GUJARAT TECHNOLOGICAL UNIVERSITY

M.E. Semester: III

Master of Environmental Engineering

(Specialization)

Subject Name: **DESIGN OF WATER AND WASTE WATER SYSTEM (Major Elective IV)**

Sr.No	Course content
1.	**Wastewater Characteristics :** Sampling, composition and variations and preservation of samples, Physical, Chemical and biological characteristics, and analysis of wastewater.
2.	**Pollution of Natural Waters:** Emission and receiving body standards. Stream pollution. Ocean disposal.
3.	**Reactor Design :** Types, Kinetics, Selection of different reactors used for waste water treatment.
4.	**Wastewater Treatment Fundamentals :** Flow sheets, Physico-chemical and biological processes. Screens comminutors. Grit chambers, Sedimentation, Equalization, Neutralization, Floatation and chemical treatment of waste waters.
5.	**Biological Treatment Processes :** Fundamentals of Monod's Kinetics and application in bioreactor Design Aerobic and anaerobic, Suspended – growth and attached – growth treatments, Types, Modifications, Activated – sludge unit, Trickling filters, Aerated lagoons, Stabilisation ponds, Oxidation ditches, Aerators. Theory of sludge handling treatment and disposal.
6.	**Sludge Treatment :** Treatment system Chemical ,Biological, Incineration and disposal of sludge solids
7.	**Advances in Wastewater Treatment :** Nitrification, Denitrification, Phosphorous and other nutrient removal treatment processes , Total dissolved solid removal methods Introduction Use members and nano-technological -processes for waste water treatment.
8.	**Reuses of waste water :** Industrial , Agricultral and domestic reuses . Concept of Gray water and uses . Green houses and buildings.

List of Experiments:

1. Waste Water Sampling, Preservation and storage . Exposure Integrated , Composite and grab sampling techniques and instrumentation
2. Major Physical Parameter Testing of Sewage and Industrial waste waters
3. DO and BOD testing using conventional laboratory methods.
4. Determination rate constant of BOD utilization and oxygenation
5. Determination of COD with modification for different special waste water
6. Determination of parameters of major chemical parameters like Nitrogen compounds , Phosphorous compounds
7. Model of aeration waste treatment and its performance.
8. Report of Performance evolution of a waste water treatment plant
9. Demonstration of Viruses and microorganisms using Electron microscope
10. Exercise on Monod's kinetics
11. Exercise on Microbial metabolisms

Reference Books:

1. Wastewater Engineering Disposal & Reuse by George Tchobanoglous by Tata Metcalf & Eddy - McGraw Hill 2003edition or later
2. Water and Wastewater Treatment by Schroeder - McGraw Hill
3. Water & Wastewater Engineering – II by Fiar, Geyer & Okun - John Wiley
4. Standard Methods of Testing Water and Waste water Latest Edition Published jointly APHA, AWWWA,WPCF