

18EEP15	ELECTRICAL AND HYBRID VEHICLES			L	T	P	C
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Course Objectives:							
To understand the operation and need of electrical vehicles, hybrid vehicles with its energy storage technologies							
Unit I	ELECTRIC VEHICLES			9	+	0	
Configurations of Electric Vehicles (EV), Performance of Electric Vehicles: Traction Motor Characteristics, Tractive Effort and Transmission Requirement, Vehicle Performance, Energy Consumption							
Unit II	HYBRID ELECTRIC VEHICLES			9	+	0	
Concept of Hybrid Electric Vehicle (HEV) Trains, Architectures of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains and Parallel Hybrid Electric Drive Trains, Torque-Coupling Parallel Hybrid Electric Drive Trains, Speed-Coupling Parallel Hybrid Electric Drive Trains, Torque-Coupling and Speed-Coupling Parallel Hybrid Electric Drive Trains							
Unit III	ELECTRIC PROPULSION SYSTEMS			9	+	0	
Functional block diagram of a typical electric propulsion system, Classification of electric motor drives for EV and HEV applications, Multiquadrant Control of Chopper-Fed DC Motor Drives, Performance Analysis and Control of BLDC Machines, Switched Reluctance Motor Drives, SRM Drive Converter, Generating Mode of Operation, Vibration and Acoustic Noise in SRM							
Unit IV	ENERGY STORAGEES			9	+	0	
Battery Technologies: Lead-Acid Batteries, Nickel-based Batteries, Lithium-Based Batteries – Ultracapacitors, Features, Basic Principles and its Performance, Ultracapacitor Technologies- Ultrahigh-Speed Flywheels, Operation and Power Capacity							
Unit V	FUEL CELL VEHICLES			9	+	0	
Fuel cell – Characteristics- Types – hydrogen Storage Systems and Fuel cell Electric Vehicle – configuration and control strategy							
Total (45+0)= 45 Periods							
Course Outcomes:							
Upon completion of this course, the students will be able to:							
CO1	:	Understand the operation of Electrical Vehicles and its energy storage technologies.					
CO2	:	Know Fuel cell, types and characteristics.					
CO3	:	Operate the vehicle with BLDC and SRM motor drives					
CO4	:	Design the EV's and HEV's.					
CO5	:	Choose the energy storage technology for electric vehicle					
Text Books:							
1.		Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, Ali Emadi, 'Modern Electric, Hybrid Electric, and Fuel Cell Vehicles Fundamentals, Theory, and Design', CRC PRESS, New York, third edition, 2016					
Reference Books:							
1.		Iqbal Hussain ,“Electric and Hybrid Vehicles: Design Fundamentals” , CRC Press, Taylor & Francis Group, 3 rd Edition (2021).					
2.		Ali Emadi, Mehrdad Ehsani, John M.Miller ,“Vehicular Electric Power Systems”, Special Indian Edition, Marcel dekker, Inc 2010					

E-Reference	
1	www.onlinecourses.nptel.ac.in
2	www.class-central.com

CO/PO Mapping

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