

**EE733PE: ELECTRIC AND HYBRID VEHICLES**  
**(Professional Elective-III.3)**

**IV Year B.Tech. EEE I-Sem**

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**Prerequisite:** Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

**Course Objectives:**

- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To know the various aspects of hybrid and electric drive train such as their configuration, t
- To have a knowledge on types of electric machines that can be used energy storage devices, etc.

**Course Outcomes:** At the end of this course, students will be able to :

- Understand the models to describe hybrid vehicles and their performance.
- Understand the different possible ways of energy storage.
- Understand the different strategies related to energy storage systems.

**UNIT- I:**

**Introduction:** Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

**UNIT- II:**

**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.

**Hybrid Electric Drive-Trains:** Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

**UNIT- III:**

**Electric Trains:** Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

**Electric Propulsion Unit:** Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

**UNIT- IV:**

**Energy Storage:** 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, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

**UNIT- V:**

**Energy Management Strategies:** Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

**Case Studies:** Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).