VASAVI COLLEGE OF ENGINEERING (A)
DEPARTMENT OF CHEMISTRY
B E III Semester
Open Elective: BATTERY SCIENCE AND TECHNOLOGY

Instruction : 2Hrs / Week	Semester End Exam Marks : 60	Subject Reference Code : U21OE310CH
Credits : 2	Continuous Internal Exam Marks : 40	Duration of semester End Exam : 3Hours

LEARNING OUTCOMES:
At the end of the course students should be able to:
1.Discuss the construction, electrochemistry, technology and applications of selected primary batteries
2.Discuss the construction, electrochemistry, technology and applications of few secondary batteries
3.Explain the working principle, electrochemistry, technology and applications of prominent fuel cells
4. Evaluate different batteries or fuel cells in order to select a suitable battery or fuel cell for a given application

UNIT-I: BATTERIES- FUNDAMENTALS
Introduction and types of batteries: Primary and secondary.
Battery characteristics: Free energy change, electromotive force of battery, ampere-hour, capacity, power, power density, energy density, efficiency, cycle life, tolerance to service conditions, performance characteristics.

UNIT-II: PRIMARY BATTERIES
Construction, chemistry and technology of Zinc-Air Battery, Zinc –HgO battery and their applications.
Primary lithium batteries: Soluble cathode cells, solid cathode cells- Lithium manganese dioxide, solid electrolyte cells- Lithium polymer electrolyte battery- Applications. Reserve battery- Electrochemistry of perchloric acid cell- applications.

UNIT-III: SECONDARY BATTERIES
Construction, chemistry and technology of maintenance free lead acid battery (MFLA), valve regulated lead acid battery (VRLA), absorbed glass mat lead acid battery (AGMLA) - comparision between lead acid battery and VRLA along with advantages - Construction, electro chemistry and applications of Nickel-Cadmium battery, Nickel metalhydride battery.
Lithium ion batteries: Construction, chemistry and applications of liquid organic electrolyte cells, polymer electrolyte cells, lithium ion cells.

UNIT- IV: FUEL CELLS
Introduction, classification based on temperature and nature of electrolyte. Working principle, components, applications and environmental aspects of alkaline fuel cell (AFC)- Hydrogen-Oxygen alkaline fuel cell, Molten carbonate fuel cell (MCFC), Polymer electrolyte membrane fuel cell (PEMFC), Solid oxide fuel cell (SOFC).

Learning Resources:

Text Books:
1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai and Pub, Co., New Delhi (2002)
2. S.S. Dara "A text book of engineering chemistry" S.Chand and Co.Ltd., New Delhi (2006).

Reference Books:
1. Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.
2. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning
3. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi,2008.
4. Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993.

Max.
CIE: 40 marks
Average of 2 - Internal - 30 marks each
Average of 2 - Assignments - 5 marks each
" " Quizzes - 5 " "

SEE
Max. marks 60