

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)**

ACCREDITED BY NAAC WITH A++ GRADE

**DEPARTMENT OF CHEMISTRY****APPLIED CHEMISTRY FOR CIVIL ENGINEERS****SYLLABUS FOR B E I SEMESTER**

Instruction : 2Hrs /Week	Semester End Exam Marks : 60	Subject Reference Code : U25BS110CH
Credits : 2	Continuous Internal Exam Marks: 40	Duration of semester End Exam: 3 Hours

<b>COURSE OBJECTIVES:</b>	<b>COURSE OUTCOMES</b>
<b>The course will enable the students to:</b>	<b>At the end of the course students should be able to:</b>
1. Study types of conductance, variation of electrode potential and EMF and to acquaint with applications of Galvanic Cell.	1. Construct a galvanic cell and calculate its EMF and pH wherever applicable.
2. Classify and compare various types of batteries and fuel cells.	2. Describe the construction, functioning and applications of the selected primary, secondary batteries and fuel cells.
3. Get acquainted with different types of polymers, composites and their applications.	3. Classify polymers and composites, explain their preparation and applications.
4. Apply the concepts of electrochemical principles in corrosion and its control.	4. Explain the gravity, type of corrosion and suggest suitable control method.

<b>CO-PO MAPPING FOR APPLIED CHEMISTRY</b>												
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	2	-	-	-	-	-	-	-	-	-	1
2	3	2	-	-	-	-	2	-	-	-	-	2
3	3	1	-	-	-	-	2	-	-	-	-	1
4	3	2	-	-	-	-	2	-	-	-	-	1

**UNIT-I: ELECTROCHEMISTRY (10)**

Introduction, conductance, types of conductance – specific, equivalent, molar conductance and their interrelationship-numericals. Principle and applications of conductometric titrations – strong acid vs strong base, weak acid vs strong base and mixture of acids vs strong base.

Cells – electrolytic and electrochemical cells. Nernst equation-derivation, applications and numericals. Types of electrodes- construction and working of calomel electrode (CE), quinhydrone electrode and glass electrode (GE). Determination of pH using glass electrode and quinhydrone electrode. Applications of potentiometry – acid base titrations.

**UNIT-II: CHEMISTRY OF BATTERIES (9)**

Introduction- definition of cell and battery – Types of cells (reversible and irreversible cells). Battery characteristics: free energy change, electromotive force of battery, power density, energy density – numericals.

Primary batteries: Construction and electrochemistry of Zn-Ag<sub>2</sub>O battery and lithium-V<sub>2</sub>O<sub>5</sub> battery.

Secondary batteries: Construction and working of lead-acid storage cell and lithium ion battery – advantages, limitations and applications.

Fuel cells: Concept, types of fuel cells and merits. Construction, working and applications of methanol-oxygen fuel cell and phosphoric acid fuel cell.

  
 Prof. B. Manohar

  
 Prof. G. Satyanarayana

  
 Dr. Krishnan Rangan

  
 Dr. P. Venugopal

### UNIT-III: POLYMER CHEMISTRY (10)

Introduction, degree of polymerization, functionality of monomers and its effect on structure of the polymer, Classification of polymers – i) homo and co-polymers; ii) homo chain and hetero chain polymers; iii) plastics, elastomers, fibers and resins.

**Plastics:** Thermo plastics and thermosets – preparation, properties and applications of i) Epoxy resin (bisphenol and epichlorohydrin) ii) PVC (Plasticized and unplasticized).

**Polymer composites:** Introduction, advantages of composites over conventional materials, Classification of composites. Manufacturing methods- Hand lay up and RTM method.

**Biodegradable polymers:** Concept, preparation and uses of polylactic acid and polyvinyl alcohol.

**Conducting polymers:** Definition- classification, mechanism of conduction in polyacetylene(Undoped) and applications.

### UNIT-IV- CORROSION AND ITS CONTROL (10)

Concept, Gravity of corrosion-Types of corrosion (Dry & Wet), Mechanism of wet corrosion. Formation of anodic and cathodic areas-Differential aeration corrosion and Galvanic corrosion- Galvanic series, factors influencing corrosion.

**Nature of metal:** Relative areas of anode & cathode, Nature of corrosion product, Relative position of metal in galvanic series.

**Nature of environment:** Temperature, pH and humidity.

**Corrosion control methods:** Methods of application of metallic coatings-Hot dipping (Galvanization process), principle of electro plating & electro less plating and their differences, Electroplating (Cu coating on Fe), Cathodic protection, Sacrificial Anodic Protection (SAP), Impressed Current Cathodic Protection (ICCP).

#### Text Books:

1. P. C. Jain, M Jain Engineering Chemistry, Dhanapathi Rai publishing company (17<sup>th</sup> edition), New Delhi.
2. O. G. PALANNA, Engineering Chemistry, TMH Edition.

#### Learning Resources:

1. B. H. Mahan, University Chemistry.
2. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book).
3. P. W. Atkins, Physical Chemistry.
4. S. S. Dara, S Chand and sons, Engineering Chemistry, New Delhi.
5. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing Co.
6. D. Dhara, IIT Kharagpur, NPTEL Polymer Chemistry Course.
7. Gowarikar V R, Polymer chemistry, V Edition.
8. S M Lindsay, Introduction to Nanoscience, Oxford University press.
9. Sashi Chawla, Text book of Engineering Chemistry, Dhanapathi Rai & Co, New Delhi.
10. J.C. Kuriacose and Rajaram, Chemistry in Engineering and Technology
11. Wiley Engineering Chemistry, Wiley India pvt Ltd, II edition.
12. Peter Grundler, Chemical sensors, An introduction for scientists and engineers, Springer

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