



Automotive ADAS Curriculum



SciEngineer's training courses are designed to help organizations and individuals close skills gaps, keep up-to-date with the industry-accepted best practices and achieve the greatest value from MathWorks® and COMSOL® Products.



MATLAB Fundamentals for Automotive Applications

This three-day course provides a comprehensive introduction to the MATLAB technical computing environment. Themes of data analysis, visualization, modeling, and programming are explored throughout the course. The course offers hands-on automotive examples and exercises that apply basic techniques to realistic problems in automotive industry.

Prerequisites

Undergraduate-level mathematics and experience with basic computer operations

[Detailed course outline >>](#)

DURATION	LEVEL
3 Days	Basic
	

TOPICS

Day 1

- Working with the MATLAB User Interface
- Variables and Commands
- Analysis and Visualization with Vectors

Day 2

- Analysis and Visualization with Matrices
- Tables of Data
- Conditional Data Selection
- Organizing Data

Day 3

- Analyzing Data
- Increasing Automation with Programming Constructs
- Increasing Automation with Functions

Image Processing with MATLAB

This two-day course provides a comprehensive introduction of reference-standard algorithms and workflow for image processing, analysis, visualization and algorithm development. Examples and exercises demonstrate the use of appropriate MATLAB and Image Processing Toolbox functionality throughout the analysis process.

Prerequisites

- MATLAB Fundamentals or equivalent experience using MATLAB.
- Basic knowledge of image processing concepts is strongly recommended.

[Detailed course outline >>](#)

DURATION	LEVEL
2 Days	Medium
	

TOPICS

Day 1

- Importing and Visualizing Images
- Preprocessing Images
- Color and Texture Segmentation
- Improving Segmentation

Day 2

- Finding and Analyzing Objects
- Detecting Edges and Shapes
- Spatial Transformation and Image Registration
- Automating Image Registration with Image Features

Computer Vision with MATLAB

This one-day course provides hands-on experience with performing computer vision tasks with MATLAB and Computer Vision System Toolbox.

Topics included: importing, displaying and annotating videos, detecting objects, estimating direction and strength of motion, tracking objects, removing lens distortion and measuring planar objects.

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB. Image Processing with MATLAB and basic knowledge of image processing and computer vision concepts.

[Detailed course outline >>](#)

DURATION	LEVEL
1 Day	Medium
	

TOPICS

Day 1

- Importing, Visualizing, and Annotating Videos
- Detecting Objects
- Estimating Motion
- Tracking Objects
- Camera Calibration

Automated Driving with MATLAB

This two-day course focuses on developing and verifying automated driving perception algorithms using MATLAB and Automated Driving Toolbox. Topics discussed include labeling of ground truth data, visualizing sensor data, detecting lanes and vehicles, fusing sensor detections and tracking and generating driving scenarios and modeling sensors.

Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB. Image Processing with MATLAB, Computer Vision with MATLAB and basic knowledge of image processing and computer vision concepts. Deep Learning with MATLAB is recommended.

[Detailed course outline >>](#)

DURATION	LEVEL
2 Days	Medium
	

TOPICS

Day 1

- Labeling of Ground Truth Data
- Visualizing Sensor Data
- Detecting Lanes and Vehicles
- Processing Lidar Point Clouds

Day 2

- Fusing Sensor Detections and Tracking
- Tracking Extended Objects
- Generating Driving Scenarios and Modeling Sensors

Designing 3D Scenes with RoadRunner

This one-day course provides hands-on experience with designing 3D scenes for simulating and testing automated driving systems. You'll learn ways to create road networks and insert customized markings, signs and signals, as well as vegetation, buildings, and other 3D models. You will apply these techniques to reconstruct a real-world scene based on map data and export the scene into common formats used by automated driving simulators.

Prerequisites

- Experience with basic computer operations

[Detailed course outline >>](#)

DURATION	LEVEL
1 Day	Medium
	

TOPICS

Day 1

- Working with the User Interface
- Roads
- Lanes
- Junctions
- Terrains and Props
- Geo-Specific Scene Design
- Working with OpenDRIVE Data

MATLAB Essentials for Simulink

This one-day course provides an introduction to the MATLAB® technical computing environment including topics most useful for Simulink workflows. No prior programming experience or knowledge of MATLAB is assumed. Themes of modeling, visualization, and programming are explored throughout the course.

Prerequisites

Undergraduate-level mathematics and experience with basic computer operations

[Detailed course outline >>](#)

DURATION

1 Day



LEVEL

Basic



TOPICS

Day 1

- Exploring the MATLAB Environment
- Scripting with MATLAB Commands
- Working with Data in MATLAB
- Controlling Flow and Creating Functions

Simulink Fundamentals for Automotive Applications

This two-day course provides a comprehensive introduction to the Simulink environment for automotive engineers. It demonstrates how to create, modify Simulink models and improve simulation accuracy and speed and create reusable model components using subsystems, model references and libraries.

Prerequisites

MATLAB Fundamentals for Automotive Applications

[Detailed course outline >>](#)

DURATION	LEVEL
2 Days	Basic
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TOPICS

Day 1

- Creating and Simulating a Model
- Modeling Programming Constructs
- Modeling Discrete Systems
- Modeling Continuous Systems

Day 2

- Solver Selection
- Developing Model Hierarchy
- Modeling Conditionally Executed Algorithms
- Combining Models into Diagrams
- Creating Libraries

Simulink Model Management and Architecture

This two-day course describes techniques for applying ModelBased Design in a common design workflow. It provides guidance on managing and sharing Simulink models when working in a large-scale project environment. This course is intended for intermediate or advanced Simulink users.

Prerequisites

MATLAB Fundamentals and Simulink Fundamentals. This course is intended for intermediate or advanced Simulink users.

[Detailed course outline >>](#)

DURATION	LEVEL
2 Days	Advanced
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TOPICS

Day 1

- Model-Based Design
- Requirements Linking and Interface Control
- Model Architecture
- Project Management

Day 2

- Data Management
- Data Customization
- Modeling Standards
- Reporting

Simulation-Based Testing with Simulink

This one-day course describes techniques for testing Simulink model behavior against system requirements using Simulink Test, Simulink Requirements, and Simulink Coverage. This course focuses on verification and validation, developing test cases, analyzing test results and creating repeatable groups of tests.

Prerequisites

MATLAB Fundamentals and Simulink Fundamentals

[Detailed course outline >>](#)

DURATION	LEVEL
1 day	Advanced
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TOPICS

Day 1

- Verification and Validation in Model-Based Design
- Developing Test Cases
- Analyzing Test Results
- Building Test Suites

MATLAB to C with MATLAB Coder

This two-day course covers C code generation from MATLAB code using MATLAB Coder. The focus is on making existing MATLAB code compliant, generating C code that meets optimization requirements, and integrating generated code with external modules. Topics include: preparing MATLAB code for code generation, working with fixed-size and variable-size data, integrating with external code and optimizing generated code.

Prerequisites

MATLAB Fundamentals and knowledge of C programming language

[Detailed course outline >>](#)

DURATION	LEVEL
2 Days	Advanced
	

TOPICS

Day 1

- Code Generation with MATLAB Coder
- Preparing MATLAB Code for Code Generation
- Working with Fixed-Size Data
- Working with Variable-Size Data

Day 2

- Working with Global Data, Structures, and Cell Arrays
- Integrating with External Code
- Optimizing Generated Code

Embedded Coder for Production Code Generation

This two-day course describes techniques for generating, validating, and customizing embedded code using Embedded Coder.

Topics include: Generated code structure and execution; Code generation options and optimizations; Integrating generated code with external code; Generating code for multirate systems; Customizing generated code and data.

Prerequisites

- Simulink Fundamentals (or Simulink Fundamentals for Automotive Applications or Simulink Fundamentals for Aerospace Applications)
- Knowledge of C programming language.

[Detailed course outline >>](#)

DURATION	LEVEL
2 Days	Medium
	

TOPICS

Day 1

- Generating Embedded Code
- Optimizing Generated Code
- Integrating Generated Code with External Code
- Controlling Function Prototypes
- Customizing Data Characteristics in Simulink®

Day 2

- Customizing Data Characteristics Using Data Objects
- Customizing Generated Code Architecture
- Model Referencing and Bus Objects
- Scheduling Generated Code Execution
- Improving Code Efficiency and Compliance

Polyspace for C/C++ Code Verification

This two-day course discusses the use of Polyspace Code Prover to prove code correctness, improve software quality metrics, and ensure product integrity. This course describes techniques for creating a verification project, reviewing and understanding verification results, emulating target execution environments, handling missing functions and data, managing unproven code, applying MISRA-C rules and reporting analysis results.

Prerequisites

Strong knowledge of C or C++

[Detailed course outline >>](#)

DURATION	LEVEL
3 days	Advanced
	

TOPICS

Day 1

- Polyspace Workflow Overview
- Polyspace Bug Finder Analysis
- Analyzing Polyspace Code Prover Results
- Code Verification Checks

Day 2

- Managing Polyspace Code Prover Verifications and Results
- Adding Precision to Polyspace Code Prover Verifications
- Integration Analysis
- Application Analysis

Day 3

- (optional, available with private training only)
- Hands-On Instruction (Optional)

The Value of an Experienced Training Expert

Our training courses are developed by MathWorks' team of training engineers with exclusive product knowledge gained from working closely with product developers. They acquire significant hands-on experience by using new products months before they are released and are always current on new capabilities.

Learn Relevant Skills

Each course contains a set of learning objectives designed to help participants quickly master necessary skills. Our hands-on approach allows participants to practice, apply, and evaluate their knowledge in the classroom.

Receive Expert Instruction

Our training employs industry-accepted best practices for adult learning and technical instruction, and has developed course content that facilitates a "Presentation, Practice, Test" approach to learning. All training engineers have been selected based on their theoretical knowledge, technical education, experience, and teaching ability.

Increase Team Success Rates

According to post-training surveys, teams who receive 40 hours of training meet project objectives three times as often as those who receive 30 hours or less. This increase in training time raises the likelihood of meeting objectives by 90%.



**Expand your
knowledge**

