EM 502: Modelling, Dynamics and Control of Electric Vehicles

Course Content/ Syllabus

Theory:

Fundamentals of Vehicle Dynamics; Design of Transmission Systems for EVs; Modeling and Analysis of suspension systems; braking and steering systems for EVs; Stability and Control of EVs; Vehicle Ride; Tire forces and tire modelling of EVs; BEV/ Hybrid System Engineering, System Engineering, SIL, HIL, Component Sizing and Data Analytics, Software & Hardware Control Strategy, EV/ Architecture (HV, LV and CAN), Functional Safety –ISO 262262, Software Validation and Quality; Design and Integration, Vehicle ECU Programming, Mounting and Installation, Thermal Management; Wiring Harness and Architecture, Harness Architecture and Simulation Tools, HV Harness Design, including Connectors, Fuses, Relays and Sensors, LV Harness design, Intra Vehicle Network Design, EMI / EMC compliance; Energy management within the power train architecture; Other controllers in EVs, Axle translational controls, gearbox controllers; SW architecture and AUTOSAR; NVH in an electric vehicle; Safety systems, FDSS, Isolation monitoring, HVIL; junction boxes, contactors, relays, fuses: selection, design, component sizing; issues in operating HV contactors – pre-charge circuits, diagnostics,

Experiments:

The laboratory component shall include the simulation of the dynamics of EVs', simulation of tire forces and modelling of EVs, measurement of vehicle ride quality for different suspension systems with different inputs.