

SRM University
M.Tech Automotive Hybrid Systems Engineering
 (Collaborative program with NFTDC, Hyderabad)
 (Proposed syllabus from the academic year 2015-16)

Optional / elective courses (program electives)

		L	T	P	C
AH2123	ENERGY DEVICES FOR xEV DRIVES	3	0	0	3
	Total Contact Hours-45				
	Prerequisites				
	Nil				
PURPOSE					
To study different energy devices used in hybrid electric vehicle drives.					

UNIT I : Power Sources and Energy Storages:

Electrochemical Batteries, Cell and battery voltages, Charge (or Amp hour) capacity, Energy stored, Specific energy, Energy density, Specific power, Amp hour (or charge) efficiency, Energy efficiency . Self-discharge rates, Battery geometry, Battery temperature, heating and cooling needs Battery life and number of deep cycles.

Lead Acid Batteries, Nickel-based Batteries: Introduction, Nickel cadmium, Nickel metal hydride batteries, Sodium-based Batteries, Lithium Batteries, Metal Air Batteries, Battery Charging, The Designer's Choice of Battery, Use of Batteries in Hybrid Vehicles, Battery Modelling,

UNIT II : Alternative and Novel Energy Sources and Stores:

Introduction, Solar Photovoltaic, Wind Power, Flywheels, Ultra capacitors, Super Capacitors, Supply Rails,

UNIT III: Fuel Cells:

Hydrogen Fuel Cells: Basic Principles, Fuel Cell Thermodynamics, Water Management in the PEM Fuel Cell, Thermal Management of the PEM Fuel Cell

UNIT IV: Hydrogen Supply

Introduction, Fuel Reforming, Hydrogen Storage I: Storage as Hydrogen, Hydrogen Storage II: Chemical Methods

UNIT V: Case Study:

- Lifetime Cost of Battery, Fuel-Cell, and Plug-in Hybrid Electric Vehicles
- Relative Fuel Economy Potential of Intelligent, Hybrid and Intelligent-Hybrid Passenger Vehicles
- Cost-Effective Vehicle and Fuel Technology Choices in a Carbon- Constrained World: Insights from Global Energy Systems Modelling
- Fuel Cell Electric Vehicles, Battery Electric Vehicles, and their Impact on Energy Storage Technologies: An Overview

References:

1. Thomas B. Johansson," *Renewable Energy: Sources for Fuels and Electricity*" Islan Press 2009.

2. Iqbal Husain, "*Electric and Hybrid Vehicles Design Fundamentals*" Published by: *CRC Press*, Boca Raton, Florida, USA, 2003.
3. D. Linden, "*Handbook of Batteries*", Second Edition, McGraw-Hill, New York, 1995.
4. M. Barak (Ed.), T. Dickinson, U. Falk, J.L. Sudworth, H.R. Thirsk, F.L. Tye, "*Electrochemical Power Sources: Primary & Secondary Batteries*", IEE Energy Series 1, A. Wheaton &Co, Exeter, 1980.
5. J. O'M. Bockris, D.M. Drazic, "*Electro-Chemical Science*", Taylor & Francis Ltd., London, 1972.
6. "*Automotive Electronics Handbook*", 2nd Edition, R. Jurgen, McGraw Hill, 1999.
7. Adel S. Sedra and Kenneth C. Smith, "*Microelectronic Circuits*", (5th Ed.) 2004.
8. Mohan, Undeland, and Robbins, "*Power Electronics*", John Wiley and Sons, Third Edition.
9. "*Automobile Electric/Electronic Systems*", Robert Bosch GmbH, 1995.
10. Muhammad H. Rashid, "*Power electronics handbook*", Third Edition, 2011.