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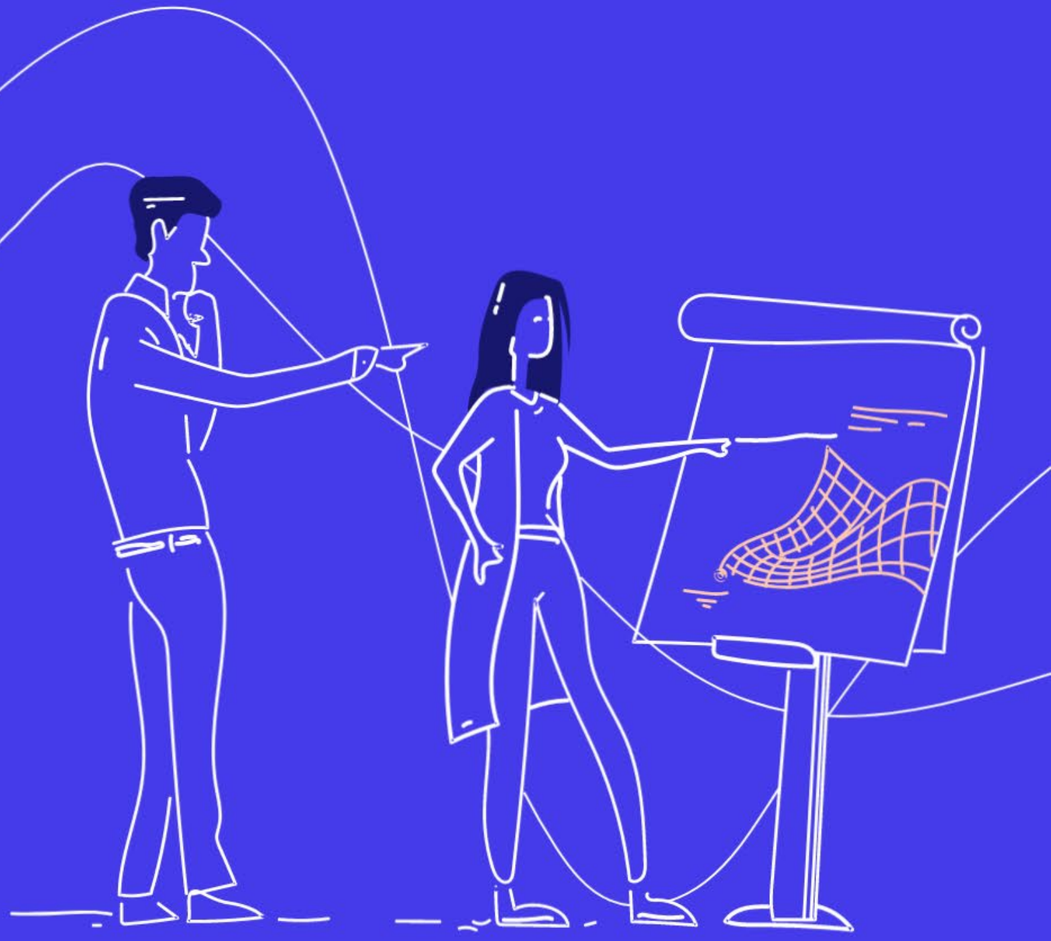
Simulink for Analog Mixed-Signal Design



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.

Simulink for Analog Mixed-Signal Design

This two-day course, targeted toward new users of Simulink, uses basic modeling techniques and tools to demonstrate how to develop Simulink block diagrams for mixed signal applications.

Prerequisites

MATLAB Fundamentals and basic knowledge of digital signal processing and mixed signal design.

TOPICS

Day 1

- Creating and Simulating a Model
- Modeling Discrete Dynamic Systems
- Modeling Logical Constructs
- Mixed-Signal Models

Day 2

- Simulink Solvers
- Subsystems and Libraries
- Testbenches and Measurements
- Control Design Analysis

Creating and Simulating a Model

OBJECTIVE: Explore the Simulink interface and block libraries. Build a simple model and analyze the simulation results.

- Creating and editing a Simulink model
- Defining system inputs and outputs
- Simulating models and analyzing results

Modeling Discrete Dynamic Systems

OBJECTIVE: Model discrete dynamic systems and visualize frame-based signals using a scope.

- Modeling a discrete system with basic blocks
- Finding sample times of block outputs
- Using frames in your model
- Using buffers
- Viewing frame-based signals
- Behavior of delay blocks with frame-based signals
- Using the discrete filter block
- Designing analog and decimation/interpolation filters

Modeling Logical Constructs

OBJECTIVE: Model logical expressions. See how zero-crossing detection is used in Simulink and model simple logic in Simulink using MATLAB code.

- Modeling logical expressions
- Modeling conditional signal routing
- Understanding zero-crossing detection
- Modeling with the MATLAB Function block

Mixed-Signal Models

OBJECTIVE: Model mixed-signal systems.

- What is a mixed-signal model?
- Modeling an ADC with aperture jitter and nonlinearity
- Case study: Modeling TI's ADS62P29 ADC
- Modeling a PLL with phase noise and other impairments
- Using blocks from the Mixed-Signal Blockset

Simulink Solvers

OBJECTIVE: Choose the right solver for a Simulink model.

- Understanding the Simulink solver
- Solving simple models
- Solving models with discrete and continuous states
- Solving models with multiple rates
- Fixed-step and variable-step solvers
- Choosing a continuous-state system solver
- Handling zero crossings
- Handling algebraic loops
- Case study: Solver profiler for PLL simulation

Subsystems and Libraries

OBJECTIVE: Create custom blocks in Simulink, apply masks, and develop custom libraries.

- Creating subsystems
- Understanding virtual and atomic subsystems
- Modeling condition-driven systems with enabled subsystems
- Modeling condition-driven systems with triggered subsystems
- Using a subsystem as a model component
- Masking subsystems
- Creating custom block libraries
- Working with and modifying library blocks
- Adding custom libraries to the Simulink Library Browser
- Creating configurable subsystems

Testbenches and Measurements

OBJECTIVE: Perform spectral analysis in Simulink, use testbenches from the Mixed-Signal Blockset to evaluate performance.

- Performing spectral analysis with the Spectrum Scope block
- Choosing spectral analysis parameters
- Using the logic analyzer
- Measuring Phase Noise, INL, DNL, Jitter
- Using testbenches from the Mixed Signal Blockset

Control Design Analysis

OBJECTIVE: Create Bode plots, perform linearization, use the Control System Designer app, control and run Simulink models from the MATLAB command line.

- Creating and analyzing bode plots
- Performing Linearization
- Using the Control System Designer
- Automating test runs
- Checking and modifying parameter settings
- Finding blocks with specific parameter values
- Constructing and modifying block diagrams

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