

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: V

ENVIRONMENTAL ENGINEERING

Subject Name: **Physico-chemical Treatment Technologies**

Subject Code: **151303**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
4	0	2	6	70	30	50

Sr. No.	Course Content
1.	Introduction: Characteristics of water and wastewater, types of treatment, conventional water and wastewater treatment, Analysis of wastewater flow rates: components of wastewater flows, statistical analysis, constituent characteristics and mass loadings.
2.	Preliminary treatment of water and wastewaters: : Screens, purposes, types of screens and Headloss in screens; Grit chambers: purposes and types of grit chambers.
3.	Primary Treatment of water and wastewater : I. Coagulation and Flocculation: Colloid characteristics, chemistry of metallic coagulants, polyelectrolytes as coagulant, mixing of co-agulants, power requirement; Flocculation: Types of flocculation, types of flocculators, Design considerations, power requirement II. Sedimentation: Purposes, Sedimentation types, Sedimentation Zones, Types of sedimentation0 tanks, Analysis of discrete settling, flocculant settling, zone settling and compression settling, design parameters, tube settlers III. Filtration: Mechanisms of filtration, hydraulics of filtration, different types of filters, filter clogging, filter washing IV. Disinfection: Purposes, Characteristics of ideal disinfection, Disinfection methods and mechanisms, Factors affecting, Disinfection with chlorine, chlorine dioxide, ozone, ultraviolet radiation

V. Sludge dewatering , treatment and disposal:

Sources of sludge; estimation of bulk density of sludge, principles of dewatering; estimation of rate of filtration; methods of dewatering and the suitability, dewatering machines ; chemical conditioning; elutriation; vacuum and pressure filtration, thickening of waste sludges , sludge drying beds, design of sludge drying beds. Aerobic and anaerobic sludge digestion.

Practicals:

1. Determination of optimum coagulant dose using multiple Jar Test Apparatus.
2. Determination of effect of coagulant dose on pH and alkalinity of water.
3. To measure Ammonical Nitrogen from waste water.
4. Determination of Residual Chlorine in drinking water.
5. Determination of removal efficiency in Type I settling using Settling Column .

Assignments:

1. Sketches & description of water treatment processes
2. Questions and numericals on Screens
3. Questions and numericals on Grit chamber
4. Questions and numericals on Coagulation & flocculation/flash mixer
5. Questions and numericals on Sedimentation
6. Questions and numericals on Filtration
7. Numericals on determination of Solids
8. Questions and numericals on Disinfectio

Reference 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. Water Works Engineering by Qasim'
(Eastern Economic Edition - Prentice-Hall of India Private Ltd.)
4. 4) Wastewater treatment plants by Qasim
(2nd Edition-Technomic Publishing CO.INC)
5. Water Treatment Plant Design by A. G. Bhole
(Published by Indian Water Works Association)
6. Environmental Engineering by Peavy and Rowe
7. Environmental Engineering by Mckenzie Davis and Cornwell
(3rd Edition-published by WCB McGraw-Hill)
8. Wastewater Treatment for Pollution Control by Soli J Arceivala
(2nd Edition- Tata McGraw-Hill Publishing Company Ltd.)

