III Year-II Semester
(20EE6414) Solar Energy & Battery Management System

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre- Requisites: None

Preamble: This course enables the students to understand various aspects of solar energy systems and batteries management system.

Course Objectives:

- To understand the basic knowledge of solar energy systems.
- Understand the importance of batteries in electric vehicles.
- Demonstrate various technical parameters of batteries and battery packs

UNIT-I: Introduction to Solar Energy

Introduction, Definition of Power and energy, difference between power and energy, the role of energy in development, Limitation of renewable energy sources, requirement, need for the use of new energy sources.

UNIT-II: Solar Systems

Solar system: Energy from the sun, solar window, atmospheric effects, diffused radiations, Air mass, effect of Air Mass, seasonal effects, environmental effects on standard test conditions.

UNIT-III: Photovoltaic

Advantages & disadvantages of photo-voltaic conversion. Use of solar cell in various instruments. Photo-voltaic array & its connections, arrangements of array according to the voltage. Module & its connections. Faults & their effects in photo-voltaic cell, array & module (connection of cell, connection of array, connection of module

UNIT–IV: Energy Storage System

Batteries: Lead Acid Battery, Nickel based batteries, Sodium based batteries, Lithium based batteries–Li-ion & Li-poly, Metal Air Battery, Zine Chloride battery; Ultra capacitors; Flywheel Energy Storage System; Hydraulic Energy Storage System; Comparison of different Energy Storage System

UNIT-V: Battery Characteristics and Parameters

Cells and Batteries- conversion of chemical energy to electrical energy- Battery Specifications: Variables to characterize battery operating conditions and Specifications to characterize battery nominal and maximum characteristics; Efficiency of batteries; Electrical parameters, Battery design-Performance criteria for Electric vehicle batteries- Vehicle propulsion factors- Power and energy requirements of batteries- Meeting battery performance criteria- setting new targets for battery performance.

Course Outcomes:

S.No	Course Outcomes	BTL
1	Understand the basics of PV installation and operation	
2	Distinguish between various types of batteries used for EV applications	
3	Elaborate various technical parameters of batteries	
4		
5		

Correlation of Cos with POs & PSOs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	3	1	-	-	-	-	2	-	-	-	2	-	3
CO2	-	-	3	1	-	-	-	-	2	-	-	-	2	-	3
CO3	-	-	3	1	-	-	-	-	2	-	-	-	2	-	3

Text Books:

1. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003.
2. Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.
3. S. Sukhtame, "Solar Energy Systems:, SCI Publications, 2012

Reference Books:

1. Tariq Muneer and Irene Illescas García, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017.
2. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles", Springer, 2013