

Branch Name:	Environment Engineering
Program Code:	ET212
Subject Title:	Fundamentals of Water and Wastewater Treatment
Subject Code:	2ET2120101T
Pre-requisite Subject:	Water and Waste Water Engineering

Course Objective:

- Student should acquire knowledge related to the requirement of water treatment technologies and its design.
- Student should acquire knowledge related to the requirement of wastewater treatment technologies and its design.
- Student will get knowledge related to contaminant and its control in water.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

Subject Contents			
Sr. No	Topic	Total Hours	Weightage (%)
1	Quality and Quantity of Water: Quantity and quality of water, Water demand, Drinking water standards, waste water effluent standards, water quality index, impurities in water and physical, chemical and biological characteristics of water.	6	14
2	Types of Wastewater Treatment: Unit operations, physical process, chemical process, biological process, primary, secondary and tertiary treatment, water supply scheme, design period, layout of water and wastewater treatment plant, treatment plant selection	7	17
3	Physico-chemical Treatment of Water & Wastewater: Aeration and gas transfer, Coagulation, Rapid mixing and flocculation, coagulation processes, stability of colloids, destabilization of colloids, transport of colloidal particles, Jar test, Types of settling, Clariflocculation, Softening	5	12
4	Filtration: Theory of granular media filtration, classification of Filters, slow sand filters and rapid sand filters, Mechanism of filtration, modes of operation and operational problems, negative head and air binding: dual and multimedia filtration, pressure filters, principle of working	6	14
5	Disinfection: Disinfection mechanism, Factors affecting disinfection, Disinfection agents, ozonation, UV radiation	5	12
6	Biological Treatment for Wastewater: Types of biological treatment: Suspended & attached Growth Processes, Design Parameters for Biological Treatments, activated sludge and trickling filter processes, rotating biological Contactor, UASB	6	14
7	Advanced Water & Wastewater Treatment Methods: Ion Exchange process, Membrane Processes, Reverse Osmosis, Microfiltration, Nano-filtration, Dialysis and Electrodialysis and Nanotechnology	5	12
8	Ground water exploration: Emerging contaminants and control	2	05

Reference Books:

1. Wastewater Engineering, Treatment and Reuse by Metcalf and Eddy, Tata McGraw- Hill Publication, New Delhi, 2003
2. Water & Waste Water Engineering by Fair and Gayer.
3. Introduction to Environmental Engineering by Mackenzie
4. Physicochemical processes for water quality control by Weber, W.J., John Wiley and sons, Newyork, 1983
5. Environmental Engineering by Peavy, H.S., Rowe, D.R. and Tchobanoglous, G., McGraw Hills, New York 1985
6. Water Quality and Treatment (A handbook of community water supplies 5th edition): Published by American Water Works Association.

List of Open-Source Software/learning website:

- <http://nptel.ac.in/>
- <http://elearning.vtu.ac.in/>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Recognize and define the quality parameters typically used to characterize wastewater	L-2
CLO2	Describe various types of process units used for preliminary and primary treatment, e.g., screening, equalization, primary settling and explain their functions	L-2
CLO3	Describe and explain how biological wastewater treatment removes pollutants	L-3
CLO4	Describe various biological wastewater treatment processes and recognize pros and cons of each process	L-2
CLO5	Explain the principles of the suspended and attached growth biological processes and the factors that influence and control these processes	L-2
CLO6	Recognize emerging technologies for advanced wastewater treatment and water recycling	L2
CLO7	Describe a disinfection process in terms of contact time and chemicals usage	L-2
CLO8	Discuss wastewater treatment excess sludge handling, treatment, disposal and biosolids application	L-3
CLO9	Draw schematics of typical water and wastewater treatment plants.	L-3

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with POs & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1						M	M							M	
CLO2						M	M							M	
CLO3	L			M										M	
CLO4						M	M							M	
CLO5				M										M	
CLO6	M		M		L		M						M	M	
CLO7						M	M							M	
CLO8	L			M										M	
CLO9	M		M		L		M						M	M	

H: High, M: Medium, L: Low