

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Environmental Engineering (13), Environmental Science & Engineering (37)

SUBJECT NAME: Wastewater Engineering

SUBJECT CODE: 2171306

B.E. 7TH SEMESTER

Type of course: Applied science

Prerequisite: Knowledge of physic chemical and biological treatment of wastewater

Rationale: This course provides fundamentals for selection and design of the most appropriate and sustainable wastewater treatment systems. It also provides the basics on technology selection and engineering economics for analysis, evaluation and comparison of different treatment alternatives.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		PA (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	4	0	8	70	20	10	30	0	20	150

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;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Domestic, Municipal and Industrial Wastewater <ul style="list-style-type: none"> • Definition , Characteristics and features • Treatment flow schemes and basic design considerations for domestic wastewater, municipal wastewater and industrial wastewater. 	04	7
2	Design of Physical Unit Operations for Wastewater Treatment <ul style="list-style-type: none"> • Design of screen and bar rack • Design of Grit chamber • Design of equalization tank 	10	18

	<ul style="list-style-type: none"> • Design for grease removal • Design of rapid mixer, flocculator and clarifier • High rate clarifier • Operational problems of physical unit operations 		
3	<p>Design of chemical unit processes for Wastewater Treatment</p> <ul style="list-style-type: none"> • Coagulation • Operational problems of chemical unit processes 	06	11
4	<p>Design of biological treatment processes for Wastewater Treatment</p> <p>[A] Aerobic process</p> <ul style="list-style-type: none"> • Detailed design of following suspended growth processes <p>(i) Complete Mix ASP</p> <p>(ii) Extended aeration</p> <p>(iii) Sequencing Batch Reactor</p> <ul style="list-style-type: none"> • Operational problems of suspended growth processes • Attached Growth Process <p>(i) Bio Towers</p> <p>(ii) Rotating Biological Contactors</p> <ul style="list-style-type: none"> • Operational problems • Types and design of aeration system • Design of secondary clarifier <p>[B] Anaerobic processes</p> <ul style="list-style-type: none"> • Design of UASB • Design of standard rate and high rate digesters • Operational problems 	26	46
5	<p>Sludge handling and management :Introduction, Placement, brief description of</p> <ul style="list-style-type: none"> ▪ Centrifuge ▪ Belt Filter Press ▪ Neutsch filter 	10	18

	<ul style="list-style-type: none"> ▪ Filter Presses ▪ Decanter ▪ Sludge Drying Beds 		
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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
10	25	25	20	20

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and 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:

1. **1. Wastewater Engineering, Treatment & Reuse by Metcalf & edition Tata – Mcraw –Hill edition.**

Tutorials:

Based on Design.

Course Outcome:

After learning the course the students should be able to:

1. Select the most suitable and cost-effective wastewater treatment process technology (among the most widely applied anaerobic, aerobic, land-based and on-site systems) to treat certain wastewater stream given its composition and characteristics and taking into account the required effluent standards.
2. Carry out a preliminary design of a wastewater treatment system (based on the most widely applied anaerobic, aerobic, land-based and on-site systems) including the engineering process lay-out, hydraulic profile and process flow-diagram (PFD).

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.