GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3151302
Semester – V
Subject Name: ADVANCED ENVIRONMENTAL INSTRUMENTATION

Type of course: professional Core Course

Prerequisite: Knowledge of subjects Environmental Sciences I and II

Rationale: To learn the advanced analytical techniques for analysis of water, wastewater and air samples.

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)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to instrumental method of analysis**	02
2	**Spectroscopic Methods of Analysis:** Electromagnetic spectrum Applications of Beer- Lambert law Visual Colourimetry UV-Visible spectrophotometry Infrared Spectroscopy Raman Spectroscopy Atomic Absorption Spectroscopy Flame Emission Spectroscopy Mass Spectroscopy	10
3	**Turbidimetry and nephalometry** Visual method and instrumental method of turbidity measurement	04
4	**Chromatography:** Classification of chromatographic methods Column Chromatography Liquid Chromatography Adsorption Column Chromatography Ion exchange Chromatography Gas Chromatography High Performance Liquid Chromatography	10

	Ion Chromatograph	
5	**Miscellaneous Methods :** Conductometry Potentiometry Ion selective electrodes Dissolved oxygen sensors TOC analyser On line sensors	**10**
6	**Errors and Treatment of statistical data:** True value, Precision, accuracy, error, mean and median, spread, deviation, standard deviation, coefficient of variation, variance, significant figures, types of errors, statistical treatment of random errors ,evaluation of experimental results, comparison of results	**06**

Reference Books:

1. Standard methods for the examination of water and wastewater; published by American public Health Association, American water works Association, Water pollution control federation (21st Edition & later).
2. Chemistry for Environmental Engineering by Sawyer and M C Carty (4th Edition- McGraw-Hill Publishing Company Ltd.)

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Name various instrumental methods of analysis	5
CO-2	Explain various principles and applications of spectroscopic methods of analysis	20
CO-3	Compare visual and instrumental methods of turbidity measurement.	10
CO-4	Explain chromatographic and other methods for different applications.	50
CO-5	Solve statistical analysis of data.	15

List of Experiments:

1. Determination of turbidity from water sample using Nephelo turbidity meter.
2. Determination of flouride concentration in drinking water using spectrophotometer.
3. Colorimetric analysis for copper using UV-Vis spectrophotometer.

4. Preparation of calibration curve of chromium using UV- Vis spectrophotometer.
5. Determination of metals (chromium/nickel/copper/arsenic) using Atomic Absorption Spectrophotometer.
6. Determination of cations and anions using Ion-Chromatograph
7. Determination of TOC from wastewater using TOC analyzer

Design based Problems (DP)/Open Ended Problem:
(based on working principle & application in Env. Engg.)

1. Flame photometer
2. Gas Chromatograph
3. High Performance Liquid Chromatograph

List of Open Source Software/learning website: