Established Under Gujarat Private Universities Act No. 9 of 2016

Syllabus for Bachelor of Technology

Chemical Engineering

Subject Code: 01GS0102

Subject Name: Engineering Chemistry I

B.Tech. Year - I

Objective: This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to

- Understanding the molecular structures and bonding involve in chemical reactions.
- Understanding of redox reaction and chemical potential.
- Learn how to use different spectroscopy techniques for analysis purpose of simple molecules.
- Learn and understand the chemistry behind corrosion.
- Develop kinetics of simple chemical reactions.
- Learn basic chemical terms like adsorption, diffusion and exraction.

Pre-requisite of course: NA.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	CSE	Viva (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Molecular Structure and Bonding:** The VSEPR model, Valence-bond theory, Molecular orbital theory, molecular orbital of polyatomic molecules, The molecular orbital theory of solids, Semi conduction and Super conduction.	5
2	**Redox Behaviour and its Implications:** Reduction Potentials, Redox stability in water, The diagrammatic presentation of potential data, The effect of complex formation on potentials.	5
3	**Chemical and Phase Equlibria:** Phase diagram for single component system, Phase diagram for mixtures, Properties of non-electrolyte solutions, Kinds of Electrodes, Concentration Cells, Corrosion of Metals in Acids, Corrosion by oxygen, Corrosion by Metal contact, The Lead storage cell and Fuel Cell.	6
4	**Chemical Response to Photons:** Laws of Photochemistry, Photo physical processes, Fluorescence and Phosphorescence, Flash photolysis, Photochemical reactions: Photolysis of HI, Photochemical reaction between H2 and Br2, Photosensitized reactions and photo cleavage of water, Lambert Beer's Law, Principles and applications of UV-Visible Molecular Absorption Spectroscopy; Chromophores, Effect of Conjugation on Chromophores, Absorption by aromatic systems, Rotational and Vibrational Spectroscopy- Principles and application to simple molecules, Magnetic Resonance Spectroscopy- Principles and Application to simple molecules and Introduction to Photoelectron Spectroscopy.	9
5	**Coordination Bond and its Implications:** Bonding in tetrahedral and octahedral Complexes, Applications in analytical chemistry, Biological system, Catalysis and Sandwich Compounds, Oxygen Storage and Transport.	5
6	**Thermodynamic and Kinetic Aspects of Chemical Conversion:** Free Energy and its Implications in occurrence of a Chemical Reaction, Kinetic Aspects of Occurrence of a Chemical Reaction and Examples of Significant Chemical Reactions.	6
7	**Solid State, Adsorption and Diffusion:** Introduction to Solid State Chemistry, Physical and Chemical Adsorption, Theories of Adsorption, Adsorption Isotherms, Laws of Diffusion and its implications, Nernst Distribution Law and Solvent Extraction.	6
	Total Hours	**42**

References:

1. Shriver D F and Atkin A W, *"lnorganic Chemistry"* 3rd Ed., ELBS, Oxford Press, Delhi (1999).
2. Castellan G W *"Physical Chemistry"* 3rd Ed., Narosa (1995).
3. Skoog D A, Holles F J and Mieman T. A., *"Principles of Instrumental Analysis"*, 5th Ed., Hercaurt Asia PTE Ltd. Singapore (2001).
4. Hill J W *"Chemistry for Changing times"* 6th Ed., Macmillan, Canada (1995).

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
25%	35%	20%	15%	5%	-

Suggested List of Experiments:

1. To study the adsorption of acetic acid on activated charcoal.
2. To verify Bear's law for a coloured solution and to determine the concentration of a given unknown solution.
3. Determine the viscosity of a given liquid by Oswald's viscometer.
4. To Synthesize paracitamol and determine percentage yield of the product.
5. To synthesize Phenol and Urea formaldehyde resin.
6. Thin layer-chromatographic separations of amino acids/organic molecules.
7. Determination of ion-exchange capacity of a given ion-exchanger (cationic /Anionic).
8. Determination of COD of water sample.
9. To draw the pH-titration curve of strong acid vs strong base.

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory