

## **WASTE WATER MANAGEMENT OPEN ELECTIVE**

### **Learning Objectives:**

- Outline planning and the design of waste water collection ,conveyance and treatment systems for a community/town/city
- Provide knowledge of characterization of waste water generated in a community
- Impart understanding of treatment of sewage and the need for its treatment
- Summarize the appurtenance in sewage systems and their necessity
- Teach planning and design of septic tank and imhoff tank and the disposal of the effluent from these low cost treatment systems
- Effluent disposal method and realize the importance of regulations in the disposal of effluents in rivers

### **UNIT-I:**

Introduction to Sanitation-Systems of sanitation- relative merits and demerits - collection and conveyance of waste water - classification of sewerage systems-Estimation of sewage flow and storm water drainage- fluctuations-types of sewers- Hydraulics of sewers and storm drains-design of sewers- appurtenances in sewerage- cleaning and ventilation of sewers

### **UNIT-II:**

Pumping of wastewater: Pumping stations-location- components- types of pumps and their suitability with regard to wastewaters.

House Plumbing: Systems of plumbing-sanitary fittings and other accessories-one pipe and two pipe systems-Design of building drainage

### **UNIT-III:**

Sewage characteristics-Sampling and analysis of waste water-Physical, chemical and Biological examination-measurement of BOD & COD- BOD equations

Treatment of sewage: Primary treatment- Screens-grit chambers- grease traps- floatation-sedimentation-design of preliminary and primary treatment units.

### **UNIT-IV:**

Secondary treatment: Aerobic and anaerobic treatment process -comparison.

Suspended growth process: Activated sludge process, principles, design and operational problems, modifications of Activated sludge processes, Oxidation ponds, Aerated Lagoons.

Attached Growth process: Trickling Filters-mechanism of impurities removal-classification-design -operation and maintenance problems. RBCs. Fluidized bed reactors

### **UNIT-V:**

Miscellaneous Treatment Methods: Nitrification and Denitrification- Removal of phosphates-UASB- Membrane reactors- Integrated fixed film reactors. Anaerobic Processes: Septic Tanks, Imhoff tanks- working principles and Design-disposal of septic tank effluent-FAB Reactors

**UNIT-VI:**

Bio-solids (sludge) management: Characteristics- handling and treatment of sludge-thickening-anaerobic digestion of sludge

Disposal of sewage: Methods of disposal- disposal into water bodies- Oxygen sag Curve-

Disposal into sea-disposal on land- sewage sickness

**Outcomes:**

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

- Plan and design the sewerage systems
- Characterization of sewage
- Select the appropriate appurtenances in the sewerage systems
- Select the suitable treatment flow for sewage treatment
- Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river

**Text Book:**

1. Waste water Engineering Treatment and Reuse by Metcalf & Eddy, Tata McGraw- Hill edition.
2. Elements of Environmental Engineering by K.N. Duggal, S.Chand & Company Ltd. New Delhi, 2012.
3. Environmental Engineering by Howard S.Peavy , Donald R. Rowe, George Tchobanoglous- Mc-Graw-Hill Book Company, New Delhi, 1985
4. Wastewater Treatment for pollution control and Reuse, by soli.J Areivala, sham R Asolekar, Mc-GrawHill, New Delhi; 3rd Edition
5. Industrial water & wastewater management by KVSG MuraliKrishna

**Reference Book:**

1. Environmental Engineering-II: Sewage disposal and Air pollution Engineering , by Garg, S.K.,: Khanna publishers
2. Sewage treatment and disposal by Dr.P.N.Modi & Sethi.
3. Environmental Engineering, by Ruth F. Weiner and Robin Matthews- 4th Edition Elsevier, 2003
4. Environmental Engineering by D. Srinivasan, PHI Learning private Limited , New Delhi,2011.