Electrical Engineering/ Electronic & Communication Engineering/ Computer Science & Engineering

Course Code: CYN11501/CYN12501	Engineering Chemistry-I	Credits:04 (L:T:P = 2:1:2)

Prerequisites: Pre-understanding of the subject.

CO	Course Outcomes
CO1	Students can acquire elaborate understanding of different fundamental concepts of chemistry such as quantum chemistry, bonding models of atoms, solid state chemistry, electrochemistry, polymer chemistry and they can apply them to develop advanced technologies and electronic devices.
CO2	Develop the ability to analyse & interpret data related to electrochemical cells/electrochemistry and polymer chemistry
CO3	Understand and develop the capability to apply the knowledge according to the need of the industry

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	-	-	-	1	1	1	1
CO2	2	2	1	1	2	-	-	-	1	2	2	1
CO3	2	2	1	1	1	-	-	-	1	1	1	1

Module	Content	Lectures
1.	**Basic Principles of Quantum Chemistry and Application to Simple Systems:** Historic background; Wave particle duality; Uncertainty principle; Postulates of Quantum Mechanics; Time-dependent and Time-independent Schrödinger equations; Eigen value problem; Free particle, Particle in an infinite and finite well; Harmonic oscillator; Tunneling; Qualitative treatment on H-atom and H-like atom.	06
2.	**Bonding Models in Chemistry:** Valence Bond Theory and Molecular Orbital Theory Band Theory: Semiconductors, insulators, doping in semiconducting materials Symmetry; Point Groups; Group Theory and Character Tables - their applications in spectroscopic software.	06
3.	**Solid State Chemistry: Basic Concepts** Crystal lattice; Unit cell; Crystal systems; Closed packed structures; Crystalline solids; Radius ratio rule; Miller indices and plane, d-spacing, Crystal defects: Schottky and Frenkel defects, Color centres, non-stoichiometry. Determination of simple, spinel and perovskite structures.	06
4.	**Electrochemistry:** Strong and weak electrolytes, conductivity, molar conductivity, drift velocity, ionic mobility; Nernst Equation; Redox reactions; Balancing of Equations; Electrochemical cells and EMF; Applications of EMF, Concentration Cells; Rechargeable battery; Solar cells; Fuel cells; Dye-sensitized solar cells.	06
5.	**Polymer Chemistry:** Classification of Polymers, Characterization, Molecular weight measurement. Properties - Size, Conformation, Structure-property relationship. Biodegradable polymers, Industrial applications	06

	Practical: List of Experiments	
	Part A:	
	1. To determine the percentage of available chlorine in the supplied sample of bleaching powder. 2. To determine the total, permanent hardness, Ca^{2+} and Mg^{2+} hardness in supplied water sample by titrating with standard EDTA solution. 3. To determine the alkalinity of the supplied water sample. 4. To determine the strength of supplied $K_2Cr_2O_7$ solution using Ferrous Ammonium Sulphate solution as intermediate and Potassium Ferricyanide solution as an external indicator 5. Preparation of Methyl Orange using a diazonium coupling reaction.	
	Part B:	
	6. Verification of Kohlrausch's 1^{st} law for strong electrolytes using conductometric measurement. 7. Verification of Ostwald's dilution law for weak electrolytes using conductometric measurement. 8. Determination of the strength of a strong acid by strong base using conductometric titration. 9. Preparation of Daniell Cell and its related study. 10. Determination of viscosity average molecular weight of a polymer sample by Ostwald Viscometer.	
	Part C:	
	11. Synthesis of TiO_2 nanoparticle via sol-gel method and determining the phase with X-Ray Diffraction experiment.	

Text Books:

1. *Engineering Chemistry*, Jain & Jain, 2013, Dhanpat Rai Publishing Co., New Delhi.
2. *Engineering Chemistry*, Shashi Chawla, 2017, Dhanpat Rai Publishing Co., New Delhi.

Reference Books:

1. *Engineering Chemistry- A Textbook*, Harish Kumar Chopra, Anupama Parmar, 2007, Narosa Publishing House Pvt. Ltd., New Delhi.
2. *Elements of Physical Chemistry*, Peter Atkins, Julio D. Paula, 2006, Oxford, UK.
3. *Introduction to Organic Electronic and Optoelectronic Materials and Devices*, Sam-Shajing Sun, Larrq R. Dalton, 2016, CRC Press.
4. *Polymer Science*, V R Gowariker, N V Viswanathan, Jayadev Sreedhar, 2005, New Age International Private Limited, New Delhi.
5. *Inorganic Chemistry: Principles of Structure and Reactivity*, By James E. Huheey, Ellen A. Keiter, Richard L. Keiter, Okhil K. Medhi, 2006, Pearson Education India.
6. *Chemical Applications of Group Theory*, F. Albert Cotton, Wiley, 2017, New Jersey, USA.
7. *Quantum Chemistry*, Ira N. Levine, 2014, Pearson.
8. *Solid State Chemistry and its Applications*, A. R. West, 2022, John Wiley & Sons, Inc., New Jersey, USA.
9. *Online Resources.*