality in the subjects to tackle the practical problems with enthusiasm
- Develop eagerness to learn more and more to face the challenges involved to meet the global demands

Programme Outcomes (PO’s):
Students will develop the

- Ability to achieve excellence in the professional career
- Ability to analyse and design the problems related to Civil Engineering
- Understanding of the practical applications of the theory learnt
## DEPARTMENT OF CIVIL ENGINEERING
### SCHEME OF TEACHING

<table>
<thead>
<tr>
<th>V Semester</th>
<th>29 Hours/week</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sub-Code</th>
<th>Title</th>
<th>Teaching Dept</th>
<th>Contact Hours/ week</th>
<th>Duration of SEE</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>12CV501</td>
<td>Structural Analysis-II</td>
<td>CV</td>
<td>3-2-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV502</td>
<td>Design of RCC Structural Elements</td>
<td>CV</td>
<td>3-2-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV503</td>
<td>Geotechnical Engg. I</td>
<td>CV</td>
<td>4-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV504</td>
<td>Transportation Engg. I</td>
<td>CV</td>
<td>3-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV505</td>
<td>Environmental Engg. I</td>
<td>CV</td>
<td>3-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV51X</td>
<td>Elective –I</td>
<td>CV</td>
<td>3-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV506</td>
<td>Hydraulics &amp; Hydraulic Machinery Lab</td>
<td>CV</td>
<td>0-0-3</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV507</td>
<td>Computer Aided Design Lab</td>
<td>CV</td>
<td>0-0-3</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>29</strong></td>
<td></td>
<td><strong>400</strong></td>
<td></td>
<td><strong>400</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

### LIST OF ELECTIVES

1. **12CV511** Advanced Surveying
2. **12CV512** Advanced Applied Engg Geology
3. **12CV513** Design of Masonry Structures
4. **12CV514** Advanced Hydraulics
5. **12CV515** Alternative Building Materials & Technologies
# DEPARTMENT OF CIVIL ENGINEERING
## SCHEME OF TEACHING

### VI Semester

<table>
<thead>
<tr>
<th>Sub-Code</th>
<th>Title</th>
<th>Teaching Dept</th>
<th>Contact Hours/week</th>
<th>Duration of SEE</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>12CV601</td>
<td>Design &amp; Drawing of RCC Structures</td>
<td>CV</td>
<td>2-0-3</td>
<td>04</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV602</td>
<td>Geotechnical Engg. – II</td>
<td>CV</td>
<td>3-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV603</td>
<td>Transportation Engg. –II</td>
<td>CV</td>
<td>4-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV604</td>
<td>Environmental Engg. –II</td>
<td>CV</td>
<td>3-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV61X</td>
<td>Elective-II</td>
<td>CV</td>
<td>3-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV62Y</td>
<td>Elective-III</td>
<td>CV</td>
<td>3-0-0</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV605</td>
<td>Geotechnical Engg. Lab</td>
<td>CV</td>
<td>0-0-3</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV606</td>
<td>Environmental Engg. Lab</td>
<td>CV</td>
<td>0-0-3</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>12CV607</td>
<td>IGW</td>
<td>HU</td>
<td>1Week</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12CV608</td>
<td>Extensive Survey Project/Mini Project</td>
<td>CV</td>
<td>2 weeks</td>
<td>03</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

|         | Total                                |               |                    | 27              | 450   | 450     | 25      |

### LIST OF ELECTIVES

- 12CV611 Matrix Method of Structural Analysis
- 12CV612 Traffic Engineering
- 12CV613 Rural Water Supply and Sanitation
- 12CV621 Groundwater Hydrology
- 12CV622 Ground Improvement Techniques
- 12CV623 Remote Sensing & GIS


**STRUCTURAL ANALYSIS – II**

Subject Code : 12CV501  
Credits : 04

Hrs/ Week : 3-2-0  
Total Hours : 52

**Objective of the course:** To make the students understand the concepts and analysis of indeterminate structures.

**Expected outcome:** At the end of the course students must be able to solve the problems connected with analysis of various structural components.

**Pre-requisites of the course:** CV103, CV301, CV303, CV401, CV402.

UNIT – I

**REDUNDANT TRUSSES**
Introduction, Analysis of statistically indeterminate structures using strain energy method, Analysis of trusses (Redundant up to second degree), Lack of fit in member of indeterminate trusses. Temperature stress in redundant trusses.

8 Hrs

UNIT - II

**SLOPE DEFLECTION METHOD**
Introduction, Sign convention, Development of slope – deflection equations, Analysis of continuous beams, Analysis of frames (Kinematics indeterminacy <3)

10 Hrs

UNIT - III

**MOMENT DISTRIBUTION METHOD**
Introduction, Definition of terms, Development of method, Analysis of continuous beams, Analysis of frames (Static indeterminacy <3)

10 Hrs

UNIT - IV

**KANI’S METHOD**
Introduction, Basic concept, Analysis of continuous beams, Analysis of frames with no lateral translation of joints, Analysis of symmetrical frames

10 Hrs

UNIT – V

**MATRIX METHOD OF ANALYSIS**

14 Hrs
TEXT BOOKS:

REFERENCE BOOKS:

DESIGN OF RCC STRUCTURAL ELEMENTS
Subject Code : 12CV502  Credits :  04
Hrs/ Week : 4  Total Hours :  52

Objective of the course: To make the students to learn designing of various structural elements.

Expected outcome: At the end of the course students must be able to design structural components of a building using IS: 456-2000

Pre-requisites of the course: CV103, CV303, CV402

UNIT - I
GENERAL FEATURES OF REINFORCED CONCRETE:
Introduction, Design Loads, Materials for Reinforced Concrete and

PRINCIPLES OF LIMIT STATE DESIGN AND ULTIMATE STRENGTH OF R.C. SECTION: Philosophy of limit state design, Principles of limit states, Factor of Safety, Characteristic and design loads, Characteristic and design strength, General aspects of Ultimate strength, Stress block parameters for limit state of collapse, Ultimate flexural strength of singly reinforced rectangular sections, Ultimate flexural strength of doubly reinforced rectangular sections, Ultimate flexural strength of flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections. 10 Hrs

UNIT - II
Concepts of development length and anchorage, Analysis examples of singly reinforced, doubly reinforced, flanged sections, shear strength and development length. 10 Hrs

UNIT - III
SERVICEABILITY LIMIT STATES: General aspects, Deflection limits in IS: 456 - 2000, Calculation of deflection (Theoretical method), Cracking in structural concrete members, Calculation of deflections and crack width.

DESIGN OF BEAMS: Practical requirements, Size of beam, Cover to reinforcement, spacing of bars, Design procedures for critical sections for moments and shears, Anchorages of bars, check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for Simply supported and Cantilever beams for rectangular and flanged sections. 12 Hrs

UNIT - IV
DESIGN OF SLABS: General consideration of design of slabs, Rectangular slabs spanning one direction, Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs as per IS: 456 – 2000.

DESIGN OF COLUMNS: General aspects, effective length of column, loads on columns, slenderness ratio for columns, minimum eccentricity, design of short axially loaded columns, design of column subject to combined axial load and uniaxial moment and biaxial moment using SP - 16. 10 Hrs
UNIT – V


DESIGN OF STAIRCASES: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases. 10 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
5. Relevant IS codes (Latest Edition)

GEOTECHNICAL ENGINEERING – I

Subject Code : 12CV503
Credits : 04
Hrs/ Week : 4
Total Hours : 52

Objective: To make the students understand the concepts of soil as three phase system and their various properties.

Expected outcome: At the end of the course student must be able to solve problems associated with the subject

UNIT - I

INTRODUCTION: Phase Diagram, Definitions- void ratio, porosity, degree of saturation, percentage air voids, air content, specific gravity,
water content, soil densities, functional relationships, field identification of soils.

**INDEX PROPERTIES OF SOILS AND THEIR DETERMINATION:** Grain size distribution, Atterberg’s Limits and Indices, Insitu density, density index Laboratory determination: specific gravity, grain size distribution-sieve analysis and sedimentation analysis (Hydrometer Method), Liquid Limit (Casagrande Method), plastic limit and shrinkage limit.  

**UNIT - II**

**CLASSIFICATION OF SOILS:** Need for classification, unified soil classification and IS classification - plasticity chart and its importance.  

**SOIL STRUCTURE AND CLAY MINERALOGY:** Soil structure – Single grained, honey combed, flocculent and dispersed structures. Valence bonds, Soil-water system- diffuse double layer, adsorbed water, base-exchange capacity; Common clay minerals - Kaolinite, Illite and Montmorillonite.  

**UNIT - III**


**COMPACTATION OF SOILS:** Moisture Content – Dry density relationship, Zero-air void line, Laboratory compaction tests. Factors affecting compaction; properties. Field compaction methods, Field compaction control - Proctor needle method  

**UNIT - IV**

**COMPRESSIBILITY AND CONSOLIDATION OF SOILS:** The consolidation process- spring analogy, compressibility of soil and volume change- coefficient of compressibility and compression index, normally consolidated and over consolidated soils , pre-consolidation pressure and its determination (Casagrande method ), Modulus of volume change and consolidation settlement. Terzaghi's theory of one dimensional consolidation - assumptions. Coefficient of consolidation- Time fitting methods.  

10 Hrs
UNIT - V

SHEAR STRENGTH OF SOIL: Stress – strain curve, Mohr - Coulomb failure criterion, peak and residual strength theory. Laboratory measurement of shear strength- drainage conditions, direct shear test, unconfined compression test, triaxial compression test and vane shear test. Failure envelops - conventional and modified. Total and effective shear strength parameters. Factors affecting shear strength of soils, sensitivity and thixotropy. Pore pressure coefficient – measurement and application.

10 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

TRANSPORTATION ENGINEERING – I

Sub Code: 12CV504
Hrs/ Week: 3
Total Hours: 39

Credits: 03

Objectives of the course:
1. To study the various elements of highway, highway materials, traffic, bridges and airport.
2. To study the design principles of highway elements and airport elements.

Pre-requisites of the course: CV304, CV403
UNIT - I
Introduction: Importance of transportation, Modes, characteristics – comparison of different modes. Jayakar committee recommendations and implementation, road development in India – Third 20 year plan and problems.
Highway Planning and alignment: Road patterns, planning surveys – Master plan – Saturation system of road plan – factor affecting alignment – Ideal alignment – surveys for new and realignment projects. 8 Hrs

UNIT - II
Design Principles: Highway geometric design, Importance, cross sectional elements, Width of carriage way, camber, Shoulder width, Design speed, Sight distance, design of horizontal and vertical alignment.
Pavement design: Types of pavements, design factors, 9 Hrs

UNIT - III
Pavement materials and Construction: Properties and requirements of Subgrade soils, CBR and Plate load test on soil, Properties and requirements of road aggregates, Bitumen, Tar, emulsion, Cutback – Specifications. 7 Hrs

UNIT - IV
Highway Economics and Financing: Highway users benefits, Highway costs, Economic analysis by annual cost method and Benefit cost ratio method, Highway Financing – BOT and BOOT concepts. Subsurface drainage system for road pavement, Types, Functions and basic design principles. 8 Hrs

UNIT - V
Introduction to bridges: Selection of sites, Types of bridges, Components and functions. Pavement maintenance: Principles of pavement evaluation, Types of pavement failures, Maintenance measures for road. 7 Hrs

TEXT BOOKS:
REFERENCE BOOKS:
1. Relevant IRC codes

ENVIRONMENTAL ENGINEERING – I

Subject Code : 12CV505
Credits : 03
Hrs/ Week : 3
Total Hours : 39

Objectives of the course:
1. To study the various elements of water treatment
2. To study the design principles of treatment facilities.

Pre-requisites of the course: CV113, CY110

UNIT – I
Introduction- Human activities and environmental pollution; requirement of water for various beneficial uses; need for protected water supply
Demand of water; Types of water demands – domestic demand (in detail), institutional and commercial, public uses, fire demand; Per capita consumption – Factors affecting per capita demand
Population forecasting – Different methods with merits & demerits; Variations in water demand
Fire demand – estimation by Kuichling’s formula, Freeman formula & National board of fire underwriters’ formula; Peak factors; Design period & factors governing the design period

UNIT-II
Quality of water; Objectives of water quality management; concept of safe water, wholesomeness, palatability and potable water; Water borne diseases
Examination of water – objectives – Physical, chemical and microbiological examinations using analytical and instrumental techniques; Drinking water standards – BIS & WHO guidelines;
Health significance of fluoride, nitrates and heavy metals like mercury and cadmium; Sampling of water for examination
Sources, collection and conveyance of water - Surface and subsurface sources – suitability with regard to quality and quantity; Intake structures – different types of intakes, factor of selection and location of intakes
Pumps – Necessity; types, power of pumps, factors for the selection of a pump; design of the economical diameter for the rising main.

8 Hrs

**UNIT – III**

Water treatment – Objectives, flow-chart of treatment process; Aeration – principles, types of aerators
Sedimentation- Theory, settling tanks, types, design; Sedimentation aided with coagulants, dosages; chemical feeding, flash mixing and flocculators
Filtration – Mechanism, theory of filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design – excluding under drainage system – back washing of filters.

8 Hrs

**UNIT – IV**

Disinfection – Theory of disinfection, methods of disinfection, chlorination, chlorine demand, residual chlorine, use of bleaching powder
Softening – Definition, methods of removal of hardness by lime soda process and zeolite process
Miscellaneous Treatment – Removal of color, odour, taste with methods like aeration, activated carbon treatment; oxidizing organic matters; removal of iron and manganese; fluoridation and defluoridation.

8 Hrs

**UNIT - V**

Methods of distribution systems – System of supply, service reservoirs and their capacity determination, methods of layout distribution
Miscellaneous – Pipe appurtenances, various valves, type of fire hydrants; location of water supply pipes in buildings

8 Hrs

**TEXT BOOKS:**

REFERENCE BOOKS:

HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

Subject Code : 12CV506                Credits : 02
Hrs/ Week    : 3

1. Determination of friction factor for a pipe.
2. Determination of minor loss constants -Bend, Sudden contraction, sudden expansion.
3. Determination of hydraulic coefficients for orifices and Mouth pieces
4. Calibration of V-notch, rectangular or Trapezoidal notches.
5. Calibration of Venturi meter
6. Calibration of Siphon spillway
7. Calibration of Venturi flume
8. Determination of vane coefficients for impact of jet on vanes
9. Performance tests on a Pelton wheel
10. Performance tests on Francis turbine.
11. Performance tests on a single stage or multi stage centrifugal pump (constant speed)
12. Performance tests on a double acting reciprocating pump (constant speed)
13. Demonstration on hydraulic ram
COMPUTER AIDED DESIGN LABORATORY

Subject Code : 12CV507  
Credits : 02  
Hrs/week : 3

UNIT - I

1. AUTOCAD
1.1 Basics of AUTOCAD:
3 Hrs

1.2 Use of AUTOCAD in Civil Engineering Drawings:
Following drawings are to be prepared for the data given using AUTOCAD
   i. Cross section of Foundation - masonry wall, RCC columns (isolated)
   ii. Different types of windows and doors
   iii. Different types of staircases
   iv. Lintel and Chejja
   v. RCC slabs and beams
   vi. Drawing of Plan, elevation and sectional elevation of single storied residential and public buildings given the single line diagram  
16 Hrs

UNIT - II

2. STRUCTURAL ANALYSIS SOFTWARE
Use of commercially available software for the analysis of beams and 2-D frames.  
16 Hrs

Note: The students shall be trained in at least two commercially available software for the problems listed above

UNIT - III

3. USE OF EXCEL IN CIVIL ENGINEERING PROBLEMS
Use of spread sheet for the following civil engineering problems
   i. SFD and BMD for Cantilever and simply supported beam subjected to uniformly distributed and uniformly varying load acting throughout the span
   ii. Design of singly reinforced and doubly reinforced rectangular
beams

iii. Computation of earthwork

iv. Design of horizontal curve by offset method 10 Hrs

**Scheme of Examination:**
1. One question to be set from Chapter 1 with following marks distribution:
   Twenty five marks question for creating AUTOCAD drawing (Plan and Elevation or sectional elevation) of building mentioned in (vi) of 1.2
2. Fifteen marks question shall be set in Chapters on Commercial software and use of Excel software
3. Ten marks for viva voce

**TEXT BOOKS:**

**REFERENCE BOOKS:**
1. Roberts J. T., “Introduction to AUTOCAD 2002”, BPB publications
ADVANCED SURVEYING

Subject Code : 12CV511 
Credits : 03
Hrs/ Week : 3 
Total Hours : 39 

Objectives of the course: To study the various modern surveying instruments and their application in the field.

Pre-requisites of the course: CV304, CV403

UNIT - I
THEORY OF ERRORS AND TRIANGULATION ADJUSTMENT

UNIT - II
ELECTRONIC DISTANCE MEASUREMENT (EDM):
Introduction, Electro magnetic (EM) waves. Phase comparison and modulations. Distomat, Range finders, Introduction to GPS. Total station: basic principles, working and use of total station in surveying and leveling operations. 7 Hrs

UNIT - III
FIELD ASTRONOMY
Earth celestial sphere, Solar system, Position by altitude and azimuth system-spherical triangle and spherical trigonometry. Astronomical triangle. Sidereal time, Greenwich mean time-standard time. Meridian and azimuth-their determination-latitude and its determination. 8 Hrs

UNIT - IV
HYDROGRAPHIC SURVEYING AND PHOTOGRAMMETRIC SURVEYING
Methods of sounding and applications. Instruments, Three point problem, Solution to three point problem. Photogrammetric surveying: Introduction, basic principles, phototheodolite, aerial camera, Scale of vertical photograph. 8 Hrs
UNIT - V

SETTING OUT WORKS
Introduction: Setting out of buildings, culverts, bridge, pipeline and sewers, tunnels  
8 Hrs

TEXT BOOKS:

REFERENCE BOOKS:

ADVANCED APPLIED ENGINEERING GEOLGY

Subject Code : 12CV512  
Credits : 03
Hrs/ Week : 3  
Total Hours : 39

Objectives of the Course:
1. To make the students understand the advanced applications of Earth Sciences, especially geology and its allied disciplines in the field of Civil Engineering, resource exploration, environmental management, etc.
2. To equip them to understand the geological problems and solutions involved in the civil engineering

Pre-requisites of the Course: CV306
UNIT - I
Geology and Engineering: Introduction, Earth Science, its disciplines and Engineering applications, significance of geology in the Civil Engineering projects, Maps and Map Reading 8 Hrs

UNIT - II
Earth Resources and applied geology: geology of dams and reservoirs, tunnels, highways and bridge site engineering. Engineering Properties of Rocks: Crushing strength, Transverse strength, porosity, density, abrasive resistance, frost and fire resistance, Qualities of good Building stones, Road Metals, Railway Ballasts & Concrete aggregates. Rocks as M.O.C. – foundation, decorative stones, flooring & roofing with examples. 8 Hrs

UNIT - III
Hydrogeology and water shed management: Concept of watershed and its development, rainwater harvesting & artificial recharging, water quality and water pollution 7 Hrs

UNIT - IV
Environmental Geology & Medical Geology: Earth and Health, Impact of Geology on environmental health hazards, Environmental Geology of landslides, mining, developmental projects, etc., its applications in Engineering disciplines and civil engineering projects viz: tunneling, dams and reservoirs, etc., Impact of Weathering and Erosion in the Civil Engineering projects and structures 8 Hrs

UNIT - V
Exploration Geology and geophysics: for foundation and groundwater; geological, geophysical and hydrological investigations, electrical resistivity and seismic methods, Remote Sensing, GIS, GPS and their application in the field of exploration and civil engineering 8 Hrs

TEXT BOOKS:
REFERENCE BOOKS:

DESIGN OF MASONRY STRUCTURES
Subject Code : 12CV513
Credits : 03
Hrs/ Week : 3
Total Hours : 39

Objective: To make the students know the details of design and construction of different masonry structures.

Pre requisite: Students should have studied 12CV 103 and CV 303

UNIT - I
Strength and stability of concentrically loaded masonry walls, effect of unit strength, mortar strength, joint thickness, rate of absorption, effect of ageing, workmanship, strength formulae and mechanism of failure of masonry subjected to direct compression. 8 Hrs

UNIT - II
Permissible compressive stresses, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses.
Load considerations for masonry: walls carrying axial load, eccentric load with different eccentric ratios—walls with openings and free standing wall. 8 Hrs
UNIT - III
Design considerations: Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action and lintels. 8 Hrs

UNIT - IV
Design of load bearing masonry walls for building up to 3 storeys using IS 1905 and SP20 procedure. 8 Hrs

UNIT – V
Reinforced masonry and its application, flexural and compression elements of reinforced masonry, shear walls. Composite masonry walls, composite wall beam elements, infilled frames. 7 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
ADVANCED HYDRAULICS

Subject Code : 12CV514
Credits : 03
Hrs/ Week : 3
Total Hours : 39

Pre-requisites of the course: 12CV305, 12CV404

UNIT - I
Flow Measurements – I
Flow measurement in channels – Current meters, Floats
Discharge measurement in rivers – Slope area method, Velocity area method, Stage discharge rating curves, Open channel section for constant velocity, Velocity distribution in open channels 8 Hrs

UNIT - II
Flow Measurements- II
Discharge through an orifice under a varying head, Time required for emptying a reservoir with a rectangular weir, through a pipe, Time of emptying and filling of a canal lock chamber, Flow through a bye-pass Siphon- Principle and working, Loss of head due to friction in a tapering pipe, Transmission of power through pipes. 8 Hrs

UNIT - III
Laminar flow
Relation between shear and pressure gradients, Steady laminar flow in circular pipes – Hagen Poiseuille law, Laminar flow through inclined pipes, Laminar flow between parallel plates, Laminar flow in open channel, Measurement of viscosity

UNIT - IV
Turbulent flow in pipes
Shear stresses in turbulent flow, Velocity distribution for turbulent flow in pipes, Hydro dynamically smooth and rough pipes, Variation of friction factor, Moody’s diagram for friction factor, Pipeline network design, Related problems

UNIT - V
Open channel flow
Computation of uniform flow and critical flow in trapezoidal channels, Concept of section factor, Gradually varied flow equation and computation by standard step method, Surges in open channels, Related problems 8 Hrs
TEXT BOOKS:

REFERENCE BOOKS:

ALTERNATIVE BUILDING MATERIALS & TECHNOLOGIES

Subject Code : 12CV515        Credits : 03
Hrs/ Week  : 3            Total Hours : 39

COURSE OUTCOME
Upon successful completion of this course student will be able to;
1. Solve the problems of Environmental issues concerned to building materials and cost effective building technologies;
2. Suggest appropriate type of masonry unit and mortar for civil engineering constructions;
3. Design Structural Masonry Elements Under Axial Compression;
4. Recommend various types of alternative building materials and technologies to be used for civil engineering constructions keeping in view the green concept.

UNIT - I

Introduction
Energy in building materials, Environmental issues concerned to building materials, Global warming and construction industry, Green concepts in buildings, Rating, Rainwater harvesting & solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions. 5 Hrs
UNIT - II
Elements of Structural Masonry
Masonry materials, requirements of masonry units’ characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal G blocks and Stabilized mud block. Manufacture of stabilized blocks.
Mortars – cementations materials, sand - natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar.
Uses of masonry, masonry bonding, Compressive strength of masonry elements - Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load. 10 Hrs

UNIT - III
Alternative Building Materials

UNIT - IV
Alternative Building Technologies
Alternative Roofing Systems
Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes. 9hrs

UNIT - V
Equipment for production of stabilised blocks, moulds and methods of production of precast elements.
Green Building Design- Cost concept & Case studies. 7hrs
DESIGN & DRAWING OF RCC STRUCTURES

Subject Code : 12CV 601  
Credits : 04
Hrs/ Week : 2-0-3  
Total Hours : 52

Objective: At the end of the course students must be able to analyze, design and prepare detailed drawings of various structures.

Pre-requisites of the course: CV402, CV502

UNIT - I
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).
   20 Hrs

UNIT - II
2. Circular and Rectangular water tanks resting on ground (Flexible base and Rigid base), using IS: 3370 (Part IV) only.
4. Combined footing (Rectangular), slab and beam type.
   32 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
Note: All designs except water tanks shall be with limit state method only using SP – 16.

**Scheme of examination**
Three questions, each carrying 20 marks, to be set from UNIT 1, from which student has to answer any two. Two questions, each carrying 60 marks, to be set from UNIT 2, student has to answer any one.

---

**GEOTECHNICAL ENGINEERING – II**

**Subject Code**: 12CV602  
**Credits**: 03  
**Hrs/ Week**: 3  
**Total Hours**: 39

**Objective**: At the end of the course, the students should understand the advanced Geotechnical Engineering and in a position to solve the problems covered.

**UNIT - I**

**SOIL EXPLORATION**: Objectives of soil exploration, Methods of Boring, Types of soil samples and Samplers, Sample disturbance, inside clearance, outside clearance, Area ratio, Recovery ratio, Spacing and depth of exploration, Ground water observation – Hvorselev’s method, Indirect methods of exploration - Sounding Tests (Cone penetration Tests and Standard penetration tests), Geophysical methods - Electrical resistivity and Seismic refraction methods, Borehole logs, Site investigation reports.

8 Hrs

**UNIT - II**

**STRESS DISTRIBUTION IN SOILS**: Boussinesq's theory – point load, line load, strip load, uniformly loaded circular area, Vertical stress distribution diagrams, Newmark’s influence chart, Westergard’s equation, Comparison, Contact pressure.

**SEEPAGE FLOW THROUGH SOILS**: Laplace equation (no derivation), Flow nets, Characteristics and uses, flownet construction – graphical method.

Determination of quantity of seepage, seepage pressure, uplift
pressure, exit gradient, determination of phreatic line in earthen dams with and without filter, piping mechanism and its control.  

**UNIT - III**

LATERAL EARTH PRESSURE: Effect of wall movement on earth pressure, Earth’s pressure at rest, Earth pressure theories, Rankine’s and Coulomb's theories. Graphical solutions to earth pressure theories (cohesion less soils only) - Culmann's method and Rebhan's construction.

7 Hrs

**UNIT - IV**

STABILITY OF SLOPES: Types of slopes, Causes and types of failure of finite slopes; Factor of safety; Stability of finite slopes – \( \Phi = 0 \) analysis, \( C - \Phi \) analysis - Method of slices, Location of most critical circle, Friction Circle method, Taylor's stability number.

7 Hrs

**UNIT - V**

BEARING CAPACITY OF SHALLOW FOUNDATIONS: Terms related to bearing capacity - ultimate, net and safe bearing capacity, Types of failure in soils, Terzaghi's and Brinch Hansen's bearing capacity equations, Effect of ground water table on bearing capacity, IS code recommendations for bearing capacity. Plate load test, Safe bearing pressure from SPT and CPT value.


8 Hrs

**TEXT BOOKS:**

**REFERENCE BOOKS:**

TRANSPORTATION ENGINEERING – II

Subject Code : 12CV603  
Credits : 04
Hrs/ Week : 3  
Total Hours : 52

Objectives of the course:
1. To study and to design the various elements of railway elements, materials, turnouts, level crossings and maintenance.
2. To study the various elements of tunnel and harbour structures.

Pre-requisites of the course: CV504

UNIT - I
Railways: Role and selection of routes. 
Permanent way: Gauges in railways, railway track, cross sections, coning of wheels, rails, rail sections, ballast, sleepers, creep of rails, rail fixtures, calculation of quantity of materials.  
11 Hrs

UNIT - II
Traction and tractive resistances, tractive power, hauling capacity. 
Geometric design of track – grade, types of grade, speed of train, super elevation, cant deficiency, negative cant, speed calculations based on IR formula.  
10 Hrs

UNIT - III
Points and crossing, turnout, station and yards, signals, level crossing. 
Tunnels – tunnels for railways and roads, cross sections, tunneling in soft soils: Forepoling method, Needle beam method, principle of tunneling through hard and soft rocks: Drift method, Heading and bench method, Full face method, Objects tunnel lining.  
10 Hrs

UNIT - IV
Airport planning, aircraft characteristics, airport classifications, site selection and regional Planning. 
Runway design, analysis of wind data, determination of best orientation of runway configuration, basic length, corrections to
runway length by ICAO and FAA specifications, runway cross
section.

UNIT - V
Taxiway design, factors affecting the layout and geometrics of
Taxiway, design of exit taxiway – ICAO specifications. Visual aids –
ILS.
Harbours – types, components, typical layout, objects and function of
different elements of harbour.

TEXT BOOKS:
1. Arora & Saxena, “Railway Engineering”, Dhanpath Rai and Sons
2. Khanna, Arora & Jain, “Airport Planning and design”, Laxmi
Publications, Bangalore
Charothar Publishing House, New Delhi

REFERENCE BOOKS:
1. Horenjeff, “Planning, Design of Airports”.

ENVIRONMENTAL ENGINEERING – II

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>12CV604</td>
<td>03</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hrs/ Week</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>39</td>
</tr>
</tbody>
</table>

Objectives of the course:
1. To study the various elements of waste water treatment
2. To study the design principles of wastewater treatment facilities

Pre-requisites of the course: CY110, CV 505

UNIT - I
Introduction: Necessity for sanitation; methods of domestic waste
water disposal; types of sewerage systems and their suitability.
Quantity of sewage: Dry weather flow; factors affecting dry weather
flow, flow variations and their effects on design of sewerage system;
computation of design flow, estimation of storm flow, rational method
and empirical formulae of design of storm water drain; Time of concentration
Design of sewers: Hydraulic formulae for velocity, effects of flow variations on velocity, self cleansing and non scouring velocities, Design of hydraulic elements for circular sewers flowing full and flowing partially full 8 Hrs

UNIT – II
Sewer materials; shapes of sewers; laying of sewers; joints and testing of sewers; ventilation and cleaning of sewers.
Sewer appurtenances: Catch basins, manholes, flushing tanks, oil and grease traps, drainage traps; Basic principles of house drainage, typical layout plan showing house drainage connections, maintenance of house drainage
Sewage pumping: Need, Types of pumps and pumping stations 8 Hrs

UNIT – III
Analysis of sewage: Physical, chemical and biological characteristics; concepts of aerobic and anaerobic activity; CNS cycles; BOD and COD; Sampling – significance, techniques and frequency.
Disposal of effluents: Disposal by dilution, self-purification phenomenon, Oxygen sag curve; Zones of purification; Sewage farming, sewage sickness; effluent disposal standards for land, surface water & ocean 8 Hrs

UNIT – IV
Treatment of sewage: Flow diagram of municipal wastewater treatment plant; Preliminary treatment – Screening, grit chambers, skimming tanks
Primary sedimentation tanks – design; Secondary treatment – Trickling filter – theory and operation, types and design 8 Hrs

UNIT – V
Activated sludge process – Principle and flow diagram, methods of aeration; modifications; F/M ratio, design of ASP; Methods of sludge disposal, Sludge drying beds, sludge digestion and filter beds.
Miscellaneous treatment methods: Septic tank and Oxidation Pond – design; Introduction to RBC, UASB and anaerobic filters. 7 Hrs

TEXT BOOKS :
REFERENCE BOOKS:

GEOTECHNICAL ENGINEERING LABORATORY

Subject Code : 12CV605
Credits : 02
Hrs/ Week : 3

Tests for determination of specific gravity and moisture content.
1. Grain size analysis of soil sample (sieve analysis).
2. In situ density by core cutter and sand replacement methods.
3. Consistency Limits – Liquid Limit (Casagrande Method), plastic limit and shrinkage limit.
5. Coefficient of permeability by constant head and variable head methods.
6. Strength Tests
   a. Unconfined Compression Test
   b. Direct Shear Test
   c. Triaxial Compression Test (undrained)
7. Consolidation Test- Determination of coefficient of consolidation.
8. Laboratory vane shear test
9. Demonstration tests:
   a. Miscellaneous equipments such as Augers, Samplers, Rapid Moisture meter, Proctor’s needle.
   b. Hydrometer Test.
c. Free Swell Index and Swell Pressure Test  
d. Determination of relative density of sands.

REFERENCE BOOKS:
4. Relevant IS codes (latest edition)

ENVIRONMENTAL ENGINEERING LAB

Subject Code : 12CV606  
Credits : 02  
Hrs/ Week : 3

Determination of solids in sewage: Total solids, suspended solids, dissolved solids, volatile Solids, fixed Solids and settable solids.  

3 Hrs

2. Determination of electrical conductivity, turbidity and Sulphates.  

3 Hrs

1. Determination of Chlorides.  
2. Determination of Alkalinity, Acidity and pH.  
3. Determination of Calcium, Magnesium and Total Hardness.  
5. Determination of BOD.  
6. Determination of COD.  
7. Determination of Available Chlorine in bleaching powder.  
8. Determination of Chlorine Demand and Residual Chlorine.  
11. Determination of Fluorides.  
12. Determination of Nitrates.

Note: (give only test name)
REFERENCE BOOKS:
3. Relevant IS codes (latest edition)

ENTRY EDGE: IMMERSIVE GROUP WORKSHOP (IGW)

Subject Code: 12CV607
Duration: 5 Days
Timings : 9.00 AM to 12.30 PM, 1.15 PM to 4.45 PM

Syllabus

Module 1: Minds-on and hands-on simulation project
- Understanding Task environment – Goals, responsibilities, Task focus
- Working in Teams towards common goals
- Organizational performance expectations–technical and behavioural competencies. 7.5 Hrs

Module 2: Re-enforcement of critical individual skills and behaviours
- Application of individual effectiveness skills in team and organizational context – improving self awareness, goal setting, time management, communication and presentation skills. 3.5 Hrs

Module 3: Etiquettes and Ethics
- Professional etiquettes at workplace – dressing, telephone, e-mail, meeting and general behaviour
- Basic honesty & respect for law / rules
- Conflict of interest
- Use of organizational resources
• Misrepresentation and misappropriation  
• Intellectual property  
• Whistle blowing  

**7 Hrs**

**Module 4: Interpersonal Behaviour & relationship skills**
• Establishing trust based relationships in team & organizational environment  
• Trust equation – credibility, responsiveness, integrity, self-interest  

**3.5 Hrs**

**Module 5: Dealing with Conflicts**
Orientation towards conflicts in team and organizational environment  
• Understanding sources of conflicts  
• Conflict resolution styles and techniques  

**3.5 Hrs**

**Pedagogical tools & techniques used in the workshop**
• Organizational templates for simulating a organizational context-structures, units, roles and activities  
• Metaphoric scenarios for simulating real –life tasks and dynamics in a team/project context  
• LEGO™ building blocks for simulating last-mile technical activity in teams  
• Case studies, Role play scenarios group learning activities, observation and feedback.

**Note:** Evaluation is done and a grade of P (pass) or NP (not pass) is awarded

**EXTENSIVE SURVEY PROJECT / MINI PROJECT**

**Subject Code :** 12CV608  
**Credits :** 01

**Objectives of the course:**
1. To study the practical applications of Surveying.  
2. To study the usage of Total station and other Electronic equipments.

**Pre-requisites of the course:** CV304, CV307, CV403, CV407.  
(To be conducted between 5th & 6th Semester for a period of 2 weeks; Viva Voce conducted along with 6th Sem. Exams)
An extensive survey training involving investigation and design of the following projects is to be conducted for 2 weeks (14 days). The students shall submit a project report consisting of designs drawings.

1. General instruction, Reconnaissance of the sites and fly leveling to establish bench marks.

2. NEW TANK PROJECT:
The work shall consist of:
   i) Alignment of center line of the proposed bund, Longitudinal and cross-sections the center line.
   ii) Capacity surveys.
   iii) Details at waste weir and sluice points.
   iv) Canal alignment.

3. RESTORATION OF AN EXISTING TANKS
The work shall consist of:
   i) Alignment of center line of the existing bund, Longitudinal and cross sections along the center line.
   ii) Capacity survey details at sluice waste weir.

4. WATER SUPPLY AND SANITARY PROJECTS:
   Examination of sources of water supply Calculation of quantity of required based on existing and projected population. Preparation of village map by any suitable method of surveying (like plane tabling) location of sites for ground level and overhead tanks, underground drainage system surveys for laying the sewers.

5. HIGHWAY PROJECT:
Preliminary and detailed investigations to align a new road between two obligatory points. The investigations shall consist of topographic surveying of strip of land for considering alternate routes and for final alignment. Report should justify the selected alignment with details of all geometric designs for traffic and design speed assumed. Drawing shall include key plan initial alignment, final alignment, longitudinal section along final alignment, typical cross sections of road.

**Scheme of examinations:**
1. Evaluation of reports and drawings : 30 marks
2. Viva voice : 20 marks
MATRICES METHODS OF STRUCTURAL ANALYSIS

Subject Code : 12CV611  Credits : 03
Hrs / Week : 3 Total Hours : 39

Objectives of the course: To study the flexibility and stiffness method of analysis of various civil engineering structures.

Pre-requisites of the course: CV402, CV501

UNIT - I
Introduction to flexibility method, Element flexibility matrix, Principle of contragradience, and Force Transformation Matrix, Member Flexibility matrix, Construction of structure flexibility matrix. Matrix determination of the displacement vector, Determination of member forces. Analysis of trusses by flexibility method using force transformation matrix. 8 Hrs

UNIT - II
Analysis of axially rigid continuous beams and rigid plane frames with axially rigid members by flexibility method using Force transformation Matrix 8 Hrs

UNIT – III
Fundamentals of the stiffness method, equivalent joint loads, Displacement Transformation matrix. Member stiffness matrix, Total or System stiffness matrix, Truss analysis by stiffness method using Displacement Transformation Matrix. 8 Hrs

UNIT – IV
Continuous Beam and rigid frame analysis with axially rigid members by stiffness method using displacement transformation matrix. 7 Hrs

UNIT – V
Introduction to direct stiffness method, local and global co-ordinate system, transformation of variables, transformation of the member displacement matrix, force matrix, stiffness matrix, transformation of the stiffness matrix of the member of a truss, transformation of the stiffness matrix of the member of the rigid frame, overall stiffness matrix, boundary conditions, computation of internal forces.
Analysis of trusses, pin jointed frames and continuous beams by direct stiffness method.  

**NOTE:**

i. Determination of member forces, displacement and reactions using matrices only  
ii. Number of indeterminacy shall be ≤ 3 (for paper setting)

**TEXT BOOKS:**


**REFERENCE BOOKS:**


**TRAFFIC ENGINEERING**

Subject Code : 12CV612  
Credits : 03  
Hrs / Week : 3  
Total Hours : 39

Objectives of the course: To know about the traffic characteristics, safety and to know about recent developments in the subject.  

Pre-requisite of the course: CV504

**UNIT - I**

Introduction: Definition; Objectives; Scope of traffic Engineering  
Road User and Vehicle Characteristics: Static and Dynamic Characteristics- Power performance of vehicles-Resistances to the motion of vehicles-Reaction time of driver.  

7 Hrs
UNIT – II
Traffic parameter Studies and Analysis: Objectives and method of study- Definition of study area- Sample size-Data Collection and Analysis- Interpretation of following Traffic Studies- Volume, Spot Speed, Origin and Destination, Speed and Delay- Parking- on Street and Off Street Parking- Accidents- Causes, Analysis (right angle collision only with parked vehicle)- Measures to reduce Accident.

9 Hrs

UNIT – III

8 Hrs

UNIT - IV

8 Hrs

UNIT – V
Traffic Rotary elements and traffic operation-Streer lighting-road side Aboriculture.
Intelligent Transport system-case studies.

7 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
RURAL WATER SUPPLY AND SANITATION

Subject Code : 12CV613  Credits : 03
Hrs / Week : 3  Total Hours : 39

Objectives of the course: To study the various elements of rural water supply and sanitation.

Pre-requisites of the course: CV505, CV604

UNIT - I
Rural water supply- introduction; need for a protected water supply, well waters, water-borne diseases. Types of systems viz., BWS, MWS, PWS water treatment defluoridation, hardness and iron removal, ground water contamination and control 8 Hrs

UNIT - II
Rural sanitation-conservancy, public latrine, concept of eco sanitation, trenching and composting methods, two pit latrines, aqua privy, W.C., septic tank, soak pit, sullage disposal, rain water harvesting and uses 8 Hrs

UNIT - III
Communicable diseases- Terminology, classifications, methods of communication, general methods of control. Disease vectors: mosquito and house fly, control measures 8 Hrs

UNIT - IV
Refuse collection and disposal-garbage, ash, rubbish, collection methods, transportation, disposal- salvaging, dumping, controlled tipping, incineration, composting, dung disposal-digester, biogas plant 8 Hrs

UNIT – V
Milk sanitation- Essentials, test for milk quality, pasteurization, quality control, cattle borne diseases, planning for a cow shed. 7 Hrs

TEXT BOOKS:
1. Joseph A. Solveto , “Environmental Sanitation” (publication details)
2. E.W Steel. “Water supply & sanitary Engineering” (publication details)

REFERENCE BOOKS:
1. Park and Park, “Preventive & Social Medicine”
GROUND WATER HYDROLOGY

Subject Code : 12CV621          Credits : 03
Hrs / Week : 3                   Total Hours : 39

Objectives: To make the students to understand the fundamentals and importance of groundwater, its exploration, development and management techniques.

Pre requisites: CV 306 , CV 503

UNIT - I
GROUND WATER EXPLORATION: Seismic method. Electrical resistivity method – principles, yield of a well. 8 Hrs

UNIT - II
FUNDAMENTALS OF GROUND WATER FLOW: Aquifer parameters-Specific yield and specific retention, porosity, storage coefficient: derivation of the expression. Darcy's law, hydraulic conductivity, coefficient of permeability and intrinsic permeability. transmissibility, permeability in isotropic - unisotropic layered soils, steady one dimensional flow - different cases with recharge. 8 Hrs

UNIT - III
WELL HYDRAULICS STEADY FLOW: Radial flow in Confined and Unconfined aquifers, pumping tests, well recuperation tests 8 Hrs

UNIT - IV
WELL HYDRAULICS-UNSTEADY FLOW: General equation derivation; Theiss method, Cooper and Jacob method, Chow's method. Solution of unsteady flow equations. Leaky aquifers (only introduction); Interference of wells - Image well theory. 8 Hrs

UNIT - V
GROUND WATER DEVELOPMENT: Types of wells. Methods of construction, tube well design, dug wells, pumps for lifting water - working principles, power requirement. Conjunctive use - necessity, techniques and economics. 7 Hrs
TEXT BOOKS:

REFERENCE BOOKS:

GROUND IMPROVEMENT TECHNIQUES

Subject Code : 12CV622  Credits : 03
Hrs / Week : 3  Total Hours : 39

Objective of the Course: Equip the students to understand the basics of ground improvement techniques and modification of soils by various methods.

Pre-requisites of the Course: CV503..

UNIT - I

GROUND IMPROVEMENT: Definition, Objectives of soil improvement. Classification of ground improvement techniques. Factors to be considered in the selection of the best soil improvement technique.

MECHANICAL MODIFICATION: Type of mechanical modification, compaction, Principle of modification for various types of soils. Effect of grain size distribution on compaction for various soil types like BC soil, latertic soil, coarse-grained soil, micaceous soil. Effect of compaction on engineering behaviour like Compressibility, Swelling and Shrinkage, Permeability, relative density, liquefaction potential. Field compaction - static, dynamic, impact and vibratory type. Specification of compaction. Tolerance of compaction. 9 Hrs
UNIT - II
HYDRAULIC MODIFICATION: Definition, aim, principle, techniques, gravity drain, lowering of water table, multistage well point, vacuum dewatering, design of dewatering system including pipe line effects of dewatering. Drainage of slopes, preloading, vertical drains, sand drains, Electro osmotic dewatering. 8 Hrs

UNIT - III

UNIT - IV
GROUTING: Introduction, Effects of grouting, Chemicals and materials used, Types of grouting, Grouting procedure and Applications of grouting.

UNIT - V
MISCELLANEOUS METHODS (only Concepts): Introduction, Soil reinforcement., Thermal methods, Ground improvement by confinement - Crib walls, Gabions & Mattresses, Anchors, Rock bolts and soil nailing. 7 Hrs

TEXT BOOKS :
1. Purushoptham Raj., P. “Ground Improvement Techniques”

REFERENCE BOOKS :
REMOTE SENSING AND GIS
APPLICATIONS IN CIVIL ENGINEERING

Subject Code : 12CV623  Credits : 03
Hrs/Week : 3  Total Hours : 39

Objective of the Course: Equip the students to understand the basics of GPS, RS & GIS and Image interpretation techniques

Pre-requisites of the Course: CV306.

UNIT - I

UNIT - II
Photogrammetry- basic principles and photo interpretation, application of aerial photo interpretation to various disciplines like water resources, terrain evaluation, pedology, forestry., Interpretation and Analysis techniques: Multispectral, Multitemporal, Multisensoral, Multistage concepts, Photo-interpretation techniques for aerial photos and satellite imagery, Visual & Digital Image interpretation, interpretation elements, false colour composites 8 Hrs

UNIT - III
Digital Analysis: Preprocessing and processing (DIP), image restoration/enhancement procedures, information extraction, pattern recognition concepts, post processing procedures. Output products: Format, scale, legends 8 Hrs

UNIT - IV
Fundamentals of GIS, spatial and non-spatial data, vector and raster GIS, GIS softwares, georeferencing, digitization, thematic maps, GPS, operation of GIS, Map projections, Map scale, data display and cartography 9 Hrs
UNIT - V
Applications in Civil Engineering: River drainage and flood flow, water shed characteristics, irrigation command area mapping, Ground water inventory, soil moisture, water quality assessment and monitoring, coastal environmental studies  

7 Hrs

TEXT BOOKS:

REFERENCE BOOKS:
2. Heywod, Ian, Sarah Cornelius & Steve Karvar An Introduction to GIS 2nd Ed., Pierson Education Ltd.,
5. Geographic Information Systems and Science John Wiley & Sons Ltd., ESRI Press.