22EEHO302	DESIGN OF MOTORS AND POWER CONVERTERS FOR ELECTRIC VEHICLE		SEMESTER			
PREREQUISTIES		**CATEGORY**	**PEC**	**Credit**		**3**
Power Electronics, Special Electrical Machines		**Hours/Week**	**L**	**T**	**P**	**TH**
			3	**0**	**0**	**3**

Course Objectives:

1.	To study the characteristics of motors used Electric Vehicle
2.	To understand the design of dc drives used in Electric Vehicle
3.	To analyse the ac drives used in Electric Vehicle
4.	To understand the role of converters used in Electric Vehicle

UNIT I	**EV MOTORS CHARACTERISTICS**	**9**	**0**	**0**	**9**

Requirement of EV motors, Review of Conventional Vehicle: Introduction to Hybrid Electric Vehicles: Types of EVs, Hybrid Electric Drive-train, Tractive effort in normal driving, Comparison of EV motors,
Basics of DC Motor, Torque speed characteristics, DC Motor dynamics, Field Weakening Control, Four quadrant operation

UNIT II	**DESIGN OF DC DRIVES**	**9**	**0**	**0**	**9**

Single quadrant variable speed chopper fed DC drives, Four quadrant variable speed chopper fed DC Drives, Single phase/ three phase converter, Dual converter fed DC Drive, current loop control, Armature current reversal, Field current control, Different controllers and firing circuits.

UNIT III	**INVERTER FED AC DRIVES**	**9**	**0**	**0**	**9**

Analysis of different AC motor with single phase and three phase inverters Operations in different modes and configurations., Problems and strategies.

UNIT IV	**PERMANENT MAGNET AC MOTORS AND CONTROL**	**9**	**0**	**0**	**9**

BLDC dynamic modelling, torque equations, BLDC control methods, machine sizing, current, voltage and speed limits, extending constant power speed range, current control methods- Application of hall current sensor in PM AC motors.

UNIT V	**PWM AND INVERTER**	**9**	**0**	**0**	**9**

Sinusoidal PWM, Injection of third order harmonics, Space Vector Modulation, Dead time & compensation Encoders, Resolvers, R/D Converters.

Total (45L+0T)= 45 Periods

Text Books:

1.	B.K. Bose, "Power Electronics and Motor Drives", Elsevier 2015.

Reference Books:

1.	H. Buyse and I.J. Robert, "Electrical machines and converters: Modeling and simulation", North Holland, digitized 2007.
2.	R. Krishnan, " Electric Motor Drives Modeling Analysis and Control", Prentice -Hall of India2001.
3.	P.S. Bhimra," Generalized Theory of Electrical Machines", Khanna Publisher.

E-Reference

1	https://nptel.ac.in/courses/108104140

Course Outcomes: Upon completion of this course, the students will be able to:			**Bloom's Taxonomy Mapped**
CO1	:	Describe the characteristics of the motors use in EV.	L1: Remembering
CO2	:	Analyze dynamics of DC motor and different controllers used in their control	L4: Analysing
CO3	:	Explain the speed control and PWM techniques used in the control of ac motor	L2: Understanding
CO4	:	Analyze the operation and control of permanent magnet ac motors.	L4: Analyzing
CO5	:	Analyze sensors used for control of 3-phase ac motors.	L4: Analysing

COURSE ARTICULATION MATRIX

COs/ POs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**	**PS O3**
CO1	2	2	3	1	1		1	1			1		2	2	1
CO2	2	2	1	1	1								1	1	2
CO3	1	2	3	2	2		1	1				1	1	2	1
CO4	2	2	3	2	3	2						1	3	2	1
CO5	1	3	2	1	3	1	1	1			1	1	3	2	1
Avg	1.6	2.2	2.4	1.4	2	1.5	1	1	0	0	1	1	2	1.8	1.2

3/2/1-indicates strength of correlation (3- High, 2-Medium, 1- Low)