ELECTRIC VEHICLES

CourseCode	20ME5703	**Year**	IV	**Semester**	I
Course Category	Minor in AE	**Branch**	ME	**Course Type**	Theory
Credits	4	**L – T – P**	3 – 1 – 0	**Prerequisites**	Automobile Engineering
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes: Upon successful completion of the course, the student will be able to

	Statement	**Skill**	**BTL**	**Units**
CO1	Understand working of Electric Vehicles and recent trends	Understand	L2	1,2,3,4,5
CO2	Apply the EV, HEV and electric propulsion unit and its control for application of electric vehicles	Apply	L3	1,2,3
CO3	Analyze design and different power converter topology used for electric vehicle application	Analyze	L4	1,4,5

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3: High, 2: Medium, 1:Low)

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

Syllabus

UNIT	**Contents**	**Mapped COs**
I	**Electric and Hybrid Electric Vehicles** Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains.	**CO1 CO2**
II	**Energy storage for EV and HEV** Energy storage requirements, Battery parameters, Types of Batteries, Modelling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modelling of PEMFC, Super Capacitors.	**CO1 CO2**
III	**Electric Propulsion** EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives	**CO1 CO2**
IV	**Design of Electric and Hybrid Electric Vehicles** Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor,	**CO1 CO3**

	power rating of engine/generator, design of PPS Parallel Hybrid Electric Drive Train Design: Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design	
V	**Power Electronic Converter for Battery Charging** Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z-converter for battery charging, High-frequency transformer based isolated charger topology, Transformer less topology	**CO1** **CO3**

Learning Resources
Text books
1.Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003 2.Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Wiley Publication, 2011.
Reference books
1.C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, OXFORD University Press, 2001. 2.M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005 3.Tom Denton, Automobile Electrical and Electronic Systems, 3rd Edition Elsevier Publications 2004.
E- Resources & other digital material
1. https://nptel.ac.in/courses/108106170?msclkid=5d0d97eacf7011ec9203c541a7cda255 2.https://nptel.ac.in/courses/108102121?msclkid=5d0ddd09cf7011ec82d15ce85a00f786