

III Year - II Semester

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### ENVIRONMENTAL ENGINEERING – I

#### Course Learning Objectives:

The course will address the following:

- Outline planning and the design of water supply systems for a community/town/city
- Provide knowledge of water quality requirement for domestic usage
- Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
- Selection of valves and fixture in water distribution systems
- Impart knowledge on design of water distribution network

#### Course Outcomes:

Upon the successful completion of this course, the students will be able to:

- Plan and design the water and distribution networks and sewerage systems
- Identify the water source and select proper intake structure
- Characterisation of water
- Select the appropriate appurtenances in the water supply
- Selection of suitable treatment flow for raw water treatments

#### SYLLABUS:

**UNIT-I Introduction:** Importance and Necessity of Protected Water Supply systems, Water borne diseases, Flow chart of public water supply system, Role of Environmental Engineer, Agency activities

**Water Demand and Quantity Estimation:** Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations- factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting.

**UNIT-II Sources of Water:** Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries.

**Collection and Conveyance of Water:** Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressure conduits, Types of Pipes, Pipe Materials, Pipe joints, Design aspects of pipe lines, laying of pipe lines

**UNIT-III Quality and Analysis of Water:** Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sources with reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water

**UNIT-IV Treatment of Water:** Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration

**UNIT-V Disinfection:** Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of color and odours - Iron and manganese removal – Adsorption-fluoridation and defluoridation–aeration–Reverse Osmosis-Iron exchange–Ultra filtration

**UNIT-VI Distribution of Water:** Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks: Hardy Cross and equivalent pipe methods -Components of Distribution system: valves such as sluice valves, air valves, scour valves and check valves, hydrants, and water meters–Laying and testing of pipe lines- selection of pipe materials, pipe joints

### **Text Books**

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985.
2. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd., New Delhi, 2012.

### **References**

1. Water Supply Engineering – P. N. Modi.
2. Water Supply Engineering – B. C. Punmia
3. Water Supply and Sanitary Engineering – G. S. Birdie and J. S. Birdie
4. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.