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

INTRODUCTION OF NEW COURSE

<table>
<tr><td>Course Title</td><td>Hybrid Electric and Electric Vehicles</td><td>Course No (to be assigned by Acad Cell)</td><td colspan="4"></td></tr>
<tr><td>Specialization</td><td>Mechanical Engineering</td><td>Structure (LTPC)</td><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>To be offered for</td><td>UG / PG</td><td>Status</td><td colspan="2">Core ☐</td><td colspan="2">Elective ■</td></tr>
<tr><td>Faculty Proposing the course</td><td>Dr.K.Selvajothy (ECE)</td><td>Type</td><td colspan="2">New ■</td><td colspan="2">Modification ☐</td></tr>
<tr><td>Pre-requisite</td><td>Basic Electrical Engineering</td><td>Submitted for approval</td><td colspan="4">46th Senate</td></tr>
<tr><td colspan="2">External Expert(s)</td><td colspan="5">Prof. G.Bhuvaneswari, IIT - D</td></tr>
<tr><td colspan="2">Recommendation from the DAC : Recommended</td><td colspan="5">Date of DAC : 01-06-2021</td></tr>
<tr><td>Learning Objectives</td><td colspan="6">● This course introduces the fundamental concepts, principles, analysis and design of hybrid and electric vehicles</td></tr>
<tr><td>Learning Outcomes</td><td colspan="6">● This course will enable the students to design the capacity of energy storage systems for both the hybrid and electric vehicle.
● To select the proper drive train configuration, electric machines, energy storage systems etc.</td></tr>
<tr><td>Contents of the course (With approximate break up of hours)</td><td colspan="6">Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles,social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. (3L)
Conventional Vehicles: Power source characterization, transmission characteristics, mathematical models to describe vehicle performance. (4L+1T)
Hybrid Electric Drive-trains: Basic concept of hybrid traction and hybrid drive-train topologies, power flow control, fuel efficiency analysis. (5L+1T)
Electric Drive-trains: Basic concept of electric traction and various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. (5L)
Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency. (8L+2T)
Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. (6L+2T)
Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems (6L+2T)
Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of energy management strategies, comparison of energy management strategies, implementation issues of energy management strategies.</td></tr>
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	(5L+2T) Case Studies: Design of a Hybrid Electric Vehicle (HEV) and Battery Electric Vehicle (BEV). (3T)
Text Books	1.I Hussein, Electric and Hybrid Vehicles: Design Fundamentals, 3rd Ed, CRC Press, 2021. 2.Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
Reference Books	1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.