Syllabus: I B.Tech-I- Semester
(w.e.f., 2020-21 admitted batch)
(Common toCSE, IT, EEE, AI & DS)

Course Title:APPLIED CHEMISTRY

L	T	P	C
3	0	0	3

Course Objectives

1. To gain the knowledge on Polymer based materials in household appliances, aerospace and automotive industries.
2. To learn the basic principles and applications of Electrochemistry.
3. Advanced Analytical instrumental techniques are introduced for material characterization.
4. Understanding of crystal structures and preparation of semiconductors and insulators.
5. A wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.
6. With the increase in demand for power and also with depleting sources of fossil fuels, the demand for alternative sources of fuels is increasing. Some of the prospective fuel sources are introduced.

UNIT 1: POLYMER CHEMISTRY (8h)

Introduction to polymers, functionality of monomers, co-polymerization, Stereospecific polymerization with specific examples.

Plastics - Thermoplastics and Thermosettings, Preparation, Properties and Applications of – Bakelite, Urea-Formaldehyde, Nylon-6,6, Carbon fibres.

Elastomers–Buna-S, Buna-N–Preparation, Properties and Applications.

Conducting polymers - polyacetylene, polyaniline, polypyrroles – Mechanism of conduction and Applications.

UNIT 2: ELECTROCHEMISTRY AND APPLICATIONS (8h)

Electrodes –Reference electrodes (Hydrogen electrode and Calomel electrode), Electrochemical cell, Nernst equation.Concept of pH, pH meter and applications of pH metry, Potentiometry- Potentiometric titrations (Redox titrations), Concept of Conductivity, Conductivity cell, Conductometric titrations (acid-base titrations), Primary cells – Dry cell - Zinc-air battery, Secondary cells – Lead acid battery, Lithium-ion batteries- working of the batteries including cell reactions, and button cells.

Fuel cells - Hydrogen-Oxygen and Methanol-Oxygen fuel cells – working of the cells.

UNIT 3: INSTRUMENTAL METHODS AND APPLICATIONS (8h)

Electromagnetic Spectrum. Absorption of radiation: Beer-Lambert's law - Principles of UV-Visible, Infrared (IR) and Nuclear Magnetic Resonance (NMR) spectroscopy.

Basic concepts of Thin Layer Chromatography (TLC), Gas Chromatography (GC) and High-Performance Liquid Chromatography (HPLC), Separation and purification of mixture of compounds.

UNIT 4: SOLID STATE CHEMISTRY (8h)

Types of solids – Crystal defects- Frenkel and Schottky defects – Spinel and Inverse spinel.

Hall Effect and Applications.

Semiconductors:Preparation of pure semiconductors by Zone refining, Distillation and Czochralskicrystal pulling technique, Doping- Epitaxy, Diffusion and Ion-implantation technique- Intrinsic and Extrinsic semiconductors - Applications.

Insulators*:* Electrical Insulators and their Applications.

UNIT 5: MATERIAL CHEMISTRY (8h)

Nano materials –Introduction- Top-down and Bottom- up approaches,Sol-gel method. Characterization by BET and TEM methods. Carbon nano tubes and fullerenes - Types, Preparation (Arc discharge Laser ablation and ChemicalVapour Deposition methods) Properties and Applications.

Liquid crystals - Introduction – Types – Applications.

Superconductors - Type-I & Type-II, Properties &Applications.

Green chemistry- Principles and Applications.

UNIT 6: NON-CONVENTIONAL ENERGY SOURCES (8h)

Introduction – Renewable and Non –Renewable energy sources - Solar Energy- Introduction, Applications of Solar energy – Photovoltaic cell: design, working and its importance. Hydropower includes setup a Hydropower plant (schematic diagram), Geo-Thermal energy: Introduction-schematic diagram of a Geothermal power plant, Tidal power - Introduction- Design and working, Biomass energy.

Standard Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015 edition.

Reference Books:

1. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
2. A text book of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
4. A text book of Engineering Chemistry bySashiChawla, Dhanpat Rai & Co. 2017

COURSE OUTCOMES:

After completing the course,students will be able to,

1. Recall the information related to polymers and their application.(Remembering)
2. Distinguish between different parts in electrochemical cell, batteries and fuel cells. (Analyzing)
3. Understand about the different analytical techniques and its applications. (Understanding)
4. Understand the conductivity phenomenon and applications of solids.(Understanding)
5. Choose the materials like nano materials, liquid crystals, superconductors, and green synthetic methods to solve the Engineering problems. (Applying)
6. Design the technologies related to renewable energy sources.(Creating)

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Course Title:APPLIED CHEMISTRY LAB

	L	T	P	C
10 OUT OF 16	**0**	**0**	**3**	**1.5**

1. Trial experiment - Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of $KMnO_4$ using standard Oxalic acid solution.
4. Estimation of MnO2 in Pyrolusite.
5. Determination of Copper using standard $K_2Cr_2O_7$ solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Vitamin – C.
8. Determination of P^H of the given sample solution using P^H meter.
9. Conductometric titration between strong acid and strong base.
10. Potentiometric titration between strong acid and strong base.
11. Estimation of copper by Colorimetry.
12. Photo Chemical Reduction of Ferric Salt (Blue-Printing).
13. Adsorption of acetic acid on charcoal.
14. Determination of rate of corrosion.
15. Preparation of a polymer.
16. Thin layer chromatography.

Reference Books:

1. A Textbook of Quantitative Analysis, Arthur J. Vogel.
2. Dr. JyotsnaCherukuri (2012) Laboratory Manual of Engineering chemistry-II, VGSTechno Series.
3. Chemistry Practical Manual, Lorven Publications.
4. Practical Engineering Chemistry, K. Mukkanti (2009) B.S. Publication.

Outcomes: The students entering into the professional course have practically very little exposure to lab classes. The experiments introduce volumetric analysis; redox titrations with different indicators; EDTA titrations; then they are exposed to a few instrumental methods of chemical analysis. Thus, at the end of the lab course, the student is exposed to different methods of chemical analysis and use of some commonly employed instruments. They thus acquire some experimental skills.