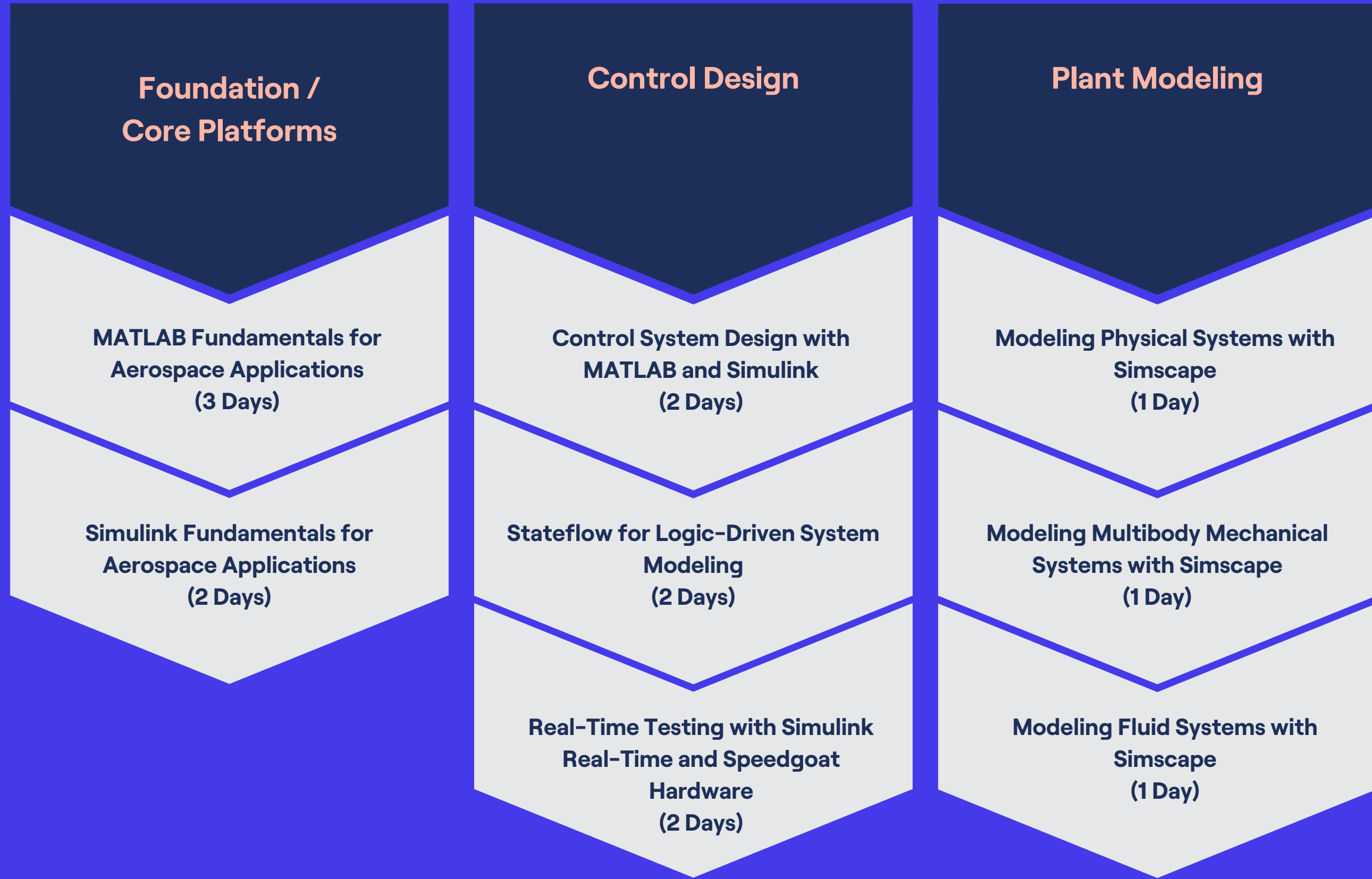




# Hypersonics Curriculum



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 Aerospace Applications

## Prerequisites

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 aerospace examples and exercises that apply basic techniques to realistic problems in a variety of aerospace and defense applications.

Undergraduate-level mathematics and experience with basic computer operations

[Detailed course outline »](#)

A dark blue rounded rectangle containing course metadata. On the left, under 'DURATION', it says '3 Days' with three orange circles below. On the right, under 'LEVEL', it says 'Basic' with a progress bar consisting of one orange segment followed by two black segments.

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

# Simulink Fundamentals for Aerospace Applications

This two-day course provides a comprehensive introduction to the Simulink environment for aerospace 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 Aerospace Applications

[Detailed course outline >>](#)

DURATION	LEVEL
2 Days	Basic
	

### 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 >>](#)

DURATION	LEVEL
2 Days	Medium
	

### 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

# 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 >>](#)

DURATION	LEVEL
2 Days	Basic
	

### 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

# 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; Optimizing 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 >>](#)

DURATION	LEVEL
2 Days	Advanced
	

### 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

# 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 >>](#)

DURATION	LEVEL
1 day	Medium
	

### 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 >>](#)

DURATION	LEVEL
1 day	Medium
	

### TOPICS

## Day 1

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

# Modeling Fluid Systems with Simscape

This one-day course focuses on modeling fluid systems in Simulink using Simscape Fluids. Topics discussed include modeling fluid power systems, actuating and controlling fluid system models, modeling thermal liquid and gas cooling systems and exchanging heat between fluid domains.

## Prerequisites

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

[Detailed course outline >>](#)

DURATION	LEVEL
1 day	Medium
	

### TOPICS

## Day 1

- Hydromechanical Systems
- Hydraulic Actuation and Control
- Thermal Liquid Systems
- Gas Systems

# 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**

