VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
ACCREDITED BY NAAC WITH A++ GRADE
DEPARTMENT OF CHEMISTRY
B E III Semester
Open Elective: BATTERY SCIENCE AND TECHNOLOGY

Instruction : 2Hrs / Week	Semester End Exam Marks : 60	Subject Reference Code : U22OE310CH
Credits : 2	Continuous Internal Exam Marks : 40	Duration of semester End Exam : 3Hours

COURSE OBJECTIVES:	**COURSE OUTCOMES:**
The course will enable the students to:	**At the end of the course students should be able to:**
1. Introduce the various terms to understand the efficiency of batteries. 2. Know the relevant materials required for the construction of primary and secondary batteries. 3. Familiarize with the reactions involved during charging and discharging processes. 4. Emphasise the need of fuel cells and the concept of their construction and functioning.	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

CO-PO MAPPING FOR BATTERY SCIENCE AND TECHNOLOGY

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	3	1	-	-	-	-	1	-	-	-	-	1
2	3	1	-	-	-	-	1	-	-	-	-	1
3	3	1	-	-	-	1	1	-	-	-	-	1
4	3	1	-	-	-	1	1	-	-	-	-	1

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).

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).
3. Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.
4. Chemistry of Engineering Materials by R. P. Mani and K. N. Mishra, CENGAGE learning
5. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2008.

Suggested Reading:

1. Dell R. M. and Rand D. A. J., "Understanding Batteries", Royal Society of Chemistry, UK, 2001.
2. Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993.

CIE: 40 Marks	
Average of 2 Internals	: 30 Marks each
Average of 2 Assignments	: 5 Marks each
Average of 2 Quizzes	: 5 Marks each