

21PCM101T					Engineering Chemistry					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hours/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

### COURSE OBJECTIVES

- To form a basis for understanding behavior of substances through chemical means for advanced study in engineering aspects
- To understand basic principles theories of electrochemistry and their applications
- To understand the concept of different separation methods and the chemistry involve to our surroundings
- To gain knowledge of different type of reactions and mechanism and to form a basis for understanding behavior of surfaces for advanced study in engineering aspects
- To develop the fundamental knowledge of solid, liquid and gaseous fuels
- To study the principles of nuclear chemistry and their application in different type of instruments for analytical purpose
- Develop an ability to conduct qualitative and quantitative analysis using different analytical instruments and solve problems

### UNIT I ELECTROCHEMISTRY, BATTERY AND FUEL CELLS

7 Hrs.

Specific, equivalent and molecular conductance, their determination, theories of electrolytic conductance, Debye Huckel theory of strong electrolytes, Galvanic cells, Reference electrodes and their potentials. Standard cell standard electrode potential determination of dissociation constants of acids and bases, solubility product, hydrolysis constant hydrogen ion concentration, Complex formation activity of electrolytes etc., theory of acid base indicators, electrolytes etc., theory of acid base indicators, electro-metric titrations. Photochemical reactions, Laws of Photo-chemistry, Batteries Fuel Cells, Hybrid cells and Electric Vehicle.

### UNIT II INORGANIC CHEMISTRY

7 Hrs.

Electrons in atoms, Bohr atomic model, wave mechanical model, introduction to quantum chemistry, wave functions and probability densities, quantum numbers, orbital shapes - s,p,d,f- LCAO-MO of H<sub>2</sub>, covalent, ionic and metallic bonding, bonding forces and energies, lattice energy and Madelung constant, metallic crystal structure, ceramic crystal structure and influencing factors.

### UNIT III SOLID, LIQUID AND GASEOUS FUELS

7 Hrs.

Solid fuels: wood, charcoal, peat, coal, analysis of coal, ASTM classification, ash, coal and its environment, fluidized bed combustion and coke. Liquid Fuels: Ignition temperature, flash point, fire point and smoke point. Gaseous fuel: Natural gas and its uses, natural gas as a fuel, other carbon based fuel gases, explosion limits. Hydrogen, methods for the preparation of H<sub>2</sub>, Transportation and storage of H<sub>2</sub>.

### UNIT IV NUCLEAR CHEMISTRY

7 Hrs.

Nuclear fission and fusion, nuclear energy, nuclear reactors, disposal of nuclear waste, radiation measurement and contentment Instrumental methods of analysis: Basic principles and operations, applications, sampling techniques of gas chromatographs, GCMS , FTIR, NMR, HPLC, spectroscopy etc., TGA, DTA, XRD, SEM

Max. 28 Hrs.

### COURSE OUTCOMES

On completion of the course, student will be able to

- CO1: To understand the concepts of electrode potentials and electro chemical cells through the theories of electrolytic conductance with an aim of achieving underlying electroanalytical techniques
- CO2: To apply the fundamental knowledge of reaction chemistry and mechanism in petrochemical industry
- CO3: To analyse the fundamental concept of solid, liquid and gaseous fuels aligned with Petroleum Industry
- CO4: Introduction to Nuclear chemistry and management and Introduction to various characterization and sampling techniques for analysis of physics and chemistry of substances
- CO5: To evaluate the Hydrogen economy

CO6: To understand the introduction to nuclear chemistry and management and Introduction to various characterization and sampling techniques for analysis of physics and chemistry of substances

**TEXT/REFERENCE BOOKS**

1. Morrison, R. T. & Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
2. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
3. Graham Solomons, T.W. Organic Chemistry, John Wiley & Sons, Inc.

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN**

**Max. Marks: 100**

Part A: 10 Questions each carrying 5 marks

Part B: 5 Questions each carrying 10 marks

**Exam Duration: 3 Hrs.**

50 Marks

50 Marks