GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Engineering

Level: Post Graduate

Branch: Environmental Management,

Course/Subject Code: ME01018021

Course / Subject Name: Water Treatment Technologies

w.e.f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PCC

Prerequisite:	Knowledge of subjects Environmental Chemistry
Rationale:	To learn the principles and theories behind the treatment of water by physical and chemical processes.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Identify the drinking water treatment scheme for considering water quality parameters and standards.
02	Describe purpose of preliminary treatment of water.
03	Apply concepts of various physical and chemical processes for surface water treatment and its design.
04	Apply concepts of various physical and chemical processes for ground water treatment.

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	**Introduction:** Water Characteristics, drinking water quality standards, unit operations and processes, types of treatment, conventional treatment scheme for surface water and groundwater, site selection criteria for treatment plant	4	6
2	**Preliminary treatment of water:** ● Aeration; types of aerators and its design ● Screens; types of screens and its design	5	10
3	**Surface water treatment:** ● Coagulation and Flocculation: Colloid characteristics, chemistry of metallic coagulants, polyelectrolytes as coagulant, Coagulant dose requirement, mixing of coagulants, power requirement; Flocculation: Types of flocculation, types of flocculators, Design considerations, power requirement. DEsign of Clariflocculator ● Sedimentation: Purposes, Sedimentation types, Sedimentation Zones, Types of sedimentation tanks, design parameters, tube settlers, design of Sedimentation tank and tube settler of water treatment ● Rapid Sand Filtration (RSF) : Mechanisms of filtration, Working of RSF, hydraulics of RSF, different types of filters, filter clogging, filter washing, design parameters of RSF and Design of RSF ● Disinfection: Purposes, Characteristics of ideal disinfection, Factors affecting disinfection, Disinfection with chlorine, Chlorine dose requirements	25	60

4	**Ground water treatment for specific parameters:** • Water softening with dose calculations • Iron and Manganese removal • Arsenic removal • Deflouridation systems • Cascade Aeration • Adsorption for odour and colour removal • UV irradiation for Disinfection • Reverse osmosis for TDS removal	**11**	**24**
	Total	**45**	**100**

Suggested SpecificationTable with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
10	**20**	**20**	**0**	**0**	**50**

Where R:Remember; U:Understanding; A:Application, N:Analyze and E:Evaluate C:Create(as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Water Supply & Sewage Systems by McGhee (5th Edition-McGraw-Hill Kogakusha Ltd.)
2. Waste water Engineering Treatment & Reuse by Metcalf and Eddy (4th Edition – Tata McGraw-Hill Publishing Company Ltd.)
3. Environmental Engineering by Peavy and Rowe
4. Environmental Engineering by Mckenzie Davis and Cornwell (3rd Edition-published by WCB McGrawHill)
5. Wastewater Treatment for Pollution Control by Soli J Arceivala (2nd Edition- Tata McGraw-Hill Publishing Company Ltd.)

(b) Open sources of software and website:

https://nptel.ac.in/

Suggested Course Practical List:

1. Determination of drinking water parameters.
2. Determination of optimum coagulant dose using multiple Jar Test Apparatus.
3. Determination of effect of coagulant dose on pH and alkalinity of water.
4. Determination of Residual Chlorine in drinking water.

List of Laboratory/Learning Resources Required:

Hot air oven, Jar test apparatus, pH meter, TDS meter, Conductivity meter, glasswares etc.

Suggested Activities for Students:

1. Visit to drinking water treatment plant

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