From the Academic Year 2025-2026

# VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

*ACCREDITED BY NAAC WITH A++ GRADE*

## DEPARTMENT OF CHEMISTRY

### APPLIED CHEMISTRY FOR MECHANICAL ENGINEERS

### SYLLABUS FOR B E I SEMESTER

| | | |
|---|---|---|
| Instruction : 2 Hrs /Week | Semester End Exam Marks : 60 | Subject Reference Code : U25BS130CH |
| Credits : 2 | Continuous Internal Exam Marks: 40 | Duration of semester End Exam: 3 Hours |

| COURSE OBJECTIVES: | COURSE OUTCOMES |
|---|---|
| **The course will enable the students to:** | **At the end of the course students should be able to:** |
| 1. Study types of conductance, variation of electrode potential and EMF and to acquaint with applications of Galvanic Cell.<br>2. Classify and compare various types of batteries and fuel cells.<br>3. Familiarize with the significance and characteristics of fuels and lubricants.<br>4. Get acquainted with different types of polymers and their applications. | 1. Construct a galvanic cell and calculate its EMF and pH wherever applicable.<br>2. Describe the construction, functioning and applications of the selected primary, secondary batteries and fuel cells.<br>3. Explain the significance and characteristics of fuels and Lubricants.<br>4. Classify the polymers and applications of a few polymers. |

**CO-PO MAPPING FOR APPLIED CHEMISTRY**

| 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, week 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-$Ag_2O$ battery and lithium-$V_2O_5$ 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- LUBRICANTS AND FUELS (10)**

**a) FUELS:**

Introduction, classification, requisites of a good fuel. Calorific value (CV)-HCV and LCV. Calculation of CV using Dulong's formula- numericals.

**Liquid Fuels:** Composition and CV of gasoline, cracking: Fixed bed catalytic cracking method. Knocking and its significance, octane number, enhancement of quality of gasoline by reforming and anti- knock agents. Leaded and unleaded petrol, power alcohol. **Bio-diesel:** Source, chemistry of transesterification and advantages of bio diesel.

**b) LUBRICANTS:**

Need for lubricants, definition, classification: solid, semi solid and liquid lubricants, Properties of lubricants and significance of – Viscosity, viscosity index, Flash point, Pour point and Saponification number- Determination of Viscosity by red wood viscometer - Application of lubricants.

**UNIT-IV: POLYMER CHEMISTRY (10)**

Introduction, degree of polymerization, functionality of monomers and its effect on structure of 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); and 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.

**Text Books:**

1. P. C. Jain, M Jain Engineering Chemistry, Dhanapathi Rai publishing company (17th 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, Springers

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