EM 501: E-mobility, Electric and Hybrid Vehicles

Course Content/ Syllabus

Theory:

Basic principles and trends of smart mobility, concept of e-mobility, last-mile and first-mile connectivity, connected vehicles, E-Mobility Business Models; Impact of smart mobility on existing sectors, e-mobility for personal vehicles, e-mobility in public transportation, e-mobility in goods transport, inter-city transport, e-mobility for 2 and 3 wheelers; EVs-Well to Wheel Analysis, power generation mix in India, emissions from power generation, net emission calculations for EVs; Drive cycle analysis, driving pattern of various vehicles, techniques collection of drive cycle data, information extraction from drive cycle analysis; Vehicle power plant requirement, torque versus speed curves of ICE engines, torque vs speed requirements and the wheels, need of gearbox in vehicles ; Electric motors for EV and HEV applications, types of motors used in EVs, performance characteristics of electric motors, construction details of motors; Control systems used in HEVs and EVs, supervisory control of vehicles, speed and torque control in EVs, rule-based and optimization-based controllers used in EVs.

Experiments:

Developing real-life drive cycles for 2-wheelers, 3-wheelers, cars and buses; Extracting features from the drive cycles for sizing motors and converters; Open-loop and closed-loop control of PM motors; Open-loop and closed-loop control of Induction motors; Open and closed-loop control of Synchronous reluctance motors; Control of motors using the drive cycles.