GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL SCIENCE AND TECHNOLOGY (35)
DESIGN OF TREATMENT PLANTS
SUBJECT CODE: 2183507
B.E. 8TH SEMESTER

Type of course: Design and Drawing in Environmental Science & Technology

Prerequisite: Basic Concepts and equations regarding water, wastewater treatment equipments.

Rationale: This subject introduces concepts of designing of treatment units and its detailed drawing.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	1	2	7	70	20	10	20	20	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1.	**Combination of Unit Operations/Processes** Layout of plants, Layout of ETP's, Storm water drain, Lab scale, Pilot scale and Scale up, Treatability studies, Data collection and decision on design parameters like flow, pH, TDS etc. , Treated effluent management- Discharge options & requirements	14	25
2.	**Design consideration in water treatment Unit Operations:** Screen Chamber, Grit Chamber, Equalization, Neutralization, Sedimentation, Secondary clarifier, Coagulation Flocculation, Dissolved Air Flotation, Activated Carbon Unit, UASB, Trickling Filter, , and Activated Sludge Process. .	14	25
3.	**Detailed design of Units:** Clarifier, Aeration tanks, MEE	14	25
4.	**Design of Integrated Waste water system:** General Design of Effluent Treatment Plant, Sewage Treatment Plant, Zero Liquid Discharges system	14	25

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level

24	**28**	**27**	**10**	**11**	**-**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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) WPCF (USA), Waste Water Treatment Plant Design Manual of Practice.
2) Schroeder, Water & Waste Water Treatment, McGraw Hill.
3) S. J. Arceivala, Waste Water Treatment & Disposal Marcel Dekker.
4) Ministry of Urban Development, Manual of Water Supply, latest Ed. Manual of Waste Water Treatment.
5) Treatment Disposal Reuse, waste Water Engg, Metcalf Eddy Incorporation Waste Water Engineering Disposal & Reuse, McGraw Hill
6) Wastewater treatment Plant, Quasim
7) Waste Water Treatment, G L Kariya & R A Christain, PHL Publication

Course Outcome:

After learning the course the students should be able to:

1) Understand and choose the flow measuring device and treatment process problem gain and compare the alternatives.
2) Prepare a layout of treatment plant and understand its hydraulic profile
3) Build knowledge of design for conventional and advanced treatment processes for treatment of water and wastewater.
4)Gain knowledge of preparing a detailed working drawing of designed units.

List of Experiments:

The list is for guideline only. As far as possible, the term work given should be in digitized form.

1) Detailed design and drawing of treatment units like Conventional Activated Sludge Process.
2) Detailed design and drawing of treatment units like types of Aeration devices.
3) Detailed design and drawing of treatment units like types of mixing devices.
4) Detailed design and drawing of treatment units like Flow measuring devices.
5) Detailed design and drawing of treatment units like Filtration systems.
6) Detailed design and drawing of treatment units like Clarifloculator.
7) Detailed design and drawing of treatment units like Trickling filter,
8) Detailed design and drawing of treatment units like Screen.
9) Detailed design and drawing of treatment units like UASB.
10) Detailed design and drawing of treatment units like RSF.
11) Detailed design and drawing of treatment units like Plant hydraulics.

Design based Problems (DP)/Open Ended Problem:

Minimum 5 practical to be performed and remaining time should be allotted to open ended projects/ study reports/ latest outcomes in technology study:

1. In the beginning of the academic term, faculties will have to allot their students at least one Open ended Project / Study Report / Latest outcome in technology.
2. Literature survey including patents and research papers of fundamental process - Design based small project or

- Study report based on latest scientific development or
- Technology study report/ modelling/ simulation/collection report or

- Computer based simulation/ web based application/ analysis presentations of basic concept field which may help them in chemical engineering.

3. These can be done in a group containing maximum three students each.
4. Faculties should cultivate problem based project to enhance the basic mental and technical level of students
5. Evaluation should be done on approach of the student on his/her efforts (not on completion) to study the design module of given task
6. In the semester student should perform minimum 5 set of experiments and complete one small open ended dedicated project based on engineering applications.

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.