| 22EEHO309 | ADVANCED ELECTRICAL DRIVES FOR ELECTRIC VEHICLE | SEMESTER | | | |
|---|---|---|---|---|---|
| PREREQUISTIES | CATEGORY | PEC | Credit | | 3 |
| Solid state drives | Hours/Week | L | T | P | TH |
| | | 3 | 0 | 0 | 3 |

**Course Objectives:**

1. To introduce the electrical machines with control module for electric vehicle propulsion.

| | | | | | |
|---|---|---|---|---|---|
| **UNIT I** | **PERMANENT MAGNET BRUSHLESS MOTOR DRIVES** | **9** | **0** | **0** | **9** |

PM Brushless Machines : Structure and Principle of PM Brushless Machines, Inverters for PM Brushless, Switching Schemes for Brushless AC Operation, PM Brushless Motor Control, Application of PM Brushless Motor Drives in Electric vehicle

| | | | | | |
|---|---|---|---|---|---|
| **UNIT II** | **SWITCHED RELUCTANCE MOTOR DRIVES** | **9** | **0** | **0** | **9** |

System Configurations, Switched Reluctance Machine: Structure and Principle of operation, Switched Reluctance Motor Converter Topologies, Soft-Switching Switched Reluctance Motor Converter Topologies, Switched Reluctance Motor Control, Torque-Ripple Minimization Control, Switched Reluctance Motor Drives for Electric Vehicle, Application Examples of Switched Reluctance Motor Drives in Electric Vehicles

| | | | | | |
|---|---|---|---|---|---|
| **UNIT III** | **MAGNETLESS MOTOR DRIVES** | **9** | **0** | **0** | **9** |

Synchronous Reluctance Motor Drives, Doubly-Salient DC Motor Drives, Flux-Switching DC Motor Drive, Axial-Flux Magnetless Motor Drives, Design Criteria of Advanced Magnetless Motor Drives for EVs, Design Examples of Advanced Magnetless Motor Drives for EVs, Potential Applications of Advanced Magnetless Motor Drives in EVs

| | | | | | |
|---|---|---|---|---|---|
| **UNIT IV** | **VERNIER PERMANENT MAGNET MOTOR DRIVES** | **9** | **0** | **0** | **9** |

System Configurations and Vernier Permanent Magnet Machines, Structure and Principle of Vernier Permanent Magnet Machines, Inverters for Vernier Permanent Magnet Motors, Vernier Permanent Magnet Motor Control, Design Examples of Vernier PM Motor Drives for EVs, Outer-Rotor Vernier PM Motor Drive, Outer-Rotor Flux-Controllable Vernier PM Motor Drive, Potential Applications of Vernier PM Motor Drives in EVs

| | | | | | |
|---|---|---|---|---|---|
| **UNIT V** | **DOUBLE-ROTOR ELECTRIC VARIABLE TRANSMISSION SYSTEMS** | **9** | **0** | **0** | **9** |

Double-Rotor Machines, Double-Rotor Electric Variable Transmission System (DR EVT) Structure and operation Advanced Double-Rotor EVT Systems, PM DR EVT System, SR DR EVT System, Axial-Flux DR EVT System Potential Applications of DR EVT Systems in HEVs

**Total (45L+0T)= 45 Periods**

**Text Books:**

1. K. T. Chau, 'Electric Vehicle Machines and Drives: Design, Analysis and Application, Wiley-IEEE Press, 2015

**Reference Books:**

1. Mary Murphy " Electric and Hybrid Vehicles: Principles, Design and Technology ", Larsen and Keller Education, 2019

**E-Reference**

1. https://archive.nptel.ac.in/courses/108/103/108103009/

| **Course Outcomes:** Upon completion of this course, the students will be able to: | | | **Bloom's Taxonomy Mapped** |
|---|---|---|---|
| CO1 | : | Explain the use for Permanent magnet Brushless motor drive for electric vehicle | L1: Remembering |
| CO2 | : | Select converter topology for Switched Reluctance Motor used for electric vehicle | L3: Applying |
| CO3 | : | Describe the operation of Magnetless Motor Drives in Electric Vehicles | L2: Understanding |
| CO4 | : | Understand the principle of Vernier Permanent Magnet Machines | L1: Remembering |
| CO5 | : | Select a suitable electric drive for electric vehicle | L4: Analyzing |

**COURSE ARTICULATION MATRIX**

| **COs/ POs** | **PO 1** | **PO 2** | **PO 3** | **PO 4** | **PO 5** | **PO 6** | **PO 7** | **PO 8** | **PO 9** | **PO 10** | **PO 11** | **PO 12** | **PS O1** | **PS O2** | **PS O3** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 3 | | 3 | | 1 | | 2 | | 2 | 2 | 1 | 2 |
| CO2 | | 3 | | | 1 | | | | | 2 | | 1 | 1 | 2 | |
| CO3 | 2 | 1 | | 2 | 1 | | 1 | | 1 | | | | 1 | 1 | 1 |
| CO4 | 1 | 1 | | 1 | | 2 | 1 | 2 | 1 | | 2 | 2 | 1 | 1 | 1 |
| CO5 | 1 | 2 | 3 | 1 | | 3 | | | | 1 | 3 | 1 | 2 | 2 | 1 |
| **Avg** | 1.75 | 1.8 | 2.5 | 1.75 | 1 | 2.67 | 1 | 1.5 | 1 | 1.67 | 2.5 | 1.5 | 1.4 | 1.4 | 1.25 |

3/2/1-indicates strength of correlation (3- High, 2-Medium, 1- Low)