Department of Chemistry

JISCE, Kalyani

An autonomous Institute

Stream: Electrical and Instrumentation Engineering (EIE)
Paper Name: Engineering Chemistry
Paper Code: CH 101(EIE)

Course Objectives:
After completion of this course the students will be able to:

- Apply the knowledge of fundamental chemistry for identification, solution and analysis of complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- Function in multi/inter-disciplinary teams with a spirit of tolerance, patience and understanding so necessary for team work;
- Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Outcomes:
After completion of this course the students will be able to:

- Identify different thermodynamic processes with the given list of examples
- Demonstrate generation of electricity from any cell
- Design semiconductor with given idea
- Identify the structure property relationship of different polymers from the given list
- Demonstrate different types of corrosion and their prevention
- Identify materials from a given list with the help of knowledge on spectroscopy

Paper code	a	b	c	d	e	f	g	h	i	j	k	l
CH101	√	√	√	√			√					√

Proposed syllabus of Engineering Chemistry for B. Tech Courses (EIE)

Contacts: 3L + 1T = 4

Credits: 4

Module 1

Chemical Thermodynamics -I

Introduction to first law of thermodynamics: different statements, mathematical form.Internal energy: Definition, Physical significance, Enthalpy: Definition, Characteristics, Physical significance, Heat Capacity: Definition, Classification of Heat Capacity (Cp and CV) Reversible and Irreversible processes: Definition, Work done in Isothermal Reversible and Isothermal Irreversible process for Ideal gas, Adiabatic changes: Work done in adiabatic process, Interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process. 3L

Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchoff's Equation. 2nd law of thermodynamics: Statement, Mathematical form of 2nd law of thermodynamics (Carnot cycle). Evaluation of entropy: characteristics and expression, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. 3L

Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas. Joule Thomson and throttling processes; Joule Thomson coefficient for Ideal gas, Concept of inversion temperature. 2L

Module 2

Electrochemistry

Conductance Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (Strong and Weak electrolyte). Kohlrausch's law of independent migration of ions, transport numbers and Ionic mobilities. 2L

Electrochemical Cell

Cell EMF,Nernst equation, Single electrode potential, Reference electrodes- hydrogen half cell, quinhydrone half cell, calomel half cell, glass electrodes ,Battery, commercial electrochemical cell and battery: dry cell, lead acid storage cell, lead accumulator battery, Alkaline storage cell, Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, Discussion, Application). 3L

Module 3

Solid state Chemistry Introduction to stoichiometric defects (Schottky & Frenkel) and non – stoichiometric defects (Metal excess and metal deficiency).

Conduction in Metal, Semiconductor-n type and p type, Effect of temperature on conductivity , p-n junction, rectifiers, transistors.

Photovoltaic cell, Fabrication of integrated circuits.

Role of silicon and germanium in the field of semiconductor. 4L

Module 4

Polymers

Introduction, classification, Hydrocarbon Molecules, Thermoplastic, Thermosetting Polymers. Basic Concepts Molecular Weight, Polymer Crystallinity. Crystallization, Meting & Glass Transtition Phenomena Polymerization mechanism, (addition and condensation polymerization), degree of polymerization, Poly dispersity index (PDI). 3L
Preparation, properties, engineering applications of: polyethylene, PVC, Bakelite, nylon. 1L
Electronic polymers- synthesis, classification, application. 2L

Nanomaterials- Basic principle of nanoscience and technology, preparation, properties and applications of nano meterials (metal, ceramic, polymeric, carbon based). 4L

Spectroscopy: Introduction, Concept of Photochemical Reaction, Absorption, Lambert-Beer's Law 2L
UV-Spectroscopy, IR-Spectroscopy, Mass –Spectroscopy 2L

Module 5

Corrosion:

Introduction, Cause and Effect of Corrosion Types and Mechanism of corrosion of corrosion-Chemical and Electrochemical corrosion, Comparison between them. 3L

Types of Electrochemical corrosion- Underground corrosion, Microbiological corrosion, Other forms of corrosion. 2L

Passivation, Factors influencing corrosion. Protective measures against corrosion. 3L

Reference Books:

1. Sashi Chawla, A Text Book of Engineering Chemistry, Dhanpat Rai & Co.Pvt. Ltd.
2. Engineering Chemistry, P. C. Jain, Dhanpat Rai Publication
3. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
4. P. Ghosh, Polymer Science and Technology of Plastics and Rubbers, Tata McGraw Hill Publishing Company Limited.
5. F.W.Billmeyer : Textbook of Polymer Science is published by Wiley India (is now an Indian Imprint.)
6. Joel R. Fried, Polymer Science and Technology, Pearson Education (2nd Edition).
7. I. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc.
8. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
9. Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers..
10. Concise Inorganic Chemistry, J. D. Lee, Black Well Science