

S. No.	Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
								Sessional	Final Exam	Total
5	EE-702(A)	Hybrid and Electric Vehicles	PEC	3	2	1	0	50	100	150

Course Outcomes:

At the end of the course the student will be able to	
CO1	Explain the concept and working principle of electric vehicles.
CO2	Describe the working principle of traction and its utilization.
CO3	Identify and evaluate the significance of Lithium batteries and battery management systems for vehicles.
CO4	Analyze various energy management techniques in hybrid and electric vehicles.
CO5	Design the charging station for electric vehicles.

Detailed Syllabus

Section-A

Unit 1: History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles, Basics of vehicle performance, Vehicle power source characterization, Transmission characteristics, Mathematical models to describe vehicle performance.

(10 Hrs)

Unit 2: Basic concept of hybrid traction, Introduction to various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Basic concept of electric traction, Fuel efficiency analysis. Fundamentals of Drives and Control of EV Using DC motor, Induction Motor, Permanent Magnet Motor, Switched Reluctance Motor, BLDC motor, Design and Sizing of Traction Motors.

(8 Hrs)

Unit 3: Introduction to lithium batteries and their applications, working principle, advantages, and disadvantages. Evaluation of various battery parameters: State of charge, Depth of discharge, charging rate, etc. current and voltage variation as per different loads. Issues and remedies for battery balancing. Government policies to fulfill the demands of lithium batteries for e-vehicles.

(10 Hrs)

Section-B

Unit 4: Energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

(8 Hrs)

Unit 5: Introduction to various charging techniques and schematic of charging stations, classification of different charging technology for EV charging station, introduction to Grid-to-Vehicle, Vehicle to Grid (V2G) or Vehicle to Buildings (V2B) or Vehicle to Home (V2H) operations, bi-directional EV charging systems, Wireless power transfer (WPT) technique for EV charging.

(10 Hrs)

Text Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Electric and Hybrid Vehicles: Design Fundamentals	Iqbal Hussein	CRC Press	1 st (2012)
2	Fundamentals and Applications of Lithium-Ion Batteries in Electric Drive Vehicles	Jiuchun Jiang and Caiping Zhang Beijing	Wiley	1 st (2015)

Reference Books

S. No.	Name of the Books	Author	Publisher	Edition (Pub. Yr.)
1	Electric Vehicle Technology	Larminie, James, and John Lowry.	John Wiley and Sons	1 st (2012)