Training - Electric Drives for Automotive Propulsion Design, Modeling & Simulation

EMOT-EN-P

Face-to-face only

5 days

This course provides a deeper knowledge on how to design, build a model and simulate electrical drives, integrate the automotive needs and constraints

Level

Knowledge

Public

Design or test engineers or technicians, currently working at manufacturers or OEM in automotive trucks or off-road fields and wishing to design, develop, model, simulate, specify or use electrical drives in electric and hybrid projects involving technical and economic constraints

Objectives

Attendees will be able to implement the following skills:

- Explain the operation, design, dimension, model, and simulate electric drives and power electronics (control principles),
- make architectural choices based on dimensioning calculations.

Pedagogical & technical resources

- Design, modeling, and simulation of electric drives using simulation software.
- Sizing of cooling circuits for electric drives and power electronics using Matlab-Simulink.
- Case studies of system architecture choices, integrating the technical, industrial, and economic constraints of the automotive industry.

Assessment of achievements

- Trainees are assessed throughout the training through practical application phases and interactions with the trainer
- A final on-the-spot evaluation may also be carried out at the end of the course and/or at the end of each module using tests designed to verify the learners' understanding and assimilation of the knowledge linked to the training objectives

Prerequisites

No prerequisites are necessary to follow this course

Responsable

IFP Training instructors, with expertise in the field and trained in modern teaching methods adapted to the specific needs of learners from the professional world

Program

AUTOMOTIVE ELECTRICAL DRIVES — 1.75 days

Fundamental of electrotechnics: electrical measurements, electrical components: magnets, conductors, magnetic materials, magnetic circuits, production of magnetic fields, magnetic forces, electromagnetic

induction, impedances (inductors, capacitors, electrical circuits), vector calculations (voltages and sinusoidal voltages, vector diagram, power calculation, currents, active and reactive power), electrical machines losses, performances and dimensions, single and three phase, real and ideal transformers.
DC machines: fundamentals, equivalent electrical circuit, design rules, design and layout constraints, manufacturing processes, industrial and economic aspects, examples of vehicle applications.
Synchronous machines: fundamentals, equivalent electrical circuit, design rules, design and layout constraints, manufacturing processes, industrial and economic aspects, examples of application of vehicle.
Induction machines: fundamentals, equivalent electrical circuit, design rules; design and layout constraints; manufacturing processes, industrial and economic aspects; examples of application of vehicle.
Cooling: cooling technologies, design rules, electrical machines heat losses calculation.

AUTOMOTIVE ELECTRICAL DRIVES POWER ELECTRONICS — 0.75 day

Power electronics for machines control: choppers, inverters, rectifiers; technology, design and operation; characteristics, layout constraints, thermal and vibration aspects; electromagnetic compatibility; manufacturing processes, industrial and economic aspects; examples of vehicle applications.
Power components: fundamentals, design and operations; conduction and switching losses; cooling (technologies, operation and design).

AUTOMOTIVE ELECTRICAL MACHINES CONTROL — 0.5 day

Reminders on electrical machines control with electric or hybrid vehicles. Reminders on energy management with electric or hybrid vehicles. Torque and speed control issues.
PWM construction and theory. DC machines torque control.
Vector control. Park Equations. Flux and torque control of synchronous and induction machines.
Sliding mode control of induction motors.

POWER ELECTRONICS DESIGN, MODELING & SIMULATION — 1 day

Chopper design, modeling and simulation with PSpice.
Bridge and three-phase inverter design, modeling and simulation with PSpice. Power electronics losses modeling.

ELECTRIC MACHINES MODELING & SIMULATION — 1 day

Electric machines modeling and simulation with equivalent circuits.
DC machine modeling and simulation. Real machine datasheet analyzes. Model design and calibration with Matlab-Simulink. DC machine and chopper torque control modeling and simulation.
Induction machine modeling and simulation. Real machine datasheet analyzes. Model design and calibration with Matlab-Simulink.
Induction machine and three-phase inverter chopper torque control by sliding speed modeling and simulation.
Synchronous machine modeling and simulation. Real machine datasheet analyzes. Model design and calibration with Matlab-Simulink.
Synchronous machine and three phase inverter torque control by oriented vector control (implementation of equations Park) modeling and simulation.

To French entities : IFP Training is referenced to DataDock ; you may contact your OPCO about potential funding.
Please contact our disabled persons referent to check the accessibility of this training program : referent.handicap@ifptraining.com