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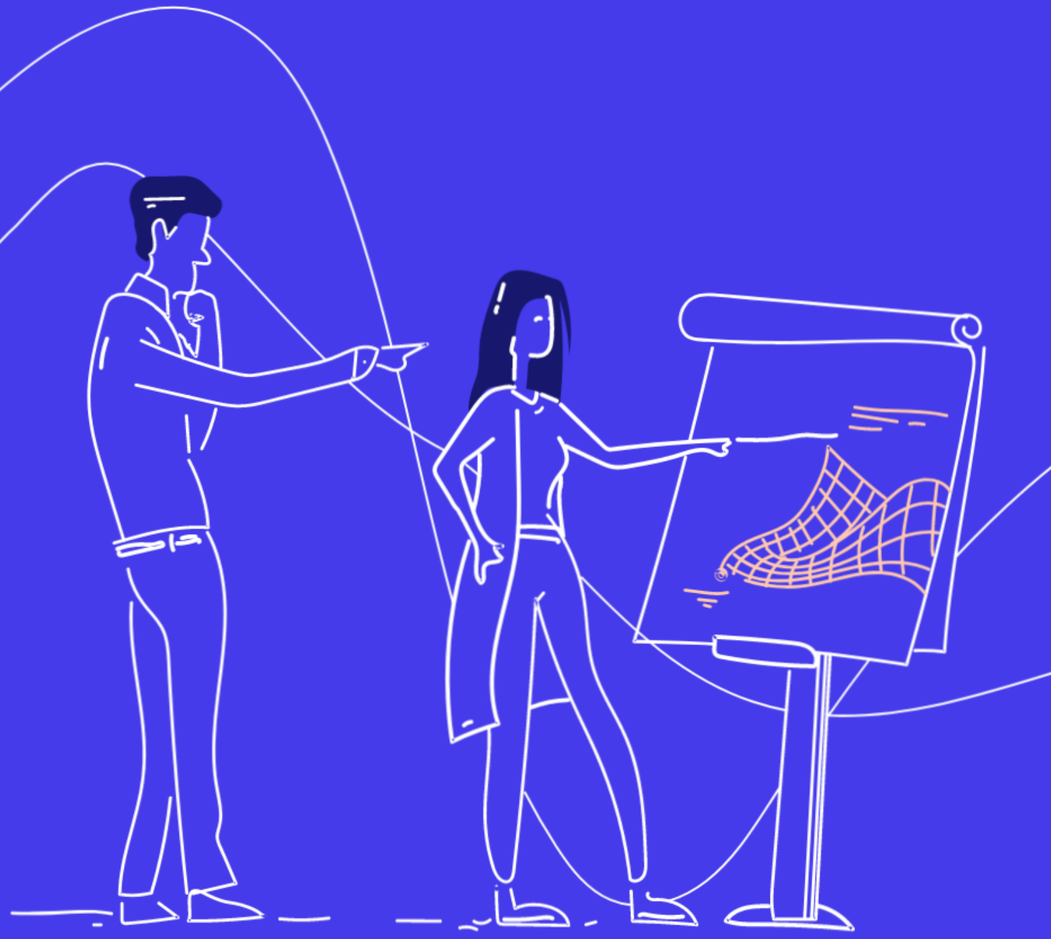
YOUR INNOVATION.
OUR PASSION.

# Wind & Solar Power Curriculum



Gamax Laboratory Solutions helps you overcome your complex engineering challenges. We help a broad spectrum of industries to accelerate the innovation process in the field of R&D. As the sole authorized regional representative for Eastern Europe since 1996, we provide over two decades of expertise with Mathworks, Comsol, and Speedgoat products, software, and training. We offer consultation in project planning and design, research, virtual prototyping, testing, and go to market simulations.

The Value of an Experienced Training Expert

## Data Acquisition

- MATLAB Fundamentals (3 Days)
- MATLAB for Data Processing and Visualization (1 Days)

## Data analysis, Modeling, & Algorithm Development

- MATLAB Fundamentals (3 Days)
- Simulink Fundamentals (2 Days)
- Control System Design with MATLAB and Simulink (2 Days)
- Signal Processing with MATLAB (2 Days)
- Stateflow for Logic-Driven System Modeling (2 Days)

## High Performance Computing

- MATLAB Fundamentals (3 Days)
- MATLAB Programming Techniques (2 Days)
- Accelerating and Parallelizing MATLAB Code (2 Days)

## Application Development & Deployment

- MATLAB Fundamentals (3 Days)
- Building Interactive Applications in MATLAB (1 Day)
- MATLAB Programming Techniques (2 Days)
- Object-Oriented Programming with MATLAB (2 Days)

Gamax Laboratory Solutions
Public Trainings

The Value of an Experienced Training Expert

Gamax Laboratory Solutions
Public Trainings

## Modeling & Simulation

- MATLAB Fundamentals (3 Days)
- Simulink Fundamentals (2 Days)
- Signal Processing with Simulink (3 Days)
- Stateflow for Logic-Driven System Modeling (2 Days)
- Modeling Physical Systems with Simscape (1 Day)

- Modeling Multibody Mechanical Systems with Simscape (1 Day)
- Modeling Electrical Power Systems with Simscape (1 Day)
- Control System Design with MATLAB and Simulink (2 Days)

## Code Generation

- MATLAB Fundamentals (3 Days)
- Simulink Fundamentals (2 Days)
- Simulink Model Management and Architecture (2 Days)
- Integrating Code with Simulink (1 Day)
- Embedded Coder for Production Code Generation (3 Days)

## Rapid Prototyping

- MATLAB Fundamentals (3 Days)
- Simulink Fundamentals (2 Days)
- Real-Time Testing with Simulink Real-Time and Speedgoat Hardware (2 Days)
- Integrating Code with Simulink (1 Day)

The Value of an Experienced Training Expert

## Test, Verification, & Tuning

- MATLAB Fundamentals (3 Days)
- Simulink Fundamentals (2 Days)
- Stateflow for Logic-Driven System Modeling (2 Days)
- Real-Time Testing with Simulink Real-Time and Speedgoat Hardware (2 Days)
- Simulink Model Management and Architecture (2 Days)

- Simulation-Based Testing with Simulink (1 Day)

## Development Process Support

- MATLAB Fundamentals (3 Days)
- Simulink Fundamentals (2 Days)
- Simulink Model Management and Architecture (2 Days)
- Simulation-Based Testing with Simulink (1 Day)

## Code Verification

- Polyspace for C/C++ Code Verification (3 Days)

Gamax Laboratory Solutions Public Trainings

# MATLAB Fundamentals

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. This course is intended for beginning users and those looking for a review.

## Prerequisites

Undergraduate-level mathematics and experience with basic computer operations.

**Detailed course outline »**

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

# MATLAB for Data Processing and Visualization

This one-day course focuses on importing and preparing data for data analytics applications. Topics discussed include importing data from multiple sources, processing data, producing informative customized graphics and working with irregular data.

## Prerequisites

MATLAB Fundamentals

**Detailed course outline »**

TOPICS

## Day 1

- Importing Data
- Processing Data
- Customizing Visualizations
- Working with Irregular Data

# Simulink Fundamentals

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

## Prerequisites

MATLAB Fundamentals

**Detailed course outline »**

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

# Control System Design with MATLAB and Simulink

This two-day course provides a general understanding of how to accelerate the design process for closed-loop control systems using MATLAB and Simulink.

Topics included: control system design overview, system modeling, identification and analysis, control design and controller implementation.

## Prerequisites

MATLAB Fundamentals and Simulink Fundamentals or equivalent experience using MATLAB and Simulink. Also, an understanding of terminology and concepts related to common control systems.

**Detailed course outline »**

TOPICS

## Day 1

- Control System Design Overview
- Model Representations
- System Identification
- Parameter Estimation
- System Analysis

## Day 2

- Linearization
- PID Control in Simulink
- Classical Control Design
- Response Optimization
- Controller Implementation

# Signal Processing with MATLAB

This two-day course shows how to analyze signals and design signal processing systems using MATLAB and Signal Processing Toolbox. Parts of the course also use DSP System Toolbox. This course focuses on creating and analyzing signals, performing spectral analysis, designing and analyzing filters, designing multirate and adaptive filters.

MATLAB Fundamentals or equivalent experience using MATLAB, and a good understanding of signal processing theory, including linear systems, spectral analysis, and filter design

**Detailed course outline »**

TOPICS

## Day 1

- Signals in MATLAB
- Spectral Analysis
- Linear Time Invariant Systems

## Day 2

- Filter Design
- The Signal Analysis App
- Multirate Filters
- Adaptive Filter Design

# Stateflow for Logic-Driven System Modeling

This two-day course shows how to model and simulate decision logic using Stateflow. The course focuses on how to employ flow charts, state machines, truth tables, state transition tables and component-based modeling in Simulink designs.

## Prerequisites

MATLAB Fundamentals and
Simulink Fundamentals

**Detailed course outline »**

TOPICS

## Day 1

- Modeling Flow Charts
- Modeling State Machines
- Hierarchical State Diagrams
- Parallel State Diagrams

## Day 2

- Using Events in State Diagrams
- Calling Functions from Stateflow
- Truth Tables and State Transition Tables
- Component-Based Modeling in Stateflow

# MATLAB Programming Techniques

This two-day course provides hands-on experience using the features in the MATLAB language to write efficient, robust, and well-organized code. These concepts form the foundation for writing full applications, developing algorithms, and extending built-in MATLAB capabilities. Details of performance optimization, as well as tools for writing, debugging, and profiling code are covered.

## Prerequisites

MATLAB Fundamentals or equivalent experience using MATLAB

**Detailed course outline »**

TOPICS

## Day 1

- Structuring Data
- Managing Data Efficiently
- Utilizing Development Tools

## Day 2

- Creating Robust Applications
- Structuring Code
- Verifying Application Behavior

# Accelerating and Parallelizing MATLAB Code

This two-day course covers a variety of techniques for making your MATLAB code run faster. You will identify and remove computational bottlenecks using techniques like pre-allocation and vectorization. In addition, you will compile MATLAB code into MEX-files using MATLAB Coder. On top of that, you will take advantage of multiple cores on your computer by parallelizing for-loops with Parallel Computing Toolbox and scale up across multiple computers using MATLAB Parallel Server.

## Prerequisites

MATLAB Fundamentals, or equivalent experience using MATLAB

**Detailed course outline »**

TOPICS

## Day 1

- Improving Performance
- Generating MEX-Files
- Parallelizing Computations

## Day 2

- Parallel for-Loops
- Offloading Execution
- Working with Clusters
- GPU Computing

# Building Interactive Applications in MATLAB

This one-day course demonstrates how to create an interactive user interface for your applications in the App Designer environment. You will learn about user interface controls, responsive components, extra dialog windows and how to use them to create a robust and user-friendly interface for your MATLAB app. No prior experience of programming graphical interfaces is required.

## Prerequisites

MATLAB Fundamentals

**Detailed course outline »**

TOPICS

## Day 1

- Using the App Designer Environment
- Creating and Updating Plots
- Creating Responsive Components
- Managing Multiple Windows and Apps

# Object-Oriented Programming with MATLAB

This two-day course focuses on using object-oriented programming techniques to develop and maintain complex MATLAB applications. The main topics are creating custom data types, desingining a MATLAB class, building class hierarchies, facilitating multiple references, writing unit tests and syncronizing objects.

## Prerequisites

MATLAB Programming Techniques or equivalent experience using MATLAB

**Detailed course outline »**

TOPICS

## Day 1

- Creating Custom Data Types
- Designing a MATLAB Class
- Building Class Hierarchies

## Day 2

- Facilitating Multiple References
- Writing Unit Tests
- Synchronizing Objects

# Modeling Physical Systems with Simscape

This one-day course discusses how to model systems in several physical domains such as electrical, mechanical, and hydraulic. This course focuses on interpreting Simscape diagrams, combining them with Simulink models, modeling energy transfer between different physical domains, and creating userdefined Simscape components.

## Prerequisites

MATLAB Fundamentals and Simulink Fundamentals

**Detailed course outline »**

TOPICS

## Day 1

- Introduction to Simscape and the Physical Network Approach
- Working with Simscape Components
- Connecting Physical Domains
- Combining Simscape Models and Simulink Models
- Creating Custom Components with the Simscape Language

# Modeling Multibody Mechanical Systems with Simscape

This one-day course focuses on how to model rigid-body mechanical systems in the Simulink environment using Simscape Multibody. Topics include: modeling simple multibody systems, creating reusable models of mechanical systems, importing models from CAD software and combining Simulink, Simscape and Simscape Multibody blocks.

## Prerequisites

MATLAB Fundamentals, Simulink Fundamentals, and Modeling Physical Systems with Simscape

**Detailed course outline »**

TOPICS

## Day 1

- Introduction to Multibody Simulation
- Refining Components
- Assembling Mechanisms
- Importing CAD Models
- Connecting to Simscape and Simulink

# Modeling Electrical Power Systems with Simscape

This one-day course discusses how to model electrical power systems in the Simulink environment using the Simscape Electrical Specialized Power Systems library. This course focuses on creating three-phase systems with passive elements and with electrical machines, analyzing and controlling electrical power systems, modeling power electronic components and speeding up simulation of electrical models.

## Prerequisites

MATLAB Fundamentals, Simulink Fundamentals, and Modeling Physical Systems with Simscape

**Detailed course outline »**

TOPICS

## Day 1

- Introduction to Three-Phase Systems
- Three-Phase Systems with Electrical Machines
- Controlling Electrical Machines
- Power Electronics

# Control System Design with MATLAB and Simulink

This two-day course provides a general understanding of how to accelerate the design process for closed-loop control systems using MATLAB and Simulink.

Topics included: control system design overview, system modeling, identification and analysis, control design and controller implementation.

## Prerequisites

MATLAB Fundamentals and Simulink Fundamentals or equivalent experience using MATLAB and Simulink. Also, an understanding of terminology and concepts related to common control systems.

**Detailed course outline »**

TOPICS

## Day 1

- Control System Design Overview
- Model Representations
- System Identification
- Parameter Estimation
- System Analysis

## Day 2

- Linearization
- PID Control in Simulink
- Classical Control Design
- Response Optimization
- Controller Implementation

# 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 »**

TOPICS

## Day 1

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

## Day 2

- Data Management
- Data Customization
- Modeling Standards
- Reporting

# Integrating Code with Simulink

This one-day course presents multiple methods for integrating C code and MATLAB code into Simulink models. Topics discussed include writing C MEX S-functions, integrating MATLAB code, and the Legacy Code Tool for wrapping external C functions into Simulink.

## Prerequisites

Simulink Fundamentals, MATLAB Fundamentals, and knowledge of C programming

**Detailed course outline »**

TOPICS

## Day 1

- Code Integration Methods
- Transitioning from MATLAB to Simulink
- Calling External Routines
- Writing Wrapper S-Functions
- Code Generation Considerations
- Code Integration Methods Review

# 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 optimalizations; 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 »**

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

# Real-Time Testing with Simulink Real-Time and Speedgoat Hardware

This two-day course focuses on real-time testing workflows using Simulink Real-Time and Speedgoat real-time target computers.

Topics include: Converting desktop-based simulation applications into real-time applications; Conducting rapid control prototyping with physical device under control; Creating interactive interfaces and formal test suites, Using standard communication protocols; Ptimizing real-time applications and hardware-in-the-loop testing.

## Prerequisites

- Simulink Fundamentals (or Simulink Fundamentals for Automotive Applications or Simulink Fundamentals for Aerospace Applications)
- Knowledge of Simscape ™ preferred

**Detailed course outline »**

TOPICS

## Day 1

- Workflow Overview
- Developing Real-Time Applications
- Building Interactive Interfaces

## Day 2

- Automating Real-Time Tests
- Using Communications Protocols
- Optimizing Plant Models for Real-Time Execution
- Hardware-in-the-Loop Testing

# 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 »**

TOPICS

## Day 1

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

# 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 »**

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%.

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# Expand your knowledge