

HYBRID ELECTRIC VEHICLES

CourseCode	19EE4801B	Year	IV	Semester	II
Course Category	Program Elective-VI	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	
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	
CO1	Define and Explain the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals.
CO2	Explain the fundamentals of vehicle movement and performance of electric vehicle.(L2)
CO3	Analyze various electric drives suitable for hybrid electric vehicles.(L4)
CO4	Discuss different energy storage technologies used for hybrid electric vehicles and their control.(L6)
CO5	Analyse the use of different power electronics devices and electrical machines in hybrid electric vehicles.(L4)

Strength of Correlation between CO – PO , CO- PSO in scale of 1-3

1: Slight (low), 2: Moderate (medium) 3: Substantial (High)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2			3	2	1				3	3	2
CO2	3		3			2	3	1				3	3	2
CO3	3		2			3	3	1				3	3	2
CO4	3		3			3	1	1				3	3	1
CO5	3		3			3	2	1				3	3	3

Syllabus		
Unit No.	Contents	Mapped CO
I	Introduction to Hybrid Electric Vehicles History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Vehicle fundamentals General Description of Vehicle Movement, Vehicle Resistance, Dynamic Equation, Basics of vehicle performance and braking performance.	CO1, CO2
II	Hybrid Electric Drive-trains Basic concept of hybrid drive train, introduction to various hybrid drive-train topologies. Electric Drive-trains	CO1, CO2

	Introduction to various electric drive-train topologies, Performance of Electric Vehicle, Tractive effort in normal driving, Energy Consumption.	
III	Electric propulsion system Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, Vector control of AC Drives, PMSM Drives, SRM Drives, Advanced Control Strategies.	CO3
IV	Energy Storage Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices.	CO4
V	Power Electronics Control Power Electronics in HEVs: Power electronics including switching, AC-DC, DC-AC conversion, electronic devices and circuits used for control and distribution of electric power, Thermal Management of HEV Power Electronics.	CO5
Learning Resources		
Text Books		
1. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003 2. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.		
Reference Books		
1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003. 2. Seth Leitman, "Build Your Own Electric Vehicle" MC Graw Hill, 1st Edition, 2013.		
e- Resources & other digital material		
1. https://nptel.ac.in/courses/108/103/108103009/		