

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BRANCH NAME: Environmental Science & Technology**  
**SUBJECT NAME: Newer Wastewater Treatment Systems**

**SUBJECT CODE: 2173513**  
**B.E. Semester: VII**

**Type of course:** Environmental Science & Technology

**Prerequisite:** Basic knowledge of different types of pollutants present in wastewater, different source of water pollution.

**Rationale:** This subject is intended to make students aware about the recent trend in wastewater treatments methods, newer technologies used for treatment of wastewater to reuse it for industrial purpose.

## Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	0	0	4	70	20	10	00	00	00	100

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

**Learning Objectives:** The learning objective of this subject is to expose the students to various technologies in water treatment in order to make water safe drink and also various treatment options available in treatment of wastewater for recycle and safe disposal.

## Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
1.	<b>Definition and concept:</b> Water sources, Philosophy of water treatment, Review of water quality characteristics and potable water standards, Estimation of water quantity, Theory and design of Conventional Unit Operations used in Water Treatment: Screening, Sedimentation, Floatation, coagulation, flocculation, filtration, softening and disinfection processes	10	30
2.	<b>Theory of Advanced Unit Operations:</b> Membrane processes, Ion Exchange, Aeration/stripping, Precipitation, Adsorption, Oxidation-reduction and advanced oxidation processes; Water Treatment Plant Design; Selection of raw water source, Planning and setting of water treatment plant, Chemical requirement and residuals management.	8	20
3.	<b>Water Quality Parameters:</b> Definition and Concepts; Philosophy of wastewater Treatment, Review of Wastewater quality parameters and discharge standards for aquatic and land disposal, Estimation of	10	30

	wastewater quantity; Wastewater Collection; Design of sewers and sewerage systems;		
4.	<b>Wastewater treatment methods</b> ; Preliminary treatment, Bar-rack, Screens, Grit chamber, Equalization tank, Primary sedimentation. Secondary treatments: Aerobic processes, Anaerobic processes. Tertiary treatment, Nutrient removal, Residual management, Design; Planning and siting of Wastewater treatment plant.	8	20

**Suggested Specification table with Marks (Theory):**

Unit No	Unit Title	Distribution of Theory Marks					Total
		R Level	U Level	A Level	N level	E level	
1	<b>Definition &amp; Concept</b>	8	6	6	5	5	30
2	<b>Theory of advanced unit operation</b>	6	4	4	3	3	20
3	<b>Water quality parameters</b>	8	6	6	5	5	30
4	<b>Waste water treatment methods</b>	6	4	4	3	3	20

**Legends: R : Remembrance ; U = Understanding; A = Application; N= Analyze; E= Evaluate and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table

**Reference Books:**

- Benefield, L.D. Judkins J.F. and Weand B.L. (1982). Process Chemistry for Water and Wastewater Treatment, End ed., Prentice-Hall, Inc, New Jersey, USA
- Benefield L.D. and Randall, C.W. (1980). Biological process design for wastewater treatment. Prentice-Hall.
- N.J. Pelczar, M.J., Chan ECS and Krieg NR, Microbiology, Tata McGraw Hill Edition, New Delhi, India.
- Talaro K., Talaro A Cassida Pelzar and Reid, (1993) Foundations in Microbiology, W.C. Brown Publishers.
- Metcalf and Eddy, M.C., "Wastewater Engineering: Treatment, Disposal and Reuse", TataMcGraw-Hill Publications, New Delhi, 2003
- Sawyer, McCarty, and Parkin, 2003.Chemistry for Environmental Engineers, 5th" McGraw Hill,

**Course Outcome:** After learning this course the students would be able to:

1. Understand various unit operations involved in water treatment and design various water treatment units required.
2. Design waste water treatment units for desire treatment.

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The

faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.