GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3153511

Semester – V
Subject Name: WASTEWATER TREATMENT - II

Type of course: Professional Core Course

Prerequisite: Fundamental of wastewater treatment.

Rationale: The main objective of this subject is to make students aware about designing aspects of preliminary and primary treatment units along with sludge handling and tertiary treatment of wastewater.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1.	Designing of preliminary units for wastewater treatment: Design of bars screen and bar screen chamber, Design of grit chamber: Horizontal Flow & Aerated grit chamber, Design of Dissolved air flotation (DAF), Design of oil & grease removal, Introduction to Corrugated Plates inceptor, operational excellence of preliminary treatment units	10
2.	Designing of primary units for wastewater treatment: Design of Equalization tank, Design of Clarifier, Design of Flocculator, Design of Neutralization tank, Design of Primary Sedimentation tank, Operational excellence of primary treatment units.	08

3.	Tertiary treatment of wastewater: Design of Rapid Sand Filter, Design of Slow sand Filter, Disinfection: Definition, Actors affecting disinfection, methods of disinfection, Chlorination: Definition, Application of chlorine, Forms of chlorination, testes for residual chlorine, mixing device of chlorine, design examples, Reverse Osmosis: Definition, Working, RO membranes, Advantages & disadvantages, MEE: Working, operational Problems, Disposal of concentrated waste, ATFD: Working and applications, Introduction to activated carbon filter, Feasibility study of ZLD, Operational Excellence of Tertiary Treatment.	08
4.	Sludge handling and management: Sludge Bulking, Sludge Composting, Sludge Thickening, Sludge Composting, Sludge volume index. Introduction & Brief description of Centrifuge, Belt filters press, Neutsch Filter, Filter Press, Decanter, Sludge Drying beds, Double drum dryer. Operational excellence of sludge handling system.	10

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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.

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

Sr. No.	CO statement
CO-1	Outline design specifications of preliminary wastewater treatment unit.
CO-2	Explain the design and working of primary wastewater treatment unit.
CO-3	Assess the process parameters of tertiary wastewater treatment unit.
CO-4	Distinguish the concept of disinfection and chlorination
CO-5	Summaries the concept of RO, MEE, & ATFD.
CO-6	Compare different techniques used for management and handling of sludge.

List of Practical's:

- To determine total suspended solids of a wastewater sample.
- To determine total dissolved solids of a wastewater sample.
- To determine dissolved oxygen of a wastewater sample.
- To determine chemical oxygen demand of a wastewater sample.
- To determine biochemical oxygen demand of a wastewater sample.
- To determine oil & grease of a wastewater sample