

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

Core courses

		L	T	P	C
AH2105	xEV MOTOR DRIVES AND CONTROLLERS	3	0	3	4
	Total Contact Hours - 90				
	Prerequisites				
	Nil				
PURPOSE					
To study different motor drives and controllers used in xEV / HEVs.					

xEV components and architecture: Internal combustion engine-characteristics General architecture of xEV-Energy source, electric machines, power electronics converters, controllers, sensors, loads. Types of xEVs - series, parallel, series-parallel etc. Mild hybrid, PHEV, REEV, EV.

Energy source: Batteries, parameters(capacity, SOC, charge/discharge ratesetc.);Lead-acid batteries, Li-Ion batteries, Battery management systems, Fuel cells ,Ultra capacitors.

Electric machines: DC machines-Characteristics, AC machines-Induction machines, permanent magnet machines, switched reluctance machines,

Power electronic converters: DC-DC converters and types (Buck, Boost, Fly back etc.); isolated converters, Inverters based on MOSFET (IGBT gate driver circuits

Controllers: Microcontrollers/DSP based controllers, PI control, cascade control, scalar control, vector control, DQ modelling, Induction motor scalar/vector control, PM machine control(scalar/vector), SRM control

Sensors: Types of sensors for electric drive, Current sensors and signal conditioners

xEV Motor: Different configuration of xEV, series, parallel,series-parallel Electric Drive Architecture: Battery bank, inverter, controller, sensors, DC-DC converter, load

Battery bank Power converters: DC-DC converter, Inverters, Sensors, Micro controller/DSP. Scalar control, Vector control, Programming tools - IDE, compiler, Assembler, loader, Dynamometer, Motor

Performance characteristics - Speed sensors and signal conditioning, Position sensors and signal conditioning, Voltage sensors, temperature sensors

DC-DC Converters: Buck, Boost, Fly-Back converters etc., Isolated Dc-Dc Converters

Tools for controller algorithm development: Simulation tools (MATLAB/VISSIM/ PSIM), Tools for circuit development (P-spice, Multi Sim), Compilers, Assemblers, Loaders, Debuggers, Emulators etc.

Testing Of Electric Drives: Vehicle mechanics, test-beds, dynamometers, electric loads, performance characteristics(Torque Vs. Rpm, Efficiency Vs. Rpm, Power Vs. Rp

References:

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3. Bimal K Bose, "*Modern Power Electronics and AC Drives*", Pearson Education, second Edition, 2003.
4. Dubey. G.K., "*Thyristorised power controllers*", New age International, New Delhi, 2002.
5. Bhimbhra P.S., "*Power Electronics*", Khanna Publishers, New Delhi, 2005
6. Miller. T. J. E., "*Brushless Permanent Magnet and Reluctance Motor Drives*", Clarendon Press, Oxford, 1989.
7. Kenjo. T and Nagamori. S, "*Permanent Magnet and Brushless DC Motors*", Clarendon Press, Oxford, 1989.
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10. Davide Andrea," *Battery Management Systems for Large Lithium-ion Battery Packs*" Artech House, 2010 .
11. Somanath Majhi., "*Advanced Control Theory A relay Feedback Approach*", Cengage Learning, 2009.