III B.Tech – I Semester
(20EE5639) ELECTRIC VEHICLES AND MANAGEMENT

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

Pre-Requisites: DC Machines and Transformers, Synchronous and Asynchronous Machines.

Course Objectives

- Understand the basic concepts of electric vehicles
- Illustrate the communication protocols used in electric vehicles
- Distinguish various energy management strategies in electric vehicles

UNIT–I: Introduction to Electric Vehicles

History of electric vehicles, social and environmental importance, impact of modern drive-trains on energy supplies. Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance, drive cycles.

UNIT–II: Electric Drive-trains

Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT–III: Communications, supporting subsystems

Overview of general-purpose networks and protocols- Ethernet, TCP, UDP, IP, ARP, RARP- LIN standard overview- workflow concept, applications, LIN protocol specification, signals, Frame transfer, Frame types, Schedule tables, Task behaviour model, Network management, status management, overview of CAN, fundamentals, Message transfer, frame types, Error handling, fault confinement, Bit time requirements.

UNIT–IV: Energy Management Strategies

Introduction to energy management strategies used in electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies

UNIT–V: Battery Management

Selection of battery for EVs, Traction Battery Pack design, Requirement of Battery Monitoring, Battery State of Charge Estimation methods, Battery Cell equalization problem, thermal control, protection interface, SOC Estimation, Energy & Power estimation, Battery thermal management system.

Course Outcomes:

After successful completion of the course, the students will be able to:

S.No	Course Outcome	BTL
1.	Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources	L5
2.	Design and develop basic schemes of electric vehicles and hybrid electric vehicles.	L5
3.	Understand the in-vehicle communication network	L2
4.	Demonstrate the energy management strategies in electric vehicles	L3
5.	Illustrate the battery management issues in electric vehicles	L3

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		2	3	1					2				2	
CO2		2	3	1					2				2	
CO3		2	3	1					2				2	
CO4		2	3	1					2				2	
CO5		2	3	1					2				2	

Text Books:

1. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
2. Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.

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