

I B. Tech – II Semester
(17CH201) APPLIED CHEMISTRY
(ECE& CSE)

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
40	60	100	3	1	-	3

Pre-Requisites: Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Course Objectives:

- Plastics and rubbers are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries.
- . Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- With the increase in demand, a wide variety of materials are coming up; some of them such as CNTs, fullerenes and superconductors have excellent engineering properties and research applications, hence few of these materials are introduced.
- Understanding of crystal structures will help to understand the conductors, semiconductors and insulators. Semiconductors and insulators having useful industrial applications especially in electronic devices and PV cells. Magnetic materials are also studied.
- 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-I: High Polymers and Plastics

Polymerisation: Introduction- stereoregular polymers – Thermoplastics and Thermosetting plastics – Compounding and fabrication (3 techniques)- Preparation, properties and applications of polyethene, PVC, Bakelite, Teflon and polycarbonates Elastomers – Natural rubber- compounding and vulcanization – Synthetic rubbers: Buna S, Buna N, Thiokol and polyurethanes – Fiber reinforced plastics – conducting polymers – biodegradable polymers.

UNIT-II: Fuel Technology

Fuels:- Introduction – Classification – Calorific value - HCV and LCV – Dulong's formula – Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis –Significance of the analyses – Liquid fuels – Petroleum- Refining – Cracking – Petrol knockingDiesel knocking - Octane and Cetane ratings – Anti-knock agents – Gaseous fuels – Natural gas. LPG and CNG – Combustion – Calculation of air for the combustion of a fuel – Flue gasanalysis – Orsat apparatus – Numerical problems on combustion.

UNIT-III: Electrochemical Cells and Corrosion

Galvanic cells - Reversible and irreversible cells – Single electrode potential – Electrochemical series and uses of this series- Standard electrodes (Hydrogen and Calomel electrodes) - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells

Corrosion:- Definition – electrochemical theory of corrosion and its mechanism – Types of electrochemical corrosion- Galvanic corrosion, concentration cell corrosion, differential aeration corrosion, waterline corrosion and pitting corrosion - Galvanic series – Factors influencing rate of corrosion - Protection from corrosion – Cathodic protection - Protective coatings: anodic and cathodic coatings – Methods of application on metals (Galvanizing, Tinning, Electroplating)

UNIT IV: Chemistry of Advanced Materials

Nano materials:-Introduction – Sol-gel method & chemical reduction method of preparation –Carbon nano tubes (CNTs) and fullerenes: Types, preparation, properties and applications **Liquid crystals:-** Introduction – Types – Applications.

Superconductors:- Type-I & Type-2 superconductors, properties & applications

Green synthesis:-Principles - 3or 4 methods of synthesis with examples.

UNIT V: Solid State Chemistry

Types of solids (crystalline and amorphous solids) - number of atoms per unit cell of BCC, FCC crystals, structures of rock salt (NaCl)&cesium chloride (CsCl), Semiconductors: Extrinsic and Intrinsic semiconductors, Preparation of ultrapure semiconductors (zone refining process and crystal pulling technique) Electrical and thermal Insulators and their applications

Magnetic materials:-Ferro and Ferri magnetism. Hall effect and its applications.

UNIT VI: Non-Conventional Energy Sources and Storage Devices

Solar Energy: - Introduction, application of solar energy, conversion of solar energy (Thermal conversion & photo conversion) – photovoltaic cell: design, working and its importance

Non-conventional energy sources:

- i) Hydropower include setup a hydropower plant (schematic diagram)
- ii) Geothermal energy: Introduction-schematic diagram of a geothermal power plant
- iii)Tidal and wave power: Introduction- Design and working-movement of tides andtheir effect on sea level.
- iv)Ocean thermal energy: Introduction, closed-cycle, ocean thermal energyconversion(OTEC), open cycle OTEC, hybrid OTEC, schematic diagram and explanation.

Fuel Cells: - Introduction - cell representation, H₂-O₂ fuel cell: Design and working, advantages and limitations. Types of fuel cells: Alkaline fuel cell - methanol-oxygen.

Course Outcomes:

After successful completion of the course, the students will be able to:

S. No	Course Outcome	BTL
1.	Demonstrate the knowledge of polymer and elastomer materials for futuristic engineering applications.	2
2.	Estimate the efficiency and quality parameters of industrial fuels using various instrumental techniques	2
3.	Employ different techniques to prevent corrosion and metal finishing in achieving a practical solution for corrosion related problems.	3
4.	Illustrate the applications various advanced materials in the field of engineering	2
5.	Describe the structure of dissimilar crystalline solids, semiconductors and insulator	2
6.	Demonstrate potential non-conventional energy sources for the future energy needs	2

CO – PO MAPPING:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	2	2	1	-	-	-	-	1	1	1
CO2	1	2	2	2	2	-	-	-	-	-	-	-
CO3	1	2	2	2	2	-	-	-	-	-	-	-
CO4	1	1	2	1	2	-	-	-	-	-	-	-
CO5	1	1	2	1	2	-	-	-	-	-	-	-
CO6	-	-	2	2	2	-	-	-	-	1	-	-

CO – PSO MAPPING:

ECE				CSE		
CO	PSO1	PSO2	PSO3	PSO1	PSO2	PSO3
CO1	1	-	1	2	-	-
CO2	-	-	1	2	-	-
CO3	-	-	1	1	1	-
CO4	1	1	1	2	1	-
CO5	1	-	1	1	2	-
CO6	2	2	-	2	2	-

Text Books:

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

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition (second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015 edition.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition.
4. Applied Chemistry by H.D. Gesser, Springer Publishers.
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press, IIM.