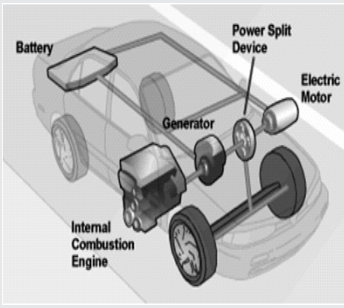
19AE403 ELECTRIC AND HYBRID VEHICLES



Source :
https:// www.fueleconomy.gov

Hours Per Week :

L	T	P	C
3	0	0	3

Total Hours :

L	T	P
45	-	-

CS	WA/RA	SSH	SA	S	BS
5	5	30	20	5	5

COURSE DESCRIPTION AND OBJECTIVES:

This course is intended for learning the Fundamentals of Electrical Hybrid vehicles. This course will give the brief idea about Hybrid vehicles propulsion methods- Hybrid architecture- Hybrid power plant specifications- Fuel cell technology - and Non electric Hybrid propulsion systems.

Links to other courses :

Automotive Electrical and Electronics.

Automotive Transmission

COURSE OUTCOMES:

Upon completion of the course, the students will be able to achieve the following out comes:

COs	Course Outcomes	POs
1	Illustrate the concept of electric vehicles and its propulsion systems.	10
2	State the concept of hybrid architecture and power plant.	2,6
3	List the energy storage systems.	3,9,10
4	Explain about the fuel cells.	4,12
5	Illustrate the non electric hybrid propulsion systems.	5,10

UNIT - I **L-9**

INTRODUCTION TO ROAD VEHICLES AND PROPULSION SYSTEM : Hybrid Vehicles: Performance characteristics of road vehicles; calculation of road- predicting fuel economy- grid connected hybrids.

Propulsion methods: DC motors series wound- shunt wound- compound wound and separately excited motors AC motors Induction- synchronous- brushless DC motor- switched reluctance motors.

UNIT - II **L-9**

HYBRID ARCHITECTURE AND POWER PLANT SPECIFICATIONS : Hybrid architecture: Series, Parallel and Series Parallel configuration locomotive drives- switching- load tracking architecture. Pre transmission parallel and combined configurations Mild hybrid- power assist- dual mode- power split- power split with shift- - wheel motors.

Hybrid power plant specifications: Grade and cruise targets- launching and boosting- braking and energy recuperation- drive cycle implications- engine friction reduction, engine downsizing and range and performance- usage requirements.

UNIT - III **L-9**

DRIVE SYSTEM AND ENERGY STORAGE TECHNOLOGY : Sizing the drive system, Matching electric drive and ICE, sizing the propulsion motor, power electronics. Energy storage technology, Battery basics, lead acid battery, different types of batteries, battery parameters.

UNIT - IV **L-9**

FUEL CELLS : Fuel cell characteristics- fuel cell types – alkaline fuel cell- proton exchange Membrane; direct methanol fuel cell- phosphoric acid fuel cell- molten carbonate fuel cell- solid oxide fuel cell- production and storage hydrogen systems- reformers- fuel cell EV- super and ultra capacitors- flywheels.

UNIT - V **L-9**

NON-ELECTRIC HYBRID PROPULSION SYSTEMS : Nonelectric Hybrid Propulsion Systems: Short Term Storage Systems Flywheel Accumulators. Continuously Variable Transmissions, Regeneration and cogeneration of energy, Hydraulic Accumulators Hydraulic Pumps/Motors- Pneumatic Hybrid Engine Systems Operation Modes

TEXT BOOKS:

1. “Propulsion systems for Hybrid vechilces”, John M. Miller the institute of Engineering and Technology, London, United Kingdom, 2008.
2. Hybrid and Alternative Fuel Vehicles (2nd Edition) (Professional Technician) by James D. Halderman and Tony Martin (Feb 7, 2010).
3. How Your Car Works: Your Guide to the Components & Systems of Modern Cars, Including Hybrid & Electric Vehicles (Rac Handbook) by ArvidLinde (Oct 15, 2011).

REFERENCES:

1. Electric and Hybrid Vehicles by Iqbal Husain (Jul 16, 2011).
2. Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives by Chris Mi, M. AbulMasrur and David WenzhongGao (Jul 5, 2011).