GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENT ENGINEERING

ENVIRONMENTAL SCIENCES I

SUBJECT CODE: 2131301

B.E. 3RD SEMESTER

Type of course: Applied Science

Prerequisite: None

Rationale: Quantitative and qualitative analysis of environmental parameters is a very important aspect of studies of Environmental Engg. The subject of Env sciences I deals with qualitative and quantitative analysis of water and accurate determination of parameters.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	4	8	70	20	10	20	10	20	150

Content:

Sr. No.	Contents	Total Hrs	% Weightage
1	**Familiarization with lab ware and instruments**	04	7
	Glass ware, Plastic ware and measuring instruments, calibration of lab ware and instruments, cleaning solutions; cleaning and washing procedures for chemical and microbiological analysis		
2	**Distilled and demineralized waters**	04	7
	Methods of preparing distilled waters, high purity waters		
3	**General Chemical concepts**	08	14
	Molar, Molal, Normal solutions, Valency, oxidation state and Bonding, Chemical Equations and weight Relationship, gas laws; units of expression of results and their interrelationships, precision and accuracy.		
4	**Preparation of standard solutions**	08	14
	Relationship of atomic, molecular, formula and equivalent weights and solutions , Requirements of primary standards, Secondary Standards and their standardization, characteristics of common laboratory chemicals.		
5	**Volumetric and Gravimetric Analysis**	08	14
	Sampling, Concept of Quantitative analysis: Precipitation, filtration, Drying, Desiccation, Concept and applications of Volumetric and Gravimetric analysis in engineering field		
6	**Standard methods for analysis of water and waste water**	02	4
7	**Instrumental Analysis**	06	10
	Concept of Optical Methods of Analysis, Emission Methods, Dispersion and scattering methods, Electrical methods		
8	**Analysis of water quality parameters**	16	30

	pH, Solids, Hardness, Alkalinity, Chlorides, Sulfates		

Reference Books:

1. Chemistry for Environmental Engineering by Clair N. Sawyer and Perry L. McCarty
2. Quantitative Analysis by R.A. Day, Jr. and A.L. Underwood
3. Standard Methods for Water and Wastewater Analysis by AWWA

Course Outcome:

After learning the course the students should be able to:

1. Calibrate the laboratory glass ware and instruments used in Environmental Engineering laboratory.
2. Prepare and standardize the chemicals to be used in Environmental Engineering laboratory.
3. Apply the basic concepts of analytical chemistry in performing laboratory analysis of water.
4. Interpret the results of analysis.
5. Relate the general chemical concepts as applicable in field of environmental engineering.

List of Experiments:

1. Familiarization with labware in instruments used in environmental engineering laboratory
2. Calibration of different glass wares & Instruments (pH meter and Weigh balance)
3. Preparation of primary and secondary standards solutions and its standardization
4. To determine pH of given water and wastewater samples.
5. To Determine Total solids (TS), Total suspended solids (TSS) and Total dissolved solids (TDS) for given water and wastewater samples.
6. To determine Total Hardness , Calcium Hardness and magnesium hardness from given water samples
7. To determine Alkalinity (Phenolphthaleine and Methyl orange Alkalinity) from given water samples.
8. To determine Chloride from given water and wastewater samples.
9. To determine sulphates of given water and wastewater samples.
10. Numericals on pH.
11. Numericals on Solids
12. Numericals on Hardness
13. Numericals on Alkalinity
14. Numericals on Chlorides
15. Numericals on Sulphates

Design based Problems (DP)/Open Ended Problem:

Some suggested mini projects are listed below:

1. Prepare charts on analytical techniques referring to Standard methods of examination of water and wastewater.
2. Collect drinking water samples from different areas and determine the quality of water.
3. Collect wastewater samples from different sources and analyse them for different parameters.
4. Collect samples from nearby water source like river, lake, borewell, sea and determine its quality.

Major Equipments:

1. pH meter
2. TDS meter
3. Hot air oven
4. Monopan balance

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.