



Year: III

Semester: II

| Subject Code | Subject Name                     | L | T | P | Credits |
|--------------|----------------------------------|---|---|---|---------|
| 20APC0122    | <b>ENVIRONMENTAL ENGINEERING</b> | 3 | 0 | 0 | 3       |

**OUTCOMES:** On completion of the course, the students will be able to:

- Identify the water demand and water characteristics.
- Apply the water treatment concept, methods, water distribution processes and operation.
- Carry out municipal water and wastewater treatment system operations and determine the sewage characteristics
- Prepare basic processes of designs of wastewater treatment plants.
- Design various sewage treatment plants and usage of solid wastes.

#### UNIT – I

**INTRODUCTION:** Importance and Necessity of Protected Water Supply systems, Objectives of Protected water supply system, Flow chart of public water supply system, Role of Environmental Engineer.

**WATER DEMAND AND QUANTITY STUDIES:** Estimation of water demand for a town or city, Types of water demands, Per capita Demand, Factors affecting the Per Capita Demand, Variations in the Demand, Design Period, Factors affecting the Design period, Population Studies, Population Forecasting Studies.

**QUALITY AND ANALYSIS OF WATER:** Characteristics of water – Physical, Chemical and Biological. Analysis of Water – Physical, Chemical and Biological. Impurities in water, Water borne diseases. Drinking water quality standards.

#### UNIT - II

**WATER TREATMENT:** Layout and general outline of water treatment units. Screening. Sedimentation - types of sedimentation tanks - design elements. Coagulation – coagulants – feeding arrangements – flocculation. Filtration – Classification of filters – working of slow and rapid gravity filters – design of filters – troubles in operation comparison of filters. Disinfection – theory of chlorination – chlorine demand, other disinfection practices – Miscellaneous treatment methods

**WATER DISTRIBUTION:** Distribution systems – Requirements, Layout of Water distribution systems - Design procedures- Hardy Cross and equivalent pipe methods.

#### UNIT – III

**INTRODUCTION TO SANITATION:** Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- types of sewers, design of sewers, cleaning and ventilation of sewers. Engineered systems for solid waste management (reuse/ recycle energy recovery, treatment and disposal).

**WASTE WATER COLLECTION AND CHARACTERISTICS:** characteristics of sewage – cycles of decay – decomposition of sewage, examination of sewage – B.O.D. – C.O.D. equations.

#### UNIT IV

**WASTE WATER TREATMENT:** Layout and general outline of various units in a waste water treatment plant – Screens – grit chambers – skimming tanks – sedimentation tanks – biological treatment – trickling filters – standard and high rate – Construction and design of Oxidation ponds.

#### UNIT – V

**SLUDGE TREATMENT:** Sludge digestion – design of Digestion tank – septic tanks and Imhoff Tanks working principles and design – soak pits.

#### TEXT BOOKS:

1. Water supply and sanitary Engineering by G.S. Birdi, Dhanpat Rai & Sons Publishers.
2. Water Supply Engineering, Vol. 1, waste water Engineering, Vol. II, B.C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt.Ltd, New Delhi
3. Environmental Engineering by Peavy, TMH Publishers.

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**REFERENCES:**

1. Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Person Education.
2. Waste water treatment- concepts and design approach by G.L. Karia and R.A. Christian, Prentice Hall of India
3. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers.

**Year: III****Semester: II**

| Subject Code | Subject Name        | L | T | P | Credits |
|--------------|---------------------|---|---|---|---------|
| 20APC0122    | Highway Engineering | 3 | 0 | 0 | 3       |

**Course Outcomes:** After the completion of the course student should be able to

1. Understand the highway development and planning.
2. Understand the geometric design of highway.
3. Understand traffic studies and regulations.
4. Understanding the concept of intersections, interchanges.
5. Understanding the various pavement types and design.

**UNIT-I**

**HIGHWAY DEVELOPMENT AND PLANNING:** Highway development in India – Necessity for highway planning – Different Road development plans – Classification of roads – Road network patterns – Highway alignment – Factors affecting alignment – Engineering surveys – Drawings and reports.

**UNIT-II**

**HIGHWAY GEOMETRIC DESIGN:** Importance of geometric design – Design controls and criteria – Highway cross section elements – Sight distance elements – Stopping sight distance, Overtaking sight distance and intermediate sight distance – Design of horizontal alignment – Design of super elevation and extra widening – Design of transition curves – Design of vertical alignment – Gradients – Vertical curves.

**UNIT-III**

**TRAFFIC ENGINEERING & REGULATIONS :** Basic Parameters of Traffic-Volume, Speed and Density - Traffic Volume Studies - Data Collection and Presentation - Speed studies - Data Collection and Presentation - Parking Studies – On street & Off street Parking - Road Accidents - Causes and Preventive Measures - Accident Data Recording – Condition Diagram and Collision Diagrams - Traffic Signs – Types and Specifications – Road Markings - Need for Road Markings-Types of Road Markings - Design of Traffic Signals – Webster Method

**UNIT-IV**

**INTERSECTION DESIGN:** Conflicts at intersections – Channelisation: Objectives – Traffic islands and design criteria – Types of At grade intersections – Types of grade separated intersections – Rotary intersection – Concept of rotary and design criteria – Advantages and disadvantages of rotary intersection.

**UNIT-V**

**PAVEMENT DESIGN:** Types of pavements – Difference between flexible and rigid pavements – Pavement components – Sub grade, Sub base, Base and wearing course – Functions of pavement components – Design factors – Flexible pavement design methods – G.I method, CBR method, (as per IRC 37-2012) – Design of rigid pavements – Critical load positions – Westergaard's stress equations.\ (as per IRC 58-2002).

**TEXT BOOKS:**

1. Highway Engineering – S.K.Khanna & C.E.G.Justo, Nemchand & Bros., 7th edition (2000).
2. Traffic Engineering & Transportation Planning – Dr.L.R.Kadyali, Khanna Publications – 6th Edition – 1997.

**REFERENCES:**

1. Principles of Traffic and Highway Engineering – Garber & Hoel, Cengage Learning.
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali and Dr.N.B.Lal - Khanna Publications.
3. Highway Engineering – S.P.Bindra , Dhanpat Rai & Sons. – 4th Edition (1981)

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| Subject Code | Subject Name           | L | T | P | Credits |
|--------------|------------------------|---|---|---|---------|
| 20APC0124    | Foundation Engineering | 3 | 0 | 0 | 3       |

**Course Outcomes:** After the completion of the course student should be able to

1. Understand the principles and methods of Soil Exploration
2. Decide the suitability of soils and check the stability of slopes
3. Calculate lateral earth pressures and check the stability of retaining walls
4. Determine the bearing capacity of soil
5. Analyze and design the shallow and deep foundations

#### UNIT – I SOIL EXPLORATION:

Need – methods of soil exploration – boring and sampling methods – penetration tests – plate load test – planning of soil exploration programme, -preparation of soil investigation report.

#### UNIT – II SLOPE STABILITY:

Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish slip circle method, method of slices– Taylor's Stability Number.

#### UNIT – III EARTH PRESSURE THEORIES:

Active, Passive and at rest soil pressures Rankine's theory of earth pressure in cohesive and non-cohesive soils – Earth pressures in layered soils -Coulomb's earth pressure theory. Culmann's and Rebhann Graphical method for active case.

**RETAINING WALLS:** Types of retaining walls – stability of cantilever retaining walls.

#### UNIT – IV SHALLOW FOUNDATION

Types - choice of foundation – location and depth - safe bearing capacity – shear criteria – Terzaghi's method of bearing capacity- settlement criteria –plate load test – allowable settlements of structures.

#### UNIT - V PILE FOUNDATION

Types of piles – load carrying capacity of piles based on static pile formulae – dynamic pile formulae - pile load tests - load carrying capacity of pile groups in sands and clays – Settlement of pile groups – negative skin friction

#### TEXT BOOKS:

1. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
1. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt Ltd
3. Soil Mechanics and Foundation by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi
4. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi.
5. Geotechnical Engineering by C. Venkataramiah, New age International Pvt. Ltd, (2002).

#### REFERENCE BOOKS:

1. Soil Mechanics and Foundation Engineering by VNS Murthy, CBS Publishers and Distributors.
2. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning Publishers.
3. Geotechnical Engineering Principles and Practices by Cuduto, PHI International.
4. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata McGraw-Hill Publishers New Delhi.

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CIVIL ENGINEERING (CE)

**Year: III****Semester: II**

| Subject Code | Subject Name                             | L | T | P | Credits |
|--------------|------------------------------------------|---|---|---|---------|
| 20APE0104    | Design of Reinforced Concrete Structures | 3 | 0 | 0 | 3       |

**Course Outcomes:** At the end of the course the student will able to

1. Understand the basic concepts of reinforced concrete analysis and design.
2. Understand the behaviour of beams.
3. Analyze and design of slabs and staircase
4. Analyze and design of columns
5. Analyze and design of footings

**UNIT –I**

**Introduction:** Concepts of RCC Design –Introduction to Working stress method - Limit State method – Material Stress- Strain Curves – Safety factors – Characteristic values. Stress Block parameters – IS: 456 – 2000.

**Beams:** Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections.

**UNIT – II**

**Shear, Torsion and Bond:** Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

Limit state design for serviceability for deflection, cracking and codal provision.

**UNIT – III**

Design of Two-way slabs and one way slab Using I S Coefficients.

Design of Stair case – Dog legged and Open well.

**UNIT –IV**

Short and Long columns –axial loads, uni-axial and biaxial bending I S Code provisions.

**UNIT – V**

Design of Footings – Design and drawing of isolated square footing, rectangular footing

**NOTE :** All the designs to be taught in Limit State Method

Following plates should be prepared by the students.

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Reinforcement particulars of columns and footings.
4. Detailing of One way, two way and continuous slabs

**TEXT BOOKS:**

1. Building Material by S K Duggal – New Age International Publishers; Second Edition
2. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
3. Building Materials by M.L.Gambhir, TMH Pubilishers.
4. A Textbook on Building Construction by S.K.Sharma, S.Chand Pubilishers.

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**REFERENCES:**

1. Building construction by W.B.Mckay, Vol.I, II, III & IV Pearson Publications, 2013 edition.
2. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.
3. Building materials by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi
4. Building materials by S.C.Rangawala, Charotar Pubilishing House, Anand- INDIA.

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| Subject Code | Subject Name                       | L | T | P | Credits |
|--------------|------------------------------------|---|---|---|---------|
| 20APE0105    | INTELLIGENT TRANSPORTATION SYSTEMS | 3 | 0 | 0 | 3       |

**Course Outcomes:** At the end of the course students will be able to

**CO1:** Understand the sensor technologies

**CO2:** Understand the communication techniques

**CO3:** Apply the various ITS methodologies

**CO4:** Understand the user needs

**CO5:** Define the significance of ITS under Indian conditions

#### UNIT - I

**Introduction:** Objectives- Advantages - Data Collection Techniques - Detectors – Automatic Vehicle Location - Automatic Vehicle Identification - Geographical Information Systems - Video Data Collection.

#### UNIT - II

**Telecommunications in ITS:** Importance of telecommunications in the ITS system - Information Management - Traffic Management Centers (TMC) - Vehicle–Road side communication – Vehicle Positioning System.

#### UNIT - III

**ITS functional areas:** Advanced Traffic Management Systems (ATMS) - Advanced Traveler Information Systems (ATIS) - Commercial Vehicle Operations (CVO) - Advanced Vehicle Control Systems (AVCS) - Advanced Public Transportation Systems (APTS) – Advanced Rural Transportation Systems (ARTS).

#### UNIT - IV

**ITS User Needs and Services:** Travel and Traffic management - Public Transportation Management - Electronic Payment - Commercial Vehicle Operations – Emergency Management - Advanced Vehicle safety systems - Information Management.

#### UNIT - V

**Automated Highway Systems:** Vehicles in Platoons – Integration of Automated Highway Systems - ITS Programs in the World – Overview of ITS implementations in developed countries - Case studies.

#### Text Books :

1. ITS Hand Book 2000: *Recommendations for World Road Association (PIARC)*, Kan Paul Chen, John Miles.
2. Sussman, J. M., *Perspective on ITS*, Artech House Publishers, 2005.
3. *National ITS Architecture Documentation*, US Department of Transportation, 2007 (CDROM).

#### Reference Books :

1. Chowdhary, M.A. and A Sadek, *Fundamentals of Intelligent Transportation systems planning*, Artech House Inc., US, 2003.

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| Subject Code | Subject Name           | L | T | P | Credits |
|--------------|------------------------|---|---|---|---------|
| 20APE0106    | Remote Sensing and GIS | 3 | 0 | 0 | 3       |

**Course Outcomes:** After the completion of the course student should be able to

1. Understand principles of aerial photography
2. Understand the concept of remote sensing
3. Understand the concept of GIS
4. Analyze the GIS spatial data
5. Apply the concepts of GIS in water resources

**UNIT – I****INTRODUCTION TO PHOTOGRAMMETRY:**

Principles & types of aerial photograph, geometry of vertical aerial photograph, Scale & Height measurement on single vertical aerial photograph, Height measurement based on relief displacement, Fundamentals of stereoscopy, fiducially points, parallax measurement using fiducially line.

**UNIT – II****REMOTE SENSING :**

Basic concepts and foundation of remote sensing – elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units. Energy resources, energy interactions with earth surface features and atmosphere, resolution, sensors and satellite visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies, introduction to digital data analysis.

**UNIT – III****GEOGRAPHIC INFORMATION SYSTEM:**

Introduction, GIS definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

**TYPES OF DATA REPRESENTATION:**

Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS – File management, Spatial data – Layer based GIS, Feature based GIS mapping.

**UNIT – IV****GIS SPATIAL ANALYSIS:**

Computational Analysis Methods(CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

**UNIT – V****WATER RESOURCES APPLICATIONS:**

Land use/Land cover in water resources, Surface water mapping and inventory -Watershed management for sustainable development and Watershed characteristics - Reservoir sedimentation, Fluvial Geomorphology - Ground Water Targeting, Identification of sites for artificial Recharge structures - Inland water quality survey and management, water depth estimation and bathymetry.

**TEXT BOOKS:**

- 1 Remote Sensing and GIS by B.Bhatta, Oxford University Press, New Delhi.
- 2 Fundamentals of remote sensing by Gorge Joseph , Universities press, Hyderabad

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**REFERENCES:**

1. Advanced Surveying : Total Station GIS and Remote Sensing – Satheesh Gopi – Pearson Publication.
2. Remote Sensing and its applications by LRA Narayana University Press 1999.
3. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
4. Remote sensing and GIS by M.Anji Reddy ,B.S.Publiications,New Delhi.
5. GIS by Kang – Tsung Chang, TMH Publications & Co.,

Year: III

Semester: II

| Subject Code | Subject Name | L | T | P | Credits |
|--------------|--------------|---|---|---|---------|
| 20APC0125    | STAAD LAB    | 0 | 0 | 3 | 1.5     |

**Course Outcomes:****CO1:** Understand basic commands used in STAAD Pro and their applications**CO2:** Analyse the structure for various loading conditions**CO3:** Analyse and design of structural elements for various loading conditions**SOFTWARE:**

1. STAAD PRO or Equivalent

**EXERCISES:**

1. 2-D Frame Analysis and Design
2. Steel Tabular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple tower Analysis and Design
6. One Way Slab Analysis & Design
7. Two Way Slab Analysis & Design
8. column Analysis & Design

**TEXT BOOK:**

1. computer Aided Design Lab Manual by Dr.M.N.Sesha Prakash And Dr.C.S.Suresh

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| Subject Code | Subject Name                         | L | T | P | Credits |
|--------------|--------------------------------------|---|---|---|---------|
| 20APC0126    | <b>ENVIRONMENTAL ENGINEERING LAB</b> | 0 | 0 | 3 | 1.5     |

**Course Objective:**

*The laboratory provides knowledge of estimating various parameters like PH, Chlorides, Sulphates, Nitrates in water. For effective water treatment, the determination of optimum dosage of coagulant and chloride demand are also included. The estimation status of Industrial effluents will also be taught in the laboratory by estimating BOD and COD of effluent*

**Course Outcomes:**

**CO1: Determine physical, chemical and biological characteristics of water and wastewater**

**CO2: Determine optimum dosage of coagulant**

**CO3: Assess the quality of water and wastewater**

**LIST OF EXPERIMENTS**

1. Determination of pH and Turbidity
2. Determination of Conductivity and Total dissolved solids.
3. Determination of Alkalinity/Acidity.
4. Determination of Chlorides.
5. Determination and Estimation of total solids, organic solids and inorganic solids.
6. Determination of iron.
7. Determination of Dissolved Oxygen.
8. Determination of Nitrogen.
9. Determination of total Phosphorous.
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of Optimum coagulant dose.
13. Determination of Chlorine demand.
14. Presumptive coliform test.

**NOTE:** At least 8 of the above experiments are to be conducted.

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|--------------|-------------------------|---|---|---|---------|
| 20APC0127    | Highway Engineering lab | 0 | 0 | 3 | 1.5     |

**Course Outcomes:** After the completion of the course student should be able to

1. Asses properties of highway construction materials

## LIST OF EXPERIMENTS

### I. ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Abrasion Test.
5. Shape tests

### II. BITUMINOUS MATERIALS :

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.

### III TRAFFIC FIELD STUDIES

1. Traffic Volume Studies at Mid-block and Data Analysis
2. Traffic Volume Studies at Intersection and Data Analysis

### LIST OF EQUIPMENT:

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometer.
4. Los angles Abrasion test machine
5. Length and elongation gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Penskey – Morten's apparatus
11. Relevant IS Codes