APPLIED ENGINEERING CHEMISTRY (AC-101)

L T P
3 1 0

[39 Lectures + 10 Tutorials = Approx. 49 hours duration]

1. POLYMERS

Introduction, classification, tacticity, types of polymerization, coordination polymerization, mechanisms of polymerization, synthesis and applications of some important polymers Effect of polymer structure on properties, Moulding of plastics into articles, Conducting polymers: preparation, types, properties and applications.

2. SCIENCE OF COMPOSITE MATERIALS

Introduction, Classification, constituents of composites, Fiber reinforced composites, unidirectional fibre reinforced composites, short fibre reinforced composites, particle reinforced composites, important types and failures of fiber reinforced composites, Advantages and applications of composites.

3. CHARACTERIZATION TECHNIQUES

Introduction to spectroscopy; UV-Visible spectroscopy- Absorption laws, Instrumentation, formation of absorption bands, Theory of electronic spectroscopy, Chromophore and auxochrome concept, fluorescence & phosphorescence, application of UV-Visible spectroscopy ; IR spectroscopy- Principle, theory of molecular vibrations, selection rules, spectral features of some classes of compounds, important features of IR spectroscopy and applications; NMR-Principle, relaxation processes, Instrumentation, shielding-desheilding effects, spin-spin coupling, coupling constant, applications of NMR; MS spectroscopy- Basic principle, Instrumentation, determination of molecular formulae, important features of mass spectroscopy; Chromatography- Introduction, types, gas chromatography ; thermal method- instrumentation, fundamental principles and applications of TGA, DTA and DSC.

4. NANOCHEMISTRY

Introduction to nanochemsitry, synthesis, characteristics and applications of carbon nanostructures fullerenes, carbon nanotubes and graphene.

5. FUELS AND NON-CONVENTIONAL ENERGY SOURCES

Introduction, classification, solid, liquid and gas fuel; Nuclear energy- Breeder reactor and light water nuclear reactor for power generation (Block diagram only), solar energy conservation and solar cells; Fuel Cells- Introduction, types and their characteristics, alternate fuels.

6. CORROSION AND ITS CONTROL

Introduction, Types of corrosion – chemical and electrochemical, Mechanisms of corrosion, factors affecting corrosion and different protection techniques for corrosion control.

7. LUBRICANTS

Introduction, Mechanisms of lubrication, Types and selection of lubricants, synthetic lubricants, properties and different methods for testing of lubricating oils and greases.

Books recommended:

Text Books:

1. Applied Chemistry- A textbook for engineers and technologist by H.D. Gesser.
2. Engineering Chemistry: by P C Jain & Monika Jain
3. A Text Book of Engineering Chemistry: by Shashi Chawla

Reference Books:

1. Fundamental of organic spectroscopy by Y. R. Sharma
2. Introduction to spectroscopy by Pavia, Lampman, Kriz.
3. Science and Engineering of Materials by Askeland and Phule
4. Introduction to nanotechnology by C. P. Poole Jr. and F.J. Owens
5. Principles of polymerization by George Odian
6. Textbook of polymer science by F.W. Billmeyer Jr.

Next page: Course plan of Applied Engineering Chemistry (AC-101)

Course Plan of Applied Engineering Chemistry (AC-101)

Lecture number	POLYMERS
1	Introduction, classification, tacticity, types of polymerization.
2	Coordination polymerization, mechanisms of polymerization.
3	Synthesis and applications of some important polymers
4	Effect of polymer structure on properties, Moulding of plastics into articles.
5	Conducting polymers: preparation, types, properties and applications
	SCIENCE OF COMPOSITE MATERIALS
6	Introduction, Classification, constituents of composites.
7	Fiber reinforced composites, unidirectional fibre reinforced composites
8	Short fibre reinforced composites, particle reinforced composites, Important types and failures of fiber reinforced composites
9	Advantages and applications of composites.
	CHARACTERIZATION TECHNIQUES [10 Lectures]
10	Introduction to spectroscopy
11	UV-Visible spectroscopy- Absorption laws, Instrumentation, formation of absorption bands, Theory of electronic spectroscopy
12	Chromophore and auxochrome concept, fluorescence & phosphorescence, application of UV-Visible spectroscopy.
13	IR spectroscopy- Principle, theory of molecular vibrations, selection rules, spectral features of some classes of compounds
14	Important features of IR spectroscopy and applications
15	NMR- Principle, relaxation processes, Instrumentation, shielding-desheilding effects
16	Spin-spin coupling, coupling constant, applications of NMR
17	MS spectroscopy- Basic principle, Instrumentation
18	Determination of molecular formulae, important features of mass spectroscopy
19	Chromatography- Introduction, types, gas chromatography
20	Thermal method- instrumentation, fundamental principles and applications of TGA, DTA and DSC
	NANOCHEMISTRY
21	Introduction to nanochemsitry
22	Synthesis, characteristics and applications of fullerenes
23	Synthesis, characteristics and applications of carbon nanotubes
24	Synthesis, characteristics and applications of graphene
	FUELS AND NON-CONVENTIONAL ENERGY SOURCES
25	Introduction, classification, solid, liquid and gas fuel
26	Nuclear energy- Breeder reactor and light water nuclear reactor for power generation (Block diagram only)
27	Solar energy conservation and solar cells
28	Fuel Cells- Introduction, types and their characteristics

29	Alternate fuels
	CORROSION AND ITS CONTROL
30	Introduction and mechanism of corrosion (Dry Corrosion and wet corrosion)
31	Types of corrosion- Galvanic, pitting, stress and intergranular
32	Waterline, crevice, microbial, soil corrosion, passivity of metal, galvanic series
33	Factors responsible for corrosion
34	Techniques applied to counter the corrosion- Environmental modifications
35	Techniques applies to modify the properties of metal
	LUBRICANTS
36	Introduction and mechanisms
37	Different types of lubricants: liquid, solid and semisolid
38	Properties of lubricants, Selection of lubricants based on the properties
39	Methods f testing of lubricating oils and greases

MARKS DISTRIBUTION (THEORY)				
1st Mid-term exam	2nd Mid-term exam	Home assignments, Class tests, Seminars, Quizzes, Attendance, etc.	End semester exam	Total Marks
15 Marks	15Marks	20 Marks	50 Marks	100