



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3173520

Semester – VII

Subject Name: WASTEWATER TREATMENT - IV

Type of course: Professional Core Course

Prerequisite: Fundamental of wastewater treatment.

Rationale: The main objective of this subject is to make students aware about the importance of biological treatment and to make them learn design of biological treatment units.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
			ESE (E)	PA (M)	ESE (V)	PA (I)		
3	1	0	4	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1.	Operational difference between STP & ETP, Characteristics, Sewage treatment and disposal, dry weather and wet weather flow, factors affecting dry weather flow and wet weather flow, Variations in flow rate, Overall design of Sewage treatment and Effluent treatment plant.	10
2.	Design of Anaerobic Process: Design of UASB, Design of high rate digesters, Operational problems. Design of Sludge Treatment units: Introduction & Treatment concept, Design Essentials, Sludge Digestion, Design consideration, Quantity of methane generation.	08
3.	Advanced wastewater treatment process: Introduction, Need and purpose of Advance wastewater treatment, Nutrient Removal – Nitrogen & Phosphorus, Advanced oxidation process: Theory, types of oxidizing agents, Ozone and non ozone based processes, Fenton & Photo fenton oxidation. Electrochemical treatment, factors affecting EC process, Electrode material, Reactor configuration, Electro-flotation, Electro-Oxidation, Introduction to forward osmosis.	10



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4.	Membrane Filtration: Microfiltration, Ultra filtration, Nano filtration, Reverse Osmosis, Forward Osmosis, Electro dialysis, Membrane Configurations: Plate and frame module, spiral wound module, tubular module, Membrane fouling: modes of membrane fouling, Control of membrane fouling,	08
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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	10	10	5	5

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:

- Wastewater Engineering: Treatment and Reuse, Metcalf & eddy; McGraw Hill Book Company, 4th Ed, 2002.
- Environmental Pollution and Control engineering, Rao C. S. - Wiley Eastern Limited, India, 1993
- Water Treatment Plants: Planning, Design & Control, S R Qasim, Technomic Pub. Co., 1999.
- Industrial Water Pollution Control, Eckenfelder W.W.; McGraw Hill Book Company, 3rd Ed, 2000.
- Environmental Engineering, Kiely G.; McGraw Hill Book Company, 1998.
- Pollution control in process industries, S.P. Mahajan TMH., 1985.
- Waste water treatment, M.Narayana Rao and A.K.Datta, Oxford and IHB publ. New Delhi.
- Industrial Pollution Control and Engineering, Swamy AVN, Galgotia publications, 2005.
- Environmental Engineering (Vol. II) - Sewage disposal and Air pollution, S.K Garg &Rajeshwari Garg, Khanna Publishers, 27th Edition, 2013.
- Environmental Engineering and Sanitation: Joseph A. Salvato, John Wiley & Sons,4th Ed. 2003
- Water Supply and Sanitary Engineering, Birdie and Birdie, Dhanpatrai and Sons, 1996.
- Environmental engineering (Vol. I) - Water Supply Engineering S.K Garg &Rajeshwari Garg, Khanna Publishers, 23rd Edition, 2013.
- Wastewater treatment concepts and design approach: GL Karia & R.A Christian.

Course Outcomes: After learning this course students will be able to



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Sr. No.	CO statement	Marks % weightage
CO-1	Describe the operational difference between sewage treatment & effluent treatment	20
CO-2	Classify different wastewater flow according to weather conditions.	15
CO-3	Relate various process used for anaerobic digestion of sludge	15
CO-4	Differentiate various membrane filtration processes used for wastewater treatment	15
CO-5	Explain various advanced treatment process used for wastewater	20
CO-6	Compare primary, secondary and tertiary wastewater treatment process.	15



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