3/4 B.Tech. FIFTH SEMESTER

CE5T2 ENVIRONMENTAL ENGINEERING-I Credits: 3

Lecture: 3 periods/week Internal assessment: 30 marks

Tutorial: 1 period /week Semester end examination: 70 marks

Pre-requisites: Environmental science, fluid mechanics, hydraulics and hydraulic machinery

Learning objectives:

- To gain knowledge on various sources of water with reference to quality and quantity in a locality, their suitability for domestic application and drinking.
- To know the water quality standards and water analysis.
- To design various treatment units as per the quality of water is concern.
- To know different operation of chlorine.
- To make pipe line networking with various appurtenances including service reservoirs, various types of valves.

Course outcomes:

After the exposure to the subject, student will be able to:

1. Comphrend water supply Engineering is important professional and ethical responsibility of Civil and Environmental Engineer.
2. Assess the quality and quantity of water requirements for a city/town.
3. Design the various types of treatment units for treating the raw water
4. Classify the chlorination and disinfection of water
5. Understand the different types of appurtenances for safe disposal of drinking water.

UNIT - I

INTRODUCTION TO WATER SUPPLY ENGINEERING

Need for protected water supplies-Objectives of water supply systems -Role of Environmental Engineers- Quantity of water-Estimating requirements- Design period- Per capita Consumption-Factors affecting per capita consumption- Fire demand Fluctuations in demand Prediction of population.

SOURCES AND INTAKE WORKS

Classification of sources of water supply- Choice of source- Suitability with regard to quality and quantity- Lake, river, reservoir and canal intake -Types of conduits- Capacity and design- Materials for pipes- Leakages- Types of pumps- Efficiency and choice of pumps.

UNIT-II

QUALITY OF WATER

Impurities in water- Routine water analysis - physical, chemical and bacteriological tests -Standards for drinking water- Methods of purification of water- Sequence of treatment for ground water and surface water sources- Water borne diseases.

PLAIN SEDIMENTATION AND COAGULATION

Theory of sedimentation; Stoke's law; Sedimentation tanks; Design aspects; Principle of coagulation; Chemicals used for coagulation; Units of coagulation plant; Optimum dose of coagulant

UNIT-III

FILTRATION OF WATER

Theory of filtration; Filter materials; slow sand and rapid sand filters; Construction and operation; Troubles in rapid sand filters; Pressure filters

DISINFECTION OF WATER

Different methods of disinfection; Chlorination; Types of chlorination; Testing of chlorine. - Chlorine demand; Break point chlorination; Application of gaseous chlorine; liquid chlorine;

UNIT-IV

WATER SOFTENING

Methods of removing temporary hardness; Methods of removing permanent hardness; Lime soda process; Base exchange process; Demineralization process; Removal of colour, odour and taste from water; Defluoridation.

DISTRIBUTION SYSTEM

General requirements; Classification; Methods of supply; Available pressure in the distribution system; Layouts of distribution networks; Hardy cross method-equivalent pipe method; Distribution reservoirs; Functions; Types; Capacity of balancing tank; Analysis of distribution system; Methods of analysis.

UNIT-V

APPURTENANCES IN THE DISTRIBUTION SYSTEM

Position of valves; site location; Sluice valves; Check valve; Air valve; Drain valve; Hydrants; Meters.

PLUMBING

Water supply – pipes and fittings; House drainage - Sanitary fittings, Traps; Plumbing system of drainage – Single stack, One pipe and Two pipe systems; Principles governing design of building drainage.

Learning resources:

Text books:

1. Elements of public health engineering by K. N. Duggal; S.Chand & Company Ltd., New Delhi.
2. Environmental Engineering Vol. I - Water supply engineering by S. K. Garg; Khanna Publishers, Delhi.

Reference books:

1. Water Supply and Sanitary Engineering Vol. 1 by Gurucharan Singh; Standard Publishers Distributors, Delhi
2. Water Supply and Sanitary Engineering by G.S. Birde; Dhanpat rai and sons, Delhi.
3. Manual on Water Supply & Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.

e-learning resources:

NPTEL