	L	T	P	C
III Year II Semester				
Code: 17CE603	**3**	**1**	**0**	**3**

ENVIRONMENTAL ENGINEERING

Course Objectives:

1. Outline planning and the design of water supply systems for a community/town/city
2. Design of water distribution network.
3. Impart understanding of importance of protection of water source quality and enlightens the efforts involved in converting raw water into clean potable water.
4. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city.
5. Impart understanding of treatment of sewage and the need for its treatment.
6. Effluent disposal method and realize the importance of regulations in the disposal of effluents in rivers.

Course Outcomes:

1. Plan and design the water distribution networks and sewerage systems
2. Select the appropriate appurtenances in the water supply
3. Selection of suitable treatment for raw water treatments
4. Plan and design the sewerage systems
5. Analyze sewage and suggest and design suitable treatment system for sewage treatment
6. Suggest a suitable disposal method with respect to effluent standards.

SYLLABUS

UNIT–I

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.

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 networks: valves such as sluice valves, air valves, scour valves and check valves, hydrants, and water meters.

UNIT-II

Sources of Water: Surface sources: Lakes, Rivers, Impounding Reservoirs - Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries. Comparison of sources with reference to quality, quantity and other considerations

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, Design aspects 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. - i.e. Drinking water quality standards and W.H.O. guidelines for drinking water

Treatment of Water: Flowchart of water treatment plant, treatment methods: theory and design of sedimentation, coagulation, sedimentation with coagulation, filtration; disinfection: theory of disinfection-chlorination and other disinfection methods.

UNIT–IV

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

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

UNIT – V

Sewage Characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations.

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

UNIT – VI

Secondary treatment: Aerobic and anaerobic treatment process comparison. Suspended growth process: Activated Sludge Process, principles, designs, and operational problems. Attached Growth Process: Trickling Filters–mechanism of impurities removal- classification–design-operation and maintenance problems.

Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design–Reuse and disposal of septic tank effluent-Disposal of sewage

Text Books

1. Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition.
2. Industrial Water and Wastewater Management, K.V.S.G. Murali Krishna
3. Elements of Environmental Engineering, K. N. Duggal, S. Chand & Company Ltd. New Delhi, 2012.

References

1. Environmental Engineering, Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 1985
2. Wastewater Treatment for Pollution Control and Reuse, Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3rd Edition
3. Environmental Engineering –II: Sewage disposal and Air Pollution Engineering, Garg, S. K., Khanna Publishers, 2003
4. Environmental Engineering, D. Srinivasan, PHI Learning Private Limited, New Delhi, 2011.