

V1EVBC03 POWERTRAIN ARCHITECHURE FOR ELECTRICAL VEHICLES

MODULE-I: Introduction to Powertrain (6 Hours)

Brief History of Electric Powertrain- energy sources for propulsion and emissions- regulatory considerations and emission trends-An overview of conventional, Battery, Hybrid, and Fuel Cell Electric Systems

MODULE-II: DC-DC Power Electronic Converters (10 Hours)

Non isolated DC-DC Converters – Introduction-Power Conversion-Common and Basic Principles- Analysis of Buck converter with CCM- Analysis of Boost converter with CCM-Passive components for power converters

Isolated DC-DC Converters – Introduction-Forward Converter-Full-Bridge Converter-Resonant Power Conversion

MODULE-III: DC-AC Power Electronic Converters (8 Hours)

Three phase inverters-modulationschemes, sinusoidal Modulation, Sinusoidal modulation with third harmonic addition–modulation index-inverter currents-switch, diode, and input average and RMS Currents-Inverter power loss-switching losses and conduction losses of IGBT module

MODULE-IV: Induction Motor Drives: (11Hours)

Introduction - Torque and Speed Control of Induction Motor - Basics of Power Electronics Control in Induction Motors - Induction Motor VSD Operating Modes - Fundamentals of Scalar and Vector Control for Induction Motors - Scalar Control - Vector Control - Field-Oriented Control - Direct Torque Control - Induction Motor Drives for Electric Vehicles

MODULE-V: Brushless DC Drives:(7 Hours)

BLDC Fundamentals-Control Principles and Strategies-Torque Production-Advantages and Disadvantages-Torque Ripple-Design Considerations-Finite Element Analysis and Design Considerations for BLDC.

TEXT BOOKS

1. John G. Hayes, G. AbasGoodarzi, Electric Powertrain: Energy Systems, Power Electronics and Drives for Hybrid, Electric and Fuel Cell Vehicles (ISBN: 978-1-119-06367-4)
2. Ali Emadi, Handbook of Automotive Power Electronics and Motor Drives, New York, NY: Marcel Dekker, ISBN: 0-8247-2361-9, May 2005.
3. Mohan, N., Undeland, T.M., and Robbins W.P., Power Electronics — Converters, Applications, and Design, 2nd Edition, John Wiley and Sons, Inc., New York, 1995.
4. B.K. Bose, Modern Power Electronics and AC Drives, Pearson Education (Singapore), 2002.
5. G.K. Dubey. Power Semiconductor Controlled Drives, 1st Ed. Englewood Cliffs, NJ: Prentice-Hall, pp. 345–349, 1989