

# Automotive Vehicle Control Systems Engineering Training Course

28 March – 1 April 2027
Johannesburg

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**Ref:** 2154_257780 **Date:** 28 March – 1 April 2027 **Location:** Johannesburg **Fees:** 6000 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.