INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

Course Title	**Energy Storages and Electrical Vehicle Systems**	Course No	INT5XXX			
Specialization	Inter disciplinary	Structure (LTPC)	3	1	0	4
Faculty Proposing the course	Dr. K. Selvajyothi	Status	Core		Elective ■	
To be offered for	UG / PG	Type	New ■		Modification □	
Recommendation from the DAC		Date of DAC	01-06-2021			
External Expert(s)	Prof. G Bhuvaneswari, IIT D and Prof Dr. Dastagiri Reddy B , NIT K					
Pre-requisite	Basic electrical, thermal fluid sciences	Submitted for approval	45th Senate			
Learning Objectives	The objective of the course is to teach the fundamentals of working principles of electric vehicles and battery charging systems.					
Learning Outcomes	The students will be able to gain knowledge about batteries, electric vehicle's power train, their working principles, performance, testing methods and evaluation.					
Contents of the course *(With approximate break up of hours)*	Introduction : Brief history, Electric Vehicles and the Environment, Types of electric vehicles, EMF, reversible and irreversible cells, STP Voltage, free energy, effect of cell temperature, thermodynamic calculation of the capacity of a battery, calculations of energy density of cells (L6+T2) Power Supplies for battery driven EVs : Principle, design, construction, performance characteristics expected of EV batteries. Primary batteries - Zn-MnO2 carbon-zinc, carbon-zinc chlorides, and zinc-silver oxide; Secondary batteries – lead-acid, nickel-cadmium, nickel-metal hydride, silver oxide-zinc system, lithium-ion, lithium- polymer, safety issues -thermal runaway, fire/explosion hazard, Battery management system - active and passive balancing techniques, Thermal management systems - active and passive systems. Augmenting the battery power with Solar PV on the surface of the vehicle. (L9 + T3) Power train and motors for EVs: Electric motors and their Controllers: The 'Brushed' DC Electric Motor, DC Regulation and Voltage Conversion, Brushless Electric Motors, Permanent magnet synchronous motor and its control, Motor Cooling, Efficiency, Size and Mass, Electric motors for Hybrid Vehicles (L7+T3) Charging Infrastructure - Electricity Supply Rails, Inductive Power Transfer for Moving Vehicles, Battery Swapping, OFF-board and on-board chargers, Levels and standards for chargers - (L7+T2) Electric Vehicle Modelling: 2W, 3W and 4W, Tractive Effort, Modelling Vehicle Acceleration, Modelling Range, Drive cycles, Aerodynamic Considerations, Rolling Resistance, Transmission Efficiency, Electric Vehicle Chassis and Body Design, Design of Ancillary Systems, Efficiencies and Carbon Release Comparison, ARAI standards and testing procedure (L6+T2) Hybrid energy systems - Batteries and Supercapacitor combinations - power convertors ; Fuel Cell - Hydrogen Fuel Cells, Fuel Cell Thermodynamics, Connecting Cells in Series, Hydrogen as fuel – production and storage (L5+T2)					
Text Books	1. R,S.Liu, L.Zhang, X.Sun,H.Liu, J. Zhang, Electrochemical Technologies for Energy Storage and Conversion, John Wiley, 1st Edition, 2012 2. I. Husain "Electric and Hybrid vehciles – Design fundamentals" CRC Press, 2011. 3. O.H.Ryan, S.W.Cha, W.Colelle, F.B.Prinz, Fuel Cell Fundamentals, John Wiley, 3rd Edition, 2016					
Reference Books	1. Larminie, J. and Lowry, J., 2012. *Electric vehicle technology explained*. John Wiley & Sons. 2. Chau, K.T., 2015. *Electric vehicle machines and drives: design, analysis and application*. John Wiley & Sons					