Environmental Engineering

(SYLLABUS)

Course Code	23CE3603	Year	III	Semester	II
Course Category	Professional Core	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Environmental Science
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks:	100

Course Learning Objectives:

The course will address the following:

1. Outline the planning and design of water supply systems for a community, town or city.
2. Provide knowledge of water quality requirements for domestic usage and the design of water distribution networks.
3. Explain the selection of appropriate valves and fixtures in water distribution systems.
4. Outline the planning and design of sewerage systems for a community, town or city.
5. Impart knowledge on wastewater treatment processes and disposal methods.

Course Outcomes:

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

CO	Statement	Blooms level
CO1	Analyze various water sources and determine their suitability based on quantity and quality considerations.	**L4**
CO2	Apply the principles of water supply and sewerage system design to develop basic system layouts for community needs.	**L3**
CO3	Analyze water and wastewater characteristics to determine appropriate treatment requirements and assess compliance with standards.	**L4**
CO4	Recommend suitable treatment processes for both raw water and wastewater based on quality criteria.	**L4**
CO5	Evaluate and decide suitable methods for wastewater disposal considering environmental and regulatory requirements.	**L4**

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	2					1	3	2
CO2	2	2	3	1	2	1		1	1	2	1	3	3
CO3	3	3	2	3	2	2			1		1	3	2
CO4	2	3	3	2	1	2			1		1	3	2
CO5	2	3	2	2	1	3	1		1		1	2	2

(1 = Low, 2 = Medium, 3 = High)

Syllabus

Unit No	Content	Mapped COs
I	**Introduction:** Importance and Necessity of Protected Water Supply systems. Water borne diseases. Planning of public water supply systems. 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, estimation of water demand for a town or city, Population Forecasting. **Sources of Water:** Various surface and subsurface sources considered for water supply and their comparison- Capacity of storage reservoirs, Conveyance of Water from the source to the point of interest: Gravity and Pressure conduits, Types of Pipes and Pipe joints.	**CO1, CO2**
II	**Quality and Analysis of Water:** Physical, Chemical and Biological characteristics of water. Water quality criteria for different uses- Rural, Municipal, Industrial and Agricultural uses. Drinking water quality standards: IS and WHO guidelines. **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 - Appurtenances of water distribution system–Laying and testing of pipe lines.	**CO1, CO2, CO3**
III	**Treatment of Water:** Typical treatment flow of a municipal water treatment plant, Unit operations of water treatment: Theory and Design of Sedimentation, Coagulation, flocculation, Filtration, Water conditioning and softening, Disinfection, Removal of color and odors - Removal of Iron and manganese - Fluoridation and De-fluoridation - Ion Exchange - Ultra filtration- Reverse Osmosis.	**CO3, CO4**
IV	**Planning and Design of Sewerage System** Characteristics and composition of sewage - population equivalent -Sanitary sewage flow estimation - Sewer materials - Hydraulics of flow in sanitary sewers - Sewer design - Storm drainage-Storm runoff estimation - sewer appurtenances - corrosion in sewers - prevention and control - sewage pumping-drainage in buildings-plumbing systems for drainage Primary Treatment of Sewage: Objectives - Unit Operations and Processes - Selection of treatment processes - Onsite sanitation - Septic tank - Grey water harvesting - Primary treatment - Principles, functions and design of sewage treatment units - screens - grit chamber-primary sedimentation tanks - Construction, Operation and Maintenance aspects.	**CO2, CO4**
V	**Secondary Treatment of Sewage** Objectives - Selection of Treatment Methods - Principles, Functions - Activated Sludge Process and Extended aeration systems -Trickling filters - Sequencing Batch Reactor (SBR) - Membrane Bioreactor - UASB - Waste Stabilization Ponds - Other treatment methods -Reclamation and Reuse of	**CO3, CO4, CO5**

	sewage - Recent Advances in Sewage Treatment - Construction, Operation and Maintenance aspects. **Disposal of Sewage** Standards for - Disposal - Methods - dilution - Mass balance principle - Self purification of river - Oxygen sag curve - de-oxygenation and re-aeration - Streeter-Phelps model - Land disposal - Sewage farming - sodium hazards - Soil dispersion system.	

Learning Resource(s)

Text Book(s)

1. Environmental Engineering - Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, McGraw-Hill Book Company, New Delhi, 1985.
2. Water Supply Engineering - Dr. P.N. Modi, Standard Book House, Delhi.

Reference Book(s)

1. Elements of Environmental Engineering - K.N. Duggal, S. Chand & Company Ltd., New Delhi.
2. Water Supply Engineering - Dr. B.C. Punmia, A.K. Jain and A.K. Jain, Laxmi Publications (P) Ltd., New Delhi.
3. Water Supply and Sanitary Engineering - G.S. Birdie and J.S. Birdie.

Web Materials:

1. https://nptel.ac.in/courses/105104102/
2. https://nptel.ac.in/courses/105105048/

Faculty **HoD-CE**