

Subject Code: 1ET4060101	Subject Title: Chemistry for Petroleum Engineers
Pre-Requisite	--

RATIONALE:

Science is the foundation for all technical courses. The Basic aim of teaching chemical science is to develop the habit of scientific inquiry, ability to establish the cause and effect, relationship. Chemistry forms the part of applied science. The study of basic concepts of chemistry like chemical bonding, corrosion, water, fuel and different engineering materials like polymers, paints, lubricants, refractories, battery etc. will help the students understanding engineering subjects where the emphasis is laid on the application of these concepts.

Chemistry is concerned with the changes in structure and properties of matter. Many of the chemical process involved in the engineering activities. Teaching of chemistry should be aimed at developing the right type of aptitude in the students and the ability to predict the result under given condition thus good foundation in basic science will help the students in their self development, to cope up with continuous flow of innovations.

COURSE OBJECTIVE:

1. Understand the Atomic structure.
2. Describe the different types of chemical bonds.
3. Understand the various types of catalysis and catalyst.
4. Describe the different types of corrosion and its prevention.
5. Understand the Basic Concepts of Organic Chemistry.
6. Classify different properties of Polymers, Elastomers & Adhesives.
7. Identify the properties and uses Fuels and Combustion.

TEACHING AND EVALUATION SCHEME:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				Total (Marks)
Lecture	Tutorial	Practical	Credit	Theory		Practical		
				University Assessment	Continuous Assessment	University Assessment	Continuous assessment	
3	-	2	4	60	40	20	30	150

DETAILS OF COURSE CONTENTS:

SR. NO.	TOPIC	TOTAL HOURS	WEIGHTAGE
UNIT-1	Atomic Structure and Classification of Elements 1.1 Arrangement of electron, proton and neutron in atom 1.2 Atomic number and atomic mass number 1.3 Distribution of electrons in shell and sub shell 1.4 Concept of atomic orbital 1.5 Auf-Bau principle and electron configuration of atom of elements 1.6 Ionization energy (IE), Electron affinity (Ea)	06	15
UNIT-2	Chemical Bonding and Catalysis 2.1 Theory Of Valence 2.2 Types of chemical bonds 2.2.1 Electrovalent bond & its characteristics 2.2.2 Covalent bond & its characteristics 2.2.3 Co- ordinate bond & its characteristics 2.2.4 Hydrogen bond, its types and Significance 2.2.5 Metallic bond, Explanation of Metallic Properties 2.3 Catalysis 2.3.1 Types of catalysis 2.4 Types of Catalyst 2.4.1 Positive Catalyst 2.4.2 Negative Catalyst 2.4.3 Auto-catalyst 2.5 Catalytic Promoter and Catalytic inhibitor	07	20
UNIT-3	Corrosion of metals & its Prevention 3.1 Definition of corrosion 3.2 Types of corrosion 3.3 Pitting corrosion 3.4 Waterline corrosion 3.5 Crevice corrosion 3.6 Factors affecting the rate of corrosion, -Nature of film, Nature of Environment, PH of Solution, Area of cathode & anode , Temperature, Moisture, Purity of metal 3.7 Corrosion Control 3.7.1 Modification of environment 3.7.2 Modification of the properties of metal 3.7.3 Use of protective coatings	08	15

	3.7.4 Anodic and Cathodic protection 3.7.5 Modification in design and choice of material		
UNIT-4	Fuels and Combustion 4.1 Definition of fuels, classification of fuels 4.2 Calorific value and its unit 4.2.1 Determination of calorific value by Bomb Calorimeter 4.3 Solid Fuels: Coal 4.3.1 Classification of coal 4.4 Liquid Fuels: Petroleum, 4.4.1 Origin of petroleum & Composition of petroleum 4.4.2 Refining of petroleum 4.4.3 Octane Number of petroleum, Cetan number of petroleum 4.5 Gaseous fuels: Composition, Properties and application of natural gas 4.5.1 CNG, LPG and LNG-Properties and application 4.5.2 Hydrogen gas as fuel	08	20
UNIT-5	Basic Concepts of Organic Chemistry 5.1 Introduction: Organic chemistry 5.2 Difference between organic and Inorganic compound 5.3 Tetravalency of carbon 5.4 Concept of hybridization-sp, sp ² , sp ³ type of one hybridization with example of each 5.5 Sigma and pi-bonding 5.6 Classification of Organic compound 5.7 Functional group classification	06	14
UNIT-6.	Polymers, Elastomers & Adhesives 6.1 Introduction and Definition of Polymer and Monomer 6.2 Classification of Polymer 6.3 Classification on basis of monomers (homo-polymer and copolymer) 6.4 Thermoplastics & Thermosetting. 6.5 Synthesis, properties and application of 6.5.1 Polyethylene 6.5.2 Polypropylene 6.5.3 Polyvinyl chloride 6.5.4 Teflon 6.5.5 Polystyrene 6.5.6 Phenol formaldehyde 6.5.7 Acrylonitrile 6.5.8 Epoxy Resin 6.6 Elastomers 6.7 Natural rubber and its properties	07	16

	6.8 Vulcanization of Rubber 6.9 Definition of adhesives and Examples 6.10 Characteristics of adhesives		
--	--	--	--

COURSE OUTCOME:

The students will be able to-

1. Explain Atomic structure and electron configuration.
2. Describe the different types of chemical bonds.
3. List the industrial applications of catalyst.
4. Understand about Corrosion Control.
5. Comprehend the different factors affecting rate of corrosion.
6. Understand the Properties and application of different Fuels.
7. Apply Calorific value and its unit.
8. Introduce about Tetravalency of carbon.
9. Explain the hybridization- sp^1 , sp^2 , sp^3 .
10. Classify polymers based on different properties.
11. Describe the properties and uses of Polymers, elastomers & adhesives.

LIST OF PRACTICAL:

Minimum Ten Experiments should be performed from the following list of experiments.

1. Find out strength of given acidic solution using standard solution of Base.
2. Standardize $KMnO_4$ solution by preparing standard oxalic acid and to estimate ferrous ions.
3. Standardize $Na_2S_2O_3$ solution by preparing standard potassium dichromate and to estimate percentage of copper from brass.
4. Determine the viscosity of given lubricating oil by using Red-wood Viscometer.
5. To Determine of saponification value of an lubricating oil.
6. To Determine PH-Values of given samples of Solution by using Universal Indicator and PH- meter.
7. Determine the total hardness of water by EDTA method.
8. Prepare (any one) polystyrene, urea formaldehyde, phenol formaldehyde and its Characterization.

9. Determine Acid Value of given lubricating Oil.
- 10 Determine percentage of moisture in given sample of coal by proximate analysis.
- 11 Study of corrosion of metals in medium of different pH.
- 12 Determine moisture content of a given sample of coal.
- 13 Study of Corrosion of Metals in the different Mediums.
- 14 Assign IUPAC names to first five members of Alkane and Alkene series.

LIST OF REFERENCES:

1. Engineering Chemistry by JAIN & JAIN
2. A Text Book of Polytechnic Chemistry by V.P. Mehta
3. Engineering Chemistry by S.S.Dara
4. Text Books of CBSE Std. 11 & 12