

Branch Name:	Civil Engineering
Program Code:	ET106
Course Name:	Water and Wastewater Engineering
Course Code:	2ET1060503P
Pre-requisite Subject:	Study of Basic Environmental Engineering

Course Objective:

- To develop a student's skills in designing the water treatment process which can provide potable water to the community in accordance with the water demand
- To understand waste water collection, treatment and disposal which are essential for maintaining the quality to the water sources and to reduce effects of water pollution.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min .	Max.	Min .	Max.	Min.	Max.	Min.	Max.	
3	-	-	2	2	-	-	-	-	10	25	10	25	50

List of Experiments:

1. Introduction to standards, collection and preservation of samples, sampling techniques and laboratory equipment
2. Determination of turbidity of the water sample
3. Determination of optimum coagulant dose for water sample
4. Determination of Dissolved Oxygen in water sample
5. Determination of Biochemical Oxygen Demand of wastewater sample
6. Determination of Chemical Oxygen Demand of wastewater sample
7. Determination of Ammoniacal Nitrogen of wastewater sample
8. Determination of Sodium in water and wastewater sample
9. Determination of Potassium in water and wastewater sample

List of Text Books:

1. Garg, S. K., *Water Supply Engineering*, Khanna Publishers, 2020.
2. Garg, S. K., *Sewage Disposal and Air Pollution Engineering*, Khanna Publishers, 2020.
3. Punmia, B. C., Jain, A. K., & Jain, A. K., *Water Supply Engineering*, Laxmi Publications, 2019.

List of Reference Books:

1. Metcalf & Eddy, *Wastewater Engineering: Treatment and Resource Recovery*, McGraw Hill Education, 5th Edition, 2014.
2. Hammer, M. J., & Hammer Jr., M. J., *Water and Wastewater Technology*, Pearson, 8th Edition, 2017.

3. Peavy, H. S., Rowe, D. R., & Tchobanoglous, G., *Environmental Engineering*, McGraw Hill Education, 1st Edition, 2013.
4. Droste, R. L., & Gehr, R. L., *Theory and Practice of Water and Wastewater Treatment*, Wiley, 2nd Edition, 2019.
5. AWWA, *Water Quality and Treatment: A Handbook of Community Water Supplies*, McGraw Hill Education, 6th Edition, 2010.

Course Outcomes

After completing this course, students will be able to:

1. Analyze and design water treatment plants and their components.
2. Design systems for the collection and conveyance of raw water.
3. Understand the physical, chemical, and biological processes in water and wastewater treatment.
4. Solve network analysis problems in water distribution systems.
5. Design wastewater collection systems and estimate discharge.
6. Apply advanced treatment technologies to enhance wastewater quality.

Course Learning Outcomes (CLO):

After successful completion of the course the students shall be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Analyze and design water treatment plants and their components.	L3
CLO2	Design systems for the collection and conveyance of raw water.	L6
CLO3	Understand the physical, chemical, and biological processes in water and wastewater treatment.	L2
CLO4	Solve network analysis problems in water distribution systems.	L5
CLO5	Design wastewater collection systems and estimate discharge.	L4
CLO6	Apply advanced treatment technologies to enhance wastewater quality.	L3

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		M		M		
CLO3	M	M		M			M				M		M		
CLO4		M		M							M			M	
CLO5							M		M		M			M	
CLO6			M												

H: High, M: Medium, L: Low