

GUJARAT TECHNOLOGICAL UNIVERSITY

Rubber Technology / Plastic Technology SUBJECT NAME: Advanced Engineering Chemistry SUBJECT CODE: 2132604 B.E. 3RD SEMESTER

Type of course: Harmonized Subject (B. E. Rubber Technology)

Prerequisite:

Rationale:

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	2	6	70	20	10	20	10	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Petroleum and Natural gas: Occurrence- Composition of crude oil- Distillation of the crude oil- cracking anti Cracking- knocking octane number- cetane number- synthetic petrol.	5	5
2	Organic Reactions Mechanisms : Bond cleavage, types of intermediates and reagents, Electron displacement effects, Types of Organic Reactions, Mechanism of addition and substitution reactions.	7	10
3	Dyes: Introduction of Dyes, Modern theories of Dyes, Classification and Applications of Dyes, Eco friendly dyes, Environmental hazards.	5	5
4	Introduction to various Unit Processes : Nitration, Amination, Hydrogenation, Halogenations, Oxidation, Reduction, Sulphonation and Sulphation, Hydrolysis, Alkylation ,polymerization etc.	7	10
5	Bio-Organic Compounds: Introduction and Classification of Carbohydrates, Manufacturing Processes of Glucose, Sucrose and Starch, Basic chemistry of oils and Fats.	7	10
6	Chemistry of Some Organic Compounds: Preparation, properties and uses: Ethanol, acetone, acetic acid, Chloroform, Phenol, Soaps, Detergents,	7	10
7	Electrochemistry: Electrical Conductance, Theories of conductance, measurement of conductance (Conductivity meter), Ostwald's dilution law, solubility of electrolytes, solubility product, and its applications, acids-base, pH and its measurement(pH meter), Buffer solutions, Fuel cells.	7	10
8	Carboxylic acid :	7	10

	Introduction- use in diff. Reactions and manufacture process- acetic acid, Formic acid, Oxalic acid, conversion of carbocyclic acid from diff. Compound and reactions. Resonance in carboxylic acid- measurement of strength of acid with examples- Esters- aceto acetic ester manufactures process- properties and uses and its importance in certain reactions.		
9	Isomerism- stereochemistry: Chemistry of compound which have asymmetric carbon-Optical isomerism in tartaric acid, lactic acid etc.	6	10
10	Application of following reactions with mechanism: Cannizzaro, aldol, condensation, Sandmeyer, Hoffman, Michael Dieckmann, wittig, reactions.	7	10
11	Synthetic and Natural organic polymers: Properties of polymer, Synthetic Organic polymer Proteins, Nucleic acid- other examples.	7	10

Reference Books:

- 1). Organic Chemistry –R.T. Morrison and R.N.Boyd Prentice Hall Inc. USA
- 2). Atkins, P.W. „Physical Chemistry“, , Oxford University Press
- 3). B. R. Puri and S.L. R. Sharma, "Principles of Physical Chemistry", Shoban Lal Nagin Chand & Co.
- 4). P.L. Soni, "Text Book of Physical Chemistry ", S. Chand & Co., New Delhi.
- 5). Unit Processes in Organic synthesis by P.H. Groggins_

Course Outcome:

After learning the course the students should be able to:

- Understand the Science of Petroleum and Natural Gas.
- Know about the purity of colours and pigments.
- Compare the Chemical reactions & Bio Chemical reactions.
- Understand the various Unit Processes.
- Learn about the chemistry about Organic Compound.
- Understand the Chemical reaction with mechanism.
- Know about the Synthetic and Natural Organic Polymers

List of Experiments:

Tutorials/Presentation/Practicals based on above topics.

Major Equipments:

Ph meter, Specific gravity balance, U-tube manometer, Weighing balance, Hot Plate etc.

List of Open Source Software/learning website:

- www.pnge.cemr.wvu.edu
- www.journals.elsevier.com/dyes-and-pigments/

- www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/react3.htm
- www.chemguide.co.uk/basicorg/isomerism/structural.html

Active learning Assignments (AL) : 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