

Automotive Vehicle Control Systems Engineering Training Course

16 – 20 May 2027
Manama

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Training Center

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Ref: 2154_257767 **Date:** 16 – 20 May 2027 **Location:** Manama **Fees:** 6500 Euro

Overview

Automotive Vehicle Control Systems Engineering Training Course is a one-week intermediate programme for automotive, vehicle systems, control, calibration and test engineers. Participants build a Vehicle Control Function Design and Validation Pack that joins vehicle control systems course principles, vehicle dynamics control, automotive feedback control, electronic stability control, vehicle control system validation and functional-safety evidence. Agile Leaders Training Center presents automotive control engineering practice.

The course treats a control function as a complete closed-loop system rather than isolated software. Participants connect driver demand, environment, vehicle states, sensors, estimators, controllers and actuators to measurable behaviour, calibration decisions, safety constraints and validation evidence.

Who Should Attend

- Automotive and vehicle-systems engineers responsible for control functions
- Control engineers developing feedback, feedforward and state-estimation logic
- Calibration engineers tuning chassis, powertrain or motion-control functions
- Test and validation engineers planning model, bench and vehicle evidence
- Technical managers coordinating system, software, hardware and safety teams

Participants should understand basic dynamics, signals and feedback-control concepts. The course does not replace vehicle-specific design authority, production software qualification, local homologation or a full ISO 26262 certification programme.

Departments and Industries

- Vehicle manufacturers and automotive engineering centres
- Tier-one and component suppliers
- Electric-vehicle, commercial-vehicle and mobility technology companies
- Automotive test laboratories and proving grounds
- Research institutes and engineering consultancies

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Learning Objectives

- Define vehicle-control objectives, boundaries, interfaces and measurable performance criteria.
- Develop simplified longitudinal, lateral and actuator models for control design.
- Select sensors and construct state-estimation and signal-conditioning logic.
- Design and tune feedback, feedforward and supervisory control structures.
- Integrate safety mechanisms, diagnostics, degradation and fault responses.
- Complete a Vehicle Control Function Design and Validation Pack with traceable evidence.

Course Agenda

Day 1: Architect the Vehicle Control Function

- Vehicle Axes, States, Inputs and Responses Reference Model
- Driver, Environment, Plant, Controller and Actuator Boundary Diagram
- Control Objective, Constraint and Performance Metric Register
- Longitudinal, Lateral, Vertical and Powertrain Function Map
- System Interface, Operating Mode and Supervisory-State Model

Day 2: Model Dynamics and Estimate States

- Longitudinal Force, Speed and Acceleration Model
- Lateral Bicycle Model, Yaw and Sideslip Concepts
- Tyre, Brake, Steering, Motor and Engine Actuator Characteristics
- Wheel Speed, Acceleration, Yaw and Steering Sensor Chain
- Filtering, Plausibility, Fusion and State-Estimation Plan

Day 3: Design and Tune Control Loops

- Feedback, Feedforward, Cascade and Supervisory Architecture
- Reference Tracking, Disturbance Rejection and Constraint Handling
- Gain Selection, Stability, Transient Response and Robustness Review
- Sampling, Delay, Quantisation, Saturation and Anti-Windup Effects
- Calibration Map, Parameter Governance and Variant Strategy

Day 4: Apply Chassis and Motion Control

- Anti-Lock Braking and Wheel-Slip Control Logic
- Traction, Torque Coordination and Longitudinal Control
- Yaw Stability, Brake Intervention and Electronic Stability Control
- Steering Assistance, Lateral Control and Path-Tracking Concepts
- Integrated Chassis Control and Function-Interaction Analysis

Day 5: Assure Safety and Validate Performance

- Hazard, Safety Goal and Functional-Safety Interface Review
- Diagnostic Coverage, Fault Detection and Degraded-Mode Strategy
- Model-in-the-Loop, Software-in-the-Loop and Hardware-in-the-Loop Plan
- Vehicle Test, Scenario, Acceptance and Regression Matrix
- Capstone Exercise: Complete a Vehicle Control Function Design and Validation Pack

Practical Exercises

- Create a closed-loop architecture for a speed or stability-control function.
- Build a simplified plant and sensor model with assumptions and limitations.
- Compare controller responses under disturbance, delay and saturation.
- Develop a fault response and degraded-mode concept.
- Plan staged verification from simulation to proving-ground evidence.

FAQs

Who should attend a vehicle control systems course?

It suits engineers and technical leaders who design, calibrate, integrate, test or govern automotive motion and powertrain control functions.

Does the course focus only on electronic stability control?

No. Stability control is one application within a broader framework that includes dynamics, sensing, estimation, longitudinal and lateral control, actuators, diagnostics and validation.

What mathematics is required?

Participants benefit from basic differential equations, signals and feedback concepts, but the course emphasizes system reasoning, models, decisions and validation rather than lengthy derivations.

How is functional safety included?

The course connects hazards, safety goals, failure detection, degraded modes and verification evidence to control-function development without claiming full certification training.

What validation methods are covered?

Participants plan model-in-the-loop, software-in-the-loop, hardware-in-the-loop, bench and vehicle testing using traceable scenarios, acceptance criteria and regression evidence.

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Conclusion

Participants leave with an integrated engineering method and a completed design-and-validation pack. They can connect dynamics, estimation, control, calibration, safety and testing into traceable vehicle behaviour.