GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering Syllabus

Subject Code : 3164403

Subject Name : Water and Wastewater Engineering

WEF Academic Year :	2021 - 22
Semester :	VI
Category of the Course :	Open Elective

Prerequisite :	**NA**
Rationale :	This course aims to familiarize students with the challenges within the realm of water management, focusing on wastewater management. Through this course, students will gain insights into the issues surrounding wastewater and its potential solutions, including various wastewater treatment methods, as well as the disposal of sewage and sludge. Students will be exposed to a range of primary, secondary, and advanced treatment techniques. The primary goal of this course is to empower students with the knowledge and skills required to apply fundamental principles of physical, chemical, and biological processes in designing, operating, and maintaining sewage treatment plants effectively.

Course Scheme :

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
				Theory		Practical		
L	T	PR	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Course Content:

Sr. No.	Course Content	No. of Hours	% of Weightage
1	**Characterization and treatment of wastewater Introduction :** Wastewater flow and its characteristics, Wastewater collection systems, Estimation and variation of wastewater flows. Problems of industrial wastewaters, sampling protocol, equalization, neutralization, proportioning processes, volume and strength reduction. Preliminary, primary, secondary and tertiary wastewater treatment processes. Theory and design of screens, grit chambers, sedimentation, coagulation, flocculation.	10	20

2	**Anaerobic treatment of wastewater :** Anaerobic treatment process, Effects of pH, temperature and other parameters on anaerobic treatment, Concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor.	8	20
3	**Activated sludge treatment for wastewater :** Physico-chemical and biological treatment strategies and their evaluation, Theory of activated sludge process (ASP), extended aeration systems, trickling filters (TF), aerated lagoons, stabilization ponds, oxidation ditches, sequential batch reactor, rotating biological contactor, etc., Mass balancing in ASP and TF and their design.	10	25
4	**Planning for wastewater treatment and its reclamation :** Indian standards for disposal of treated wastewaters on land and in natural streams, Agricultural irrigation, Ground water recharge, Treated wastewater reclamation and reuse, Introduction to duckweed pond, vermiculture and root zone technology for wastewater treatment, Special treatments, Recent technologies of treatment.	10	20
5	**Industrial wastewater treatment :** Study on wastewater generation points, wastewater characteristics, process flow sheets, wastewater treatment scheme for sugar, textile, steel, paper/ pulp, oil refinery, pharmaceutical, dyes and intermediates industries.	8	15
	Total	**46**	**100**

Reference Book :

1. Eckenfelder W.W, “Industrial Water Pollution Control”, Mc Graw Hill, 2000
2. M. N Rao & A. K Dutta, “Wastewater treatment”, PHI Publication
3. Mark.J.Hammer & Mark.J.Hammer Jr ., Water and Wastewater Technology, Prentice Hall of India. Ltd.
4. Metcalf and Eddy Inc: “Wastewater engineering”, Tata Mc Graw Hill, New Delhi
5. Qasim S, “Water Works Engineering”, Prentice Hall Publication, New Delhi
6. S.K Garg,” Wastewater engineering” , Khanna publication

Course Outcome :

After Completion of the Course, Student will able to :

No.	Course Outcomes	RBT Level*
CO-1	To understand the basic knowledge about the wastewater and its treatment processes.	15
CO-2	To understand the activated sludge process for the treatment of wastewater.	25
CO-3	To understand the anaerobic process for the treatment of wastewater.	25
CO-4	To understand the standards for wastewater treatment, disposal and its reclamation.	15
CO-5	To study the wastewater treatment scheme for various industries.	20

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

List of Learning Resources Required :

1. Students can refer to video lectures available on the websites including NPTEL.
2. Students can refer to IITs lecture available on website

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