3 Months COURSEWORK for Comprehensive Competency & Skill Development on

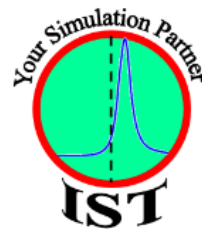# EV & HEV Drivetrain Simulation in GT-DRIVE

Case Study

Practice

Access to Live Videos

Your Simulation Partner

IST

IST Pvt Ltd

**EV, HEV & Engine Development
Staff Augmentation
Corporate Training**

Agenda Overview

This training module is designed for those individual engineers who are interested to develop comprehensive competency & skill in EV & HEV drivetrain simulation using 1D simulation GT-DRIVE software.

Participants to go through technological and simulation aspects of the domain with lots of case studies and practices

❑ **EV & HEV drivetrain technology theory**
  ✓ Why EV & HEV
  ✓ EV & HEV fundamentals and components
  ✓ EV & HEV dynamics, performance & energy economy
  ✓ Electric propulsion system
  ✓ Battery
  ✓ Regenerative braking and ABS
  ✓ HEV drivetrain performance, control and selection
 ✓ EV drivetrain performance, control and selection

❑ **HEV & EV modeling**
  ✓ Data required to build and calibrate HEV & EV
  ✓ Model each component of a HEV & EV - Engine, battery, motor, clutch, torque converter, transmissions (AT, MT), drive shafts, axles, tires, brakes, road, vehicle and environment
  ✓ Model control systems – Supervisory, driver, ECU, BMS, motor, TCU, brake (regenerative + friction)
  ✓ Subassemblies - Internal, external, and encryption
  ✓ Model setup - Initialization, parameter sweeps, convergence, run setup, case setup
  ✓ Different architectures – Conventional vehicle, EV and P0, P1,…., series, parallel HEV
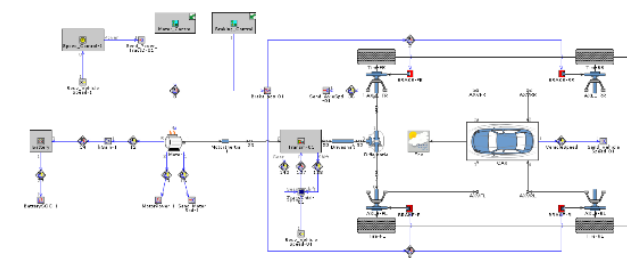

❑ **EV performance evaluation**
  ✓ Predict vehicle performance - Acceleration time, max vehicle speed, time to reach certain distance, tip-in time, gradability and regenerative braking, all electric range (AER) for different driving cycles
  ✓ Interpret change in performance parameters of battery and motor
  ✓ Impact of control strategy, vehicle, transmission, road, battery and motor parameters
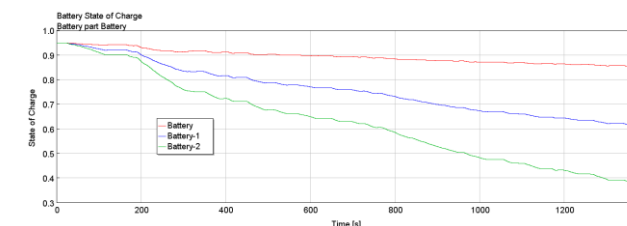
❑ **HEV performance evaluation**
  ✓ Understand control strategy, power distribution,
  ✓ Predict vehicle performance, engine start/stop, electric launch & assist, regenerative braking, energy/fuel economy
  ✓ Interpret change in performance parameters of battery and motor
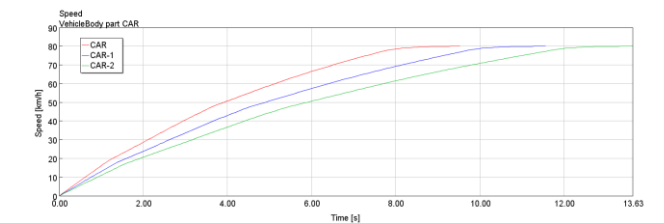 ✓ Impact of control strategy, vehicle, transmission, road, battery and motor parameters
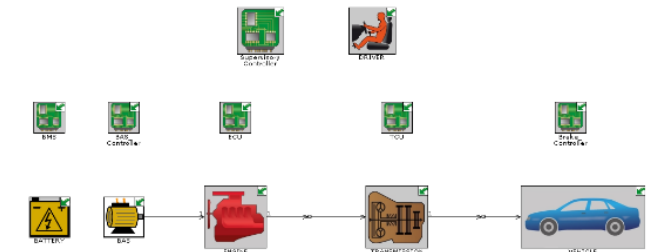
❑ **Conversion of a convectional vehicle into EV**
  ✓ Convert a conventional vehicle into equivalent EV for similar vehicle performance; and minimal battery, motor size & transmission requirements
  ✓ Investigate with various component sizing and architecture

❑ **Conversion of a convectional vehicle into HEV**
  ✓ Convert a conventional vehicle into equivalent HEV architecture for similar vehicle performance; and minimal battery, motor size and transmission requirements
  ✓ Investigate with various component sizing and architecture (mild, series, etc)
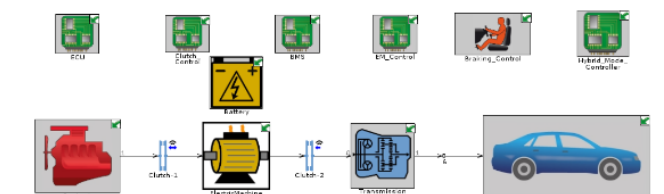
Trainer

❑ Over 19 years of industrial experience in diesel, gasoline, gas engines; HEV & EV; and aircraft engines
❑ 1D simulation domain – engine performance, cooling, HVAC, HEV & EV drivetrain, battery, lubrication, acoustics, hydraulics, cranktrain, and valvetrain
❑ Worked with GE, Cummins, ESI, MTU (Rolls-Royce), IST
❑ Conducting training for 10 years
❑ GT-SUITE user for 14 years
❑ M.Tech. from IIT Kharagpur