

**VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)**

ACCREDITED BY NAAC WITH A++ GRADE

**DEPARTMENT OF CHEMISTRY**

**APPLIED CHEMISTRY**

**(For Civil & Mechanical branches)**

Instruction : 3Hrs / week	Semester End Exam Marks : 60	Subject Reference Code : U24BS120CH
Credits : 3	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>
<ol style="list-style-type: none"> <li>1. Study types of conductance, variation of electrode potential and EMF and to acquaint with applications of Galvanic Cell.</li> <li>2. Classify and compare various types of batteries and fuel cells.</li> <li>3. Get acquainted with different types of polymers and their applications.</li> <li>4. Emphasize upon the quantity and quality of fossil fuels and need for bio- diesel</li> <li>5. Describe the requirements of water for domestic and industrial uses.</li> </ol>	<ol style="list-style-type: none"> <li>1. Construct a galvanic cell and calculate its EMF and pH wherever applicable.</li> <li>2. Describe the construction, functioning and applications of the selected primary, secondary batteries and fuel cells.</li> <li>3. Classify the polymers and discuss the synthesis and applications of few polymers.</li> <li>4. Rate the fuels and suggest methods for enhancement of the quality of fuels for the required output.</li> <li>5. Suggest appropriate treatment methods of water to make it fit for domestic and industrial applications.</li> </ol>

<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	2	-	-	-	-	2	-	-	-	-	2
4	3	2	-	-	-	-	2	-	-	-	-	2
5	3	2	-	-	-	-	2	-	-	-	-	2

**UNIT-I: ELECTROCHEMISTRY (11)**

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. IUPAC convention of cell notation, cell reaction, concept of electrode potential, electro motive force (EMF). Electrochemical series – applications, 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.

**UNIT-II: BATTERY TECHNOLOGY (8)**

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

  
Dr. Krishnan Rangan

  
Dr. D. Satyanarayana

  
Dr. P. Venugopal



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

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

Types of Polymerizations – Addition and condensation polymerization.

Glass transition temperature and factors affecting glass transition temperature.

**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 poly lactic acid.

### UNIT-IV-CHEMICAL FUELS (9)

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

**Solid Fuels:** Coal: Proximate analysis of coal and its significance and 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. Catalytic converters and their role in reducing the toxicity of automobile exhaust emissions. Composition and CV of diesel oil, cetane number.

**Bio-diesel:** Source, chemistry of transesterification and advantages of bio diesel.

### UNIT-V: WATER TECHNOLOGY (8)

Hardness of water – types. Calculation of degree of hardness of water-numericals. Determination of hardness of water by EDTA method numericals. Boiler troubles – scales and sludges formation and prevention –External treatment by Blow-down process and internal treatment by Calgon conditioning. Desalination of water by Reverse Osmosis and electro dialysis. Specifications of potable water. Water treatment for drinking purpose sterilization by chlorination – concept of Break Point Chlorination.

#### Text Books:

1. P. C. Jain, M Jain Engineering Chemistry, Dhanapathi Rai publishing company (17<sup>th</sup> edition), New Delhi.
2. Sashi Chawla, Text book of Engineering Chemistry, Dhanapathi Rai & Co, New Delhi.
3. O. G. PALANNA, Engineering Chemistry, TMH Edition.
4. J.C. Kuriacose and Rajaram, Chemistry in Engineering and Technology
5. Wiley Engineering Chemistry, Wiley India pvt Ltd, II 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. Gowariker V R, Polymer chemistry, V Edition.

  
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