**19ECY131: ENGINEERING CHEMISTRY**

**(ECE, CSE, EEE and IT)**

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| **Unit I: Electrochemical Energy Systems** | **9L** |

Introduction Origin of electrode potential, Electrode Potentials, Measurement of Electrode Potentials, Nernst Equation for a single electrode, EMF of a cell, Types of Electrodes or Half Cells Hydrogen and Calomel electrode, Electrochemical Cell, Galvanic Cell vs Electrolytic Cell, Electrochemical conventions, Types of Ion Selective Electrodes-glass membrane electrode, polymer membrane electrodes, solid state electrodes, gas sensing electrodes (classification only), Concentration Cells.

**Unit II: Battery Technology** **8L**

Basic concepts, battery characteristics, classification of batteries,

Important applications of batteries, Classical batteries-dry/Leclanche cell, Modern batteries-zinc air, lithium cells-Li MnO2 cell- challenges of battery technology. Fuel cells Introduction - classification of fuel cells – hydrogen and oxygen fuel cell, propane and oxygen fuel cell- Merits of fuel cell.

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| **Unit III: Renewable Sources of Energy** | **8L** |
| **Introduction- sources of renewable energy** |  |

**Solar energy** – Introduction - Physical and Chemical properties of Silicon-Production of Solar Grade Silicon from Quartz - Doping of Silicon- p and n type semi conductors- PV cell / solar cell- Manufacturing of Photovoltaic Cells using Chemical Vapor Deposition Technique-applications of solar energy.

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| **Unit IV: Metal Finishing** | **9L** |

Technological importance of metal finishing, methods of metal finishing, manufacturing of electronic components, electrochemical techniques of forming, machining and etching, electrolytic cell, principle of electroplating, nature of electrodeposits, electroplating process, Electroplating of chromium, gold etc. Electroless plating of copper, nickel.

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| **Unit V: Polymers, Nanomaterials and Molecular Machines &** |  |
| **Switches** | **8L** |

**Polymers**: Introduction, differences between thermoplastic and thermosetting resins, Preparation, properties and uses of polystyrene and Polyphosphazines.

**Nanomaterials:** Introduction to nanomaterial: nanoparticles,nanocluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method. Characterization: Principle and applications of scanning electron microscope (SEM) and transmission electron microscope (TEM).

**Molecular machines & Molecular switches:** Rotaxanes and Catenanesas artificial molecular machines; Molecular switches – cyclodextrin-based switches

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**19ECY131:Engineering Chemistry Laboratory**

**(CSE, IT, ECE & EEE)**

**List of Experiments**

1. Determination of Mohr’s salt by potentiometric method
2. Determination of strength of an acid by pH metric method
3. Determination of conductance by conductometric method
4. Determination of viscosity of a liquid
5. Determination of surface tension of a liquid
6. Determination of sulphuric acid in lead-acid storage cell
7. Determination of chromium (VI) in potassium dichromate
8. Determination of copper in a copper ore
9. Determination of Zinc by EDTA method.
10. Estimation of active chlorine content in Bleaching powder
11. Preparation of Phenol-Formaldehyde resin
12. Preparation of Urea-Formaldehyde resin
13. Thin layer chromatography
14. Preparation of TiO2/ZnO nano particles
15. SEM analysis of nano materials

**Text books**

1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel’s Quantitative Chemical Analysis 6/e, Pearson publishers 2000.
2. N.K Bhasin and Sudha Rani Laboratory Manual on Engineering

Chemistry 3/e, Dhanpat Rai Publishing Company 2007.

**Course Outcomes:**

After the completion of this laboratory course, the student will be able to

* explain the functioning of the instruments such as pH, Conductometric and Potentiometric methods (L2).
* identify different ores (Cr & Cu) and their usage in different fields

(industry, software devices, electronic goods) (L3).

* experiment with the physical parameter of organic compounds (L3).
* compare the viscosities of oils (L4).
* list the preparation of polymers and nano materials (L4).