18PEE61	ELECTRICAL VEHICLES	L	T	P	C
		3	0	0	3

Course Objectives:

1.	To understand the concept of electrical vehicles and its operations
2.	To understand the need for energy storage in hybrid vehicles
3.	To provide knowledge about various possible energy storage technologies that can be Used in electric vehicles

Unit I	INTRODUCTION	9	+	0

Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics.

Unit II	ARCHITECTURE	9	+	0

Architecture of EV's and HEV's – Plug-n Hybrid Electric Vehicles (PHEV) - Power train components and sizing, Gears, Clutches, Transmission and Brakes.

Unit III	DRIVES	9	+	0

DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking) of induction motor drive system – Induction motor and permanent motor based vector control operation – Switched reluctance motor (SRM) drives.

Unit IV	BATTERIES	9	+	0

Battery Basics, Different types, Battery Parameters, Battery modeling, Traction Batteries

Unit V	FUEL CELL	9	+	0

Fuel cell – Characteristics- Types – hydrogen Storage Systems and Fuel cell EV – Ultra capacitors

Total (L+T)= 45 Periods

Course Outcomes:

Upon completion of this course, the students will be able to:

CO1	:	*Remember the fundamentals of electric vehicle and its mechanics*
CO2	:	*Understand the architecture of electric and hybrid electric vehicle.*
CO3	:	*Analyse the four quandrant operation of DC drive, induction motor drive and SRM drive.*
CO4	:	*Apply and analyse the basic battery concepts and modeling.*
CO5	:	*Understand the concepts of fuel cell*

Reference Books:

1.	"Electric and Hybrid Vehicles: Design Fundamentals",Iqbal Hussain, CRC Press, Taylor & Francis Group, Second Edition (2011).
2.	"Vehicular Electric Power Systems", Ali Emadi, Mehrdad Ehsani, John M.Miller, Special Indian Edition, Marcel dekker, Inc 2010

PO / CO	CO Statement	PO1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO1 1
CO1	*Remember the fundamentals of electric vehicle and its mechanics*	3	1	2	1	1		1	1		1	1
CO2	*Understand the architecture of electric and hybrid electric vehicle.*	1	1	3	2	2		2			2	
CO3	*Analyse the four quandrant operation of DC drive, induction motor drive and SRM drive.*	1	1	2	3	2		1	1	1	3	
CO4	*Apply and analyse the basic battery concepts and modeling.*	2	3	3	1	1		1	2		1	2
CO5	*Understand the concepts of fuel cell*	2	1	1	1	2		1	3		1	1