

GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI

Civil Engineering

Subject Name: **Water and Wastewater Engineering**
 Subject Code: **160604**

Teaching Scheme				Evaluation Scheme		
Theory	Tutorial	Practical	Total	University Exam (Theory) (E)	Mid Sem Exam (Theory) (M)	Practical (I)
3	0	2	5	70	30	50

Module - I:

Sr. No	Course Content	Total Hrs.
1.	Water quantities Requirement: Factors affecting per capita demand, waste and losses, variations in demand, design periods, population forecasting methods.	10
2.	Collection and Conveyance of Water: Intakes, types of intakes, design of intakes, conveyance of water, design of pump and rising main	

Module II:

Sr. No	Course Content	Total Hrs.
1.	Water Treatment Processes: Water supply scheme, plain sedimentation, aeration, sedimentation tank & its design, sedimentation with coagulation, types of coagulants, optimum dose of coagulants, mixing devices, design of flocculator. Theory of filtration, types of filters and their comparison, design of rapid sand filter, washing of filter, Methods of disinfection, Methods of removing hardness.	11
2.	Distribution System: Layout of distribution networks, methods of water distribution, storage capacity of ESR, and underground service reservoir.	

Module III :

Sr. No	Course Content	Total Hrs.
1.	Collection and Estimation of Sewage: Different types of sewers, design period, variations in sewage flow, estimation of waste water discharge.	12
2.	Hydraulic Design of Sewer: Hydraulic formulae, maximum and minimum velocities in sewer, hydraulic characteristics of circular sewer in running full and partial full conditions, laying and testing of sewer, sewer appurtenances and network.	

Module IV :

Sr. No	Course Content	Total Hrs.
1.	Unit Operations for Waste Water Treatment: Physical unit operation-Screening, flow equalization, mixing, flocculation, sedimentation. Chemical unit processes-Chemical precipitation. Biological unit processes: Aerobic attached growth and aerobic suspended growth treatment processes, anaerobic suspended growth treatment process. Low Cost Sanitation System: septic tanks, soak pit, stabilization ponds	15
2.	Design of Facilities for Physical, Chemical & Biological Treatment of Waste Water: Design of racks, screens, grit chamber, aeration units, sedimentation tanks, activated sludge and trickling filter processes, rotating biological contactors, sludge digesters and drying beds	

List of experiments/design

Sr. No	Title	No. of turns
1	Introduction to Standards, collection and preservation of samples, sampling techniques and laboratory equipment	1
2	Determination of Turbidity and Jar test	1
3	Determination of dissolved oxygen and BOD	1
4	Determination of COD	1
5	Treatability studies of domestic wastewater (Aeration for 24, 48, 72 hrs. Finding influent and effluent COD,SVI, MLSS conc.)	1

6	Design of Tree type distribution network	1
7	Design of Water treatment units	3
8	Sewage Collection and Hydraulic Design of Sewer	2
9	Design of Wastewater treatment units (Primary and Secondary units)	3

Text Books:

1. B S N Raju, Water Supply and Waste Water Engineering, Tata-McGraw Hill, New Delhi
2. A.P. Sincero and G.A. Sincero, Environmental Engineering, Prentice Hall India-New Delhi
3. G.S. Birdie and J.S. Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai Publishing Co.-New Delhi
4. C.S. Rao, Environmental Pollution Engineering, Wiley Eastern Ltd. Bombay

Reference Books:

1. H.S. Peavy, D.R. Row & G. Tchobanoglous, Environmental Engineering, Mc Graw Hill International Edition
2. Viesman, Hammer, Water Supply and Pollution Control, Dun Donnelley Publisher, New York
3. M. L. Davis and D.A. Cornwell, Introduction to Environmental Engineering:- 2nd edition-1997, Mc Graw Hill International Edition
4. Metcalf and Eddy,(Revised by G. Tchobanoglous) Wastewater Engineering: Treatment, disposal Reuse, Tata-McGraw Hill, New Delhi