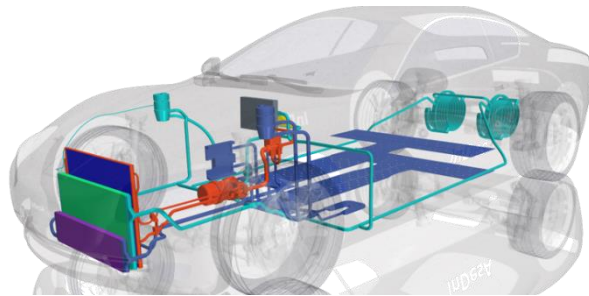


3.5 Months **COURSEWORK** for Comprehensive Competency & Skill Development on

EV & HEV Thermal Management Simulation in GT-COOL

Case Study



Practice

Access to Live Videos



IST Pvt Ltd

EV, HEV & Engine Development
Staff Augmentation
Corporate Training

For registration, please contact us:

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Agenda Overview

This training module is designed for those individual engineers who are interested to develop comprehensive competency & skill in EV & HEV thermal management simulation using 1D simulation GT-COOL, COOL-3D software.

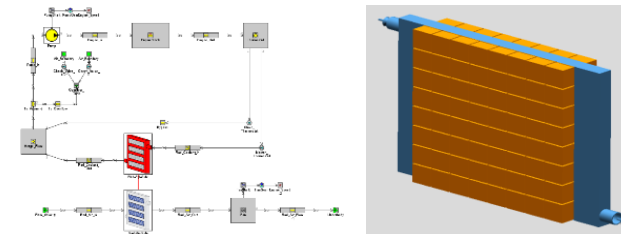
Participants to go through technological and simulation aspects of the domain with lots of case studies and practices

□ EV & HEV thermal management technology theory

- ✓ Engine cooling system
- ✓ Underhood cooling system
- ✓ HVAC cooling system
- ✓ Cooling of battery, motor, power electronics, etc
- ✓ Vehicle thermal management of conventional, HEV and EV

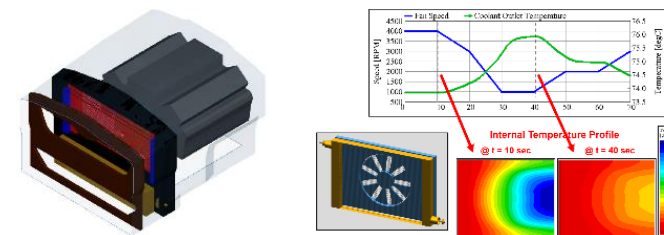
□ Engine cooling system modeling & simulation

- ✓ Modeling engine cooling system which includes coolant flow circuit, block, pump, fan, thermostat, heat exchanger (aftercooler, intercooler, radiator, and EGR cooler) components
- ✓ Solver basic of fluid flow and heat transfer
- ✓ Engine cooling system calibration
- ✓ Investigate with change in cooling system design & boundary variables



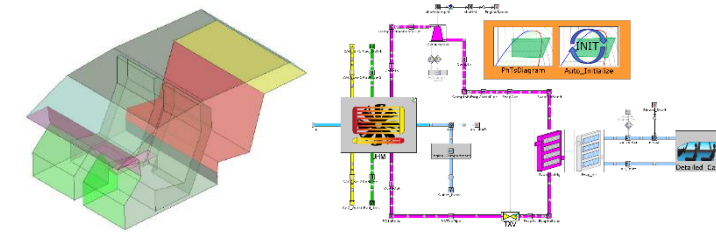
□ Underhood cooling system modeling & simulation

- ✓ Modeling vehicle underhood cooling (UHC) system which includes grills, radiator, condenser, CAC, fan, shroud, and blockage in COOL-3D
- ✓ UHC system calibration
- ✓ Investigate with change in UHC system design & boundary variables
- ✓ Optimization of UHC system components (sizing & positions of radiator, CAC, condenser, fan; number of fans; HEX scaling, etc) for desired heat load requirement



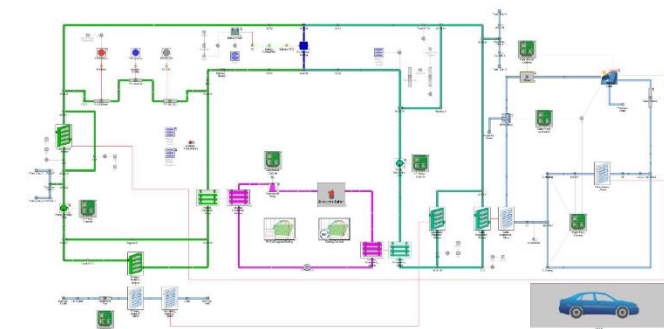
□ HVAC system modeling & simulation

- ✓ Modeling refrigerant flow network and A/C system components such as compressor, evaporator, TXV, drier/receiver, condenser, pump, cabin, HVAC door, heater, blower
- ✓ Use of GEM-3D & COOL-3D to build flow systems & HEX components in 1D & quasi-3D environment
- ✓ Detailed cabin design
- ✓ Solver basic of fluid flow and heat transfer
- ✓ HVAC system calibration
- ✓ Investigate with change in HVAC system design & boundary variables
- ✓ Cabin pull down characteristics
- ✓ Transient drive cycle for fuel economy/ energy management
- ✓ Refrigerant charge determination
- ✓ Investigation with different types of refrigerant
- ✓ Impact of oil percentage on refrigerant system performance



□ EV thermal management modeling & simulation

- ✓ Modeling cooling of battery, motor, power electronic components
- ✓ Modeling control system
- ✓ Integration of different sub-systems which include UHC, HVAC, battery, motor, power electronic components, vehicle drivetrain
- ✓ Investigate energy management, cabin pull down characteristics, battery and motor behavior with different driving cycles



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

