22EEHO304	DESIGN OF ELECTRIC VEHICLE CHARGING SYSTEM				SEMESTER			
PREREQUISTIES		CATEGORY			PEC	Credit		3
Electric vehicle		Hours/Week			L	T	P	TH
					3	0	0	3

Course Objectives:

1. To introduce the fundamentals of charging architectures, converter topologies and control schemes for electric vehicle charging system

UNIT I	**CHARGING ARCHITECTURES FOR ELECTRIC VEHICLES**	**9**	**0**	**0**	**9**

Classification of EV charging architectures, Onboard Chargers, Level 1: Dedicated Converter (Slow Charging), Level 2: Integrated Converter (Semi-fast Charging), Off-Board Chargers, Level 3: Dedicated Off-Board DC Chargers (Fast Charging), Common AC Bus Architecture, Common DC Bus Architecture

UNIT II	**CONVERTER TOPOLOGIES FOR CHARGING STATION**	**9**	**0**	**0**	**9**

Vienna Rectifier, Multipulse Rectifier with DC Active Power Filter, Non-isolated Multichannel Interleaved Buck Converter, Phase-Shifted ZVS Full-Bridge Converter, Grid-connected cascaded H-bridge converter, Grid-connected Modular Multilevel Converter based integrated charger for split integrated battery pack, Neutral-Point Clamped Converter

UNIT III	**CONTROL SCHEMES AND CHARGING STANDARDS**	**9**	**0**	**0**	**9**

Control Schemes for Charging Converters, Single-Phase AC–DC Converter Control, Three-Phase AC–DC Converter Control, voltage-oriented control (VOC) and direct power control (DPC), Electric Vehicle / Plug in Hybrid Electric Vehicle charging Standards

UNIT IV	**BATTERY TECHNOLOGIES FOR TRANSPORTATION APPLICATIONS**	**9**	**0**	**0**	**9**

Nickel-Cadmium (Ni-Cd) Battery, Nickel-Metal Hydride (Ni-MH), Lithium-Ion (Li-Ion), Flow Batteries, Battery Charging Methods, Battery management system

UNIT V	**LATEST DEVELOPMENTS IN EV CHARGING**	**9**	**0**	**0**	**9**

Inductive Charging, Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H), EV charging safety configuration and considerations, Grid-Tied Residential charging Systems, Grid-Tied Public charging Systems, EV cable communication protocols, Charging cable standards

Total (45L+0T)= 45 Periods

Text Books:

1. Sulabh Sachan, P. Sanjeevikumar, Sanchari Deb, Smart Charging Solutions for Hybrid and Electric Vehicles, Wiley- Scrivener Publishing LLC, 2022

Reference Books:

1. Mary Murphy " Electric and Hybrid Vehicles: Principles, Design and Technology ", Larsen and Keller Education, 2019

E-Reference

1. https://archive.nptel.ac.in/courses/108/103/108103009/

Course Outcomes: Upon completion of this course, the students will be able to:			**Bloom's Taxonomy Mapped**
CO1	:	Understand the configurations for chargers for electric vehicle	L1: Remembering
CO2	:	Select a converter topology for electric vehicle charging station	L3: Applying
CO3	:	Use an appropriate control scheme for charging converter	L3: Applying
CO4	:	Understand the principle of batteries used for EV charging station	L1: Remembering
CO5	:	Explain the latest developments in Electric vehicle charging technologies	L2: Understanding

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	1	1	2	2		2		1		2		2	2	2	2
CO2	2	1			1					2		1	1	3	
CO3	2	1	1	2	1	1	2		1				1	1	1
CO4	1	1		1		2	2	2	1		2	2	1	1	
CO5	2	2	3	1		3	1			1	3		2	2	3
Avg	1.6	1.2	2	1.5	1	2	1.67	1.5	1	1.67	2.5	1.67	1.4	1.8	2
3/2/1-indicates strength of correlation (3- High, 2-Medium, 1- Low)															