

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
SYLLABUS OF B.E VI- SEMESTER
HYBRID VEHICLES (Open Elective – VII)

Instruction: 2 Hours/week	SEE Marks: 70	Course Code: OE630EE
Credits: 2	CIE Marks: 30	Duration of SEE: 3 Hours

Course Objectives	Course Outcomes
<p>Students will be able to learn Energy sources, electrical machines and power electronics for hybrid vehicles</p>	<p>At the end of the course students will be able to</p> <ol style="list-style-type: none"> 1. Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles 2. Identify alternative hybrid vehicles and explain their operation 3. Judge suitable hybrid vehicle as per the need based on the type of motor and configuration used 4. Identify power electronic converters involved and charging methods

Unit I: Introduction to hybrid vehicles

History of electric vehicle, history of hybrid electric vehicle, history of fuel cell vehicle, advantages and limitations, air pollution and global warming, Electric vehicle drive train: EV transmission configurations, transmission components, ideal gear box, types of hybrid electric vehicles

Unit II: Energy sources for hybrid vehicles

Battery: principle and types, Li-ion battery, ultra capacitor, fuel cell: operating principles and types, solar and wind

Unit III: Electric machines for hybrid vehicles

Permanent magnet synchronous motor, switched reluctance motor, induction motor, permanent magnet brushless DC motor, regenerative braking

Unit IV: Power electronics for hybrid vehicles

Basic switches: diode, power transistor, power MOSFET, IGBT, Rectifiers, choppers, inverters, charging of hybrid electric vehicle, hybrid electric vehicles in smart grid: vehicle to grid (V2G), grid to vehicle (G2V),

Suggested Books:

1. Iqbal Husain, ELECTRIC and HYBRID VEHICLES, Design Fundamentals, CRC Press, 2003.
2. M. Ehsani, Y. Gao, S. Gay and A. Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles, CRC Press, 2005.
3. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2015.