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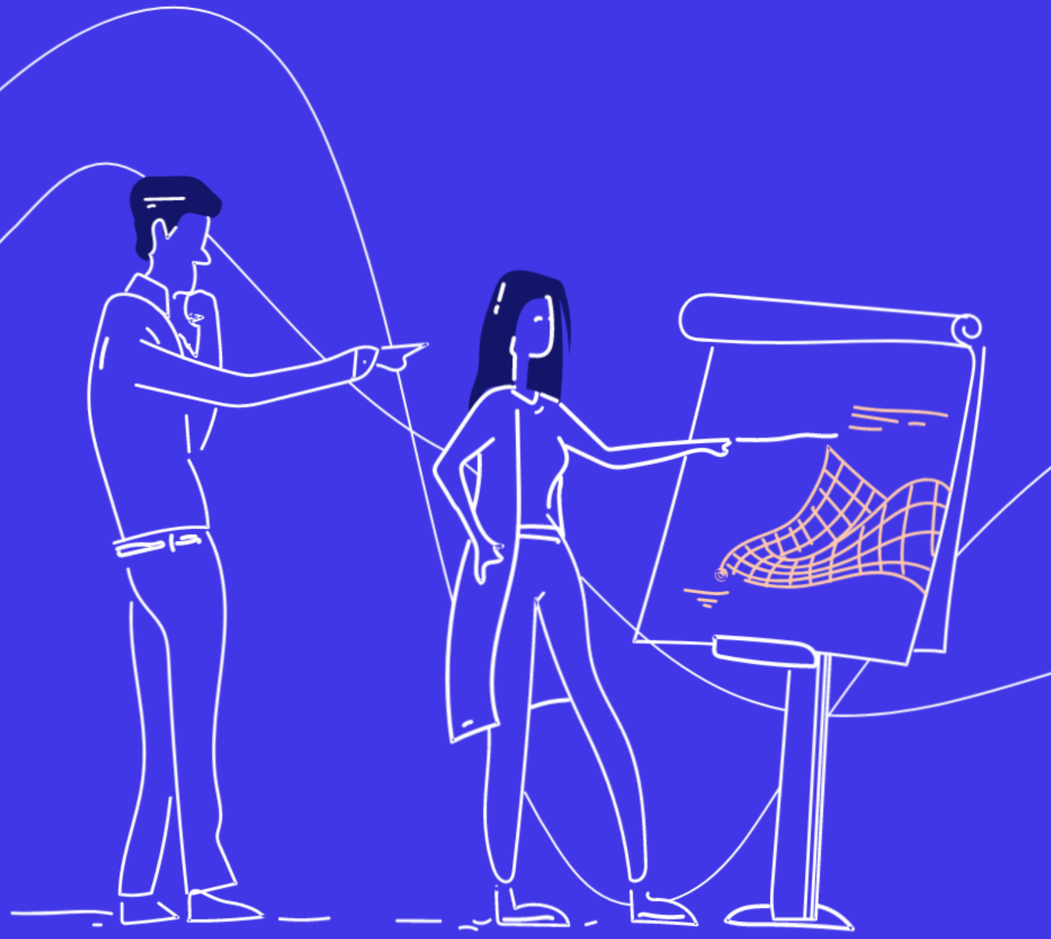
RF System Design Using MathWorks Tools



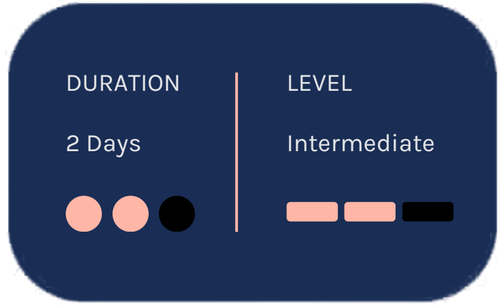
SciEngineer’s training courses are designed to help organizations and individuals close skills gaps, keep up-to-date with the industry-accepted best practices and achieve the greatest value from MathWorks® and COMSOL® Products.

RF System Design Using MathWorks Tools

This two-day course shows how to use RF Blockset™ and RF Toolbox™ for modeling wireless front ends. You will learn when to use two different modeling paradigms to speed up the simulation of RF signals: Equivalent Baseband and Circuit Envelope. The fundamentals of the simulation techniques will be discussed, and best modeling practices will be highlighted..

Prerequisites

- Signal Processing with Simulink
- A good understanding of RF theory



TOPICS

Day 1

- What is RF Blockset?
- Fundamentals of RF Simulation
- Modeling AUTOSAR Adaptive Events
- Importing S-Parameters and Modeling Linear Elements

Day 2

- Fundamentals of Noise Simulation
- Modeling Nonlinear Operation
- Building Tunable Networks and Developing Custom Models

TRAINING CONTENT - DAY 1

What is RF Blockset?

OBJECTIVE: Give an overview of RF simulation using MathWorks tools; the goal of this section is to familiarize the audience with RF Blockset and its terminology. Attendees who never used RF Blockset before will be able to recognize which applications can be modeled with RF Blockset and which approach is most suitable.

- Describe what can be done with RF Blockset
- Describe the benefits of using RF simulation techniques
- Articulate why and when RF Blockset is needed

Fundamentals of RF Simulation

OBJECTIVE: Describe the fundamentals of Equivalent Baseband and Circuit Envelope simulation techniques. We will provide an overview of the underlying simulation techniques in the RF Blockset context. Attendees will build their first RF Blockset model, configure the simulation set up and run a simulation.

- Understand the RF simulation techniques supported by RF Blockset
- Decide when to use Equivalent Baseband or Circuit Envelope
- Build an RF model starting from high-level specifications

Importing S-Parameters and Modeling Linear Elements

OBJECTIVE: Describe how to model linear elements in RF Blockset and RF Toolbox. The focus of this section is how to import S-parameters in the form of Touchstone files and how to perform a time-domain simulation using frequency-defined elements. Attendees will compare results obtained from both the Circuit Envelope and Equivalent Baseband simulation techniques for a handful of passive lumped and distributed elements, and they will gain insight into what simulation technology will work best for their application.

- Understand the available techniques to simulate S-parameters in the time domain
- Choose the best modelling approach for S-parameters
- Assess the quality of S-parameters simulation results

Fundamentals of Noise Simulation

OBJECTIVE:

- Follow best practices for modeling thermal noise
- Capture the effects of phase noise
- Understand the impact of frequency conversion on noise
- Validate the time-domain results of noise simulation

Modeling Nonlinear Operation

OBJECTIVE: Introduce the simulation of nonlinear components in RF Blockset, focusing amplifiers and mixers. Attendees will learn how to describe and validate the impact of nonlinear characteristics. Attendees will learn best practices for modeling spectral regrowth, saturation, and interferers.

- Modeling even and odd order nonlinearities
- Modeling of AM/AM and AM/PM curves
- Manipulating interferers, spurs, and multi-carrier signals
- Modeling Power Amplifiers including memory effects

Building Tunable Networks and Developing Custom Models

OBJECTIVE: Describe how to build custom models in RF Blockset Circuit Envelope using the Simscape language and combining it with Simulink modeling capabilities.

- Build adaptive RF systems including control logic
- Use Simscape language to build custom models in the domain of voltages and currents
- Understand simulation results of custom models

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Expand your knowledge