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# HFSS User Training

## Technical Data

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### Course Overview

This one-day training course helps engineers become familiar with and efficient in using the HP 85180A High-Frequency Structure Simulator (HFSS).

HFSS is a computer-aided engineering software package that analyzes the electromagnetic behavior of passive, arbitrarily shaped, three-dimensional structures.

The course contains a set of lectures and labs that give students a start-to-finish knowledge of HFSS, including how to draw solid models, solve for S-parameters, and analyze and visualize results. The course also offers tips for using HFSS efficiently and to best advantage.

### Course Features

- Set up and draw geometric models
- Define ports and surfaces for geometric models
- Solve problems for a single frequency point or for a frequency sweep
- View S-parameter data, calculate port impedances, and present results as line graphs, shaded field plots, and far-field plots

### Specifications

#### Course Length

1 day

#### Audience

Electrical engineers involved in the design of RF and microwave high-frequency circuits.

#### Prerequisites

Familiarity with basic circuit design and analysis, and at least an introductory knowledge of electromagnetic theory.

#### Delivery Method

Dedicated, or HP classroom on several dates per year and different locations around the country.

#### Format

Course content is approximately 25% lecture and 75% labs.

### Classroom Training Benefits

#### Experienced HP Instructors

Learn from an experienced HP instructor who is an expert in using HP EEs of simulation and design software to meet real-world design challenges.

#### Available at HP Classrooms or Your Site

Take advantage of HP's learning facilities, equipment, and interactive learning environment by attending class at an HP facility. Or, save travel expenses and time by organizing a dedicated class at your location.

#### Regularly Scheduled Classes

Plan training months in advance.

#### Extensive Hands-on Practice

HP classroom training is characterized by extensive hands-on experience and interactive class discussion. HP classroom training pays off immediately because it is geared to real-world solutions.

#### Comprehensive Student Materials

Copies of course materials are provided for future reference on the job.

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## HFSS User Training (85180A+24D)

### Agenda

#### Lecture: Introduction to HFSS

- What is HFSS?
- Theory of Operation
- Solution Process
- HFSS Software Modules
- What HFSS Simulates
- What HFSS Does Not Simulate

#### Lab: Creating a Model -- Microstrip Low-Pass Filter

- Microstrip Low-Pass Filter Dimensions
- Naming the Microstrip Low-Pass Filter Project
- Adding an Alias for the Microstrip Low-Pass Filter
- Setting Unit, Grid, and Mouse Settings
- Choosing a 2D Plane
- Making the 2D Window the Full Screen
- Drawing the 2D Rectangle
- Sweeping the Rectangle
- Defining a Plane to Split the Block
- Splitting the Block
- Deleting Unnecessary Objects
- Setting up to Draw the Low-Pass Filter
- Drawing the Low-Pass Filter
- Mirroring the Line Segments, Bottom to Top
- Mirroring the Line Segments, Left to Right
- Closing the Ends of the Line Segments
- Complete Geometric Model
- Review of Lab: Questions and Answers

#### Lab: Creating a Model - Coax Tee-Junction

- Setting Up the Coax Tee-Junction
- Drawing the Y-Axis Outer Coax
- Drawing the Y-Axis Inner Coax
- Sweeping the Y-Axis Circles
- Drawing the Z-Axis Outer and Inner Circles
- Sweeping the Z-Axis Circles
- Subtracting the Inner Tee from the Outer Tee
- Splitting the Coax Tee-Junction
- Review of Lab: Questions and Answers

#### Lab: Assigning Materials, Ports, and Boundaries

- Basic Example: Coax Tee-Junction
- Defining Materials: Coax Tee-Junction
- Defining Ports and Surfaces: Coax Tee-Junction
- Defining Port 1
- Defining Ports 2 and 3
- Defining the Magnetic Symmetry Plane
- Displaying the Ports and Surfaces
- Impedance and Calibration Lines
- Drawing Impedance and Calibration Line, Port 1
- Drawing Impedance and Calibration Lines, Ports 2 and 3
- Impedance Multiplier
- Lossy Material Definition
- Lossy Material Definition: Microstrip Low-Pass Filter
- Radiation Boundary: Horn Antenna

#### Lab: Solving Problems: Solve Options

- Setting Up a Frequency Sweep: Microstrip Low-Pass Filter
- Setting Up a Fast Sweep: Microstrip Low-Pass Filter
- The Solution Monitor Menu
- Viewing Convergence Data: View Model
- Viewing Convergence Data: View Statistics
- View Convergence Data: View Delta S

#### Lab: analyzing and Presenting Results

- Writing Out a Solution file: CITIFile Format
- Plotting S-Matrix Data
- S-Matrix Plots: Microstrip Low-Pass Filter Example
- S-Matrix Plots: Plot Settings and Graph Settings
- Creating a Shaded Plot: Magic Tee Example
- Creating a Shaded Plot: Defining a Plane to Shade
- Creating a Shaded Plot: Setting Up an Animated Plot
- Creating a Shaded Plot: Animation Control

- Creating a Shaded Plot: Magic Tee Example
- Creating a Far Field Plot: Setting Up the Plot
- Creating a Far Field Plot: Polar Plot Option
- Creating a Far Field Plot: Polar Plot
- Creating a Far Field Plot: Cartesian Plot

#### Lecture: Tips for Using HFSS

- Use Symmetry
- Symmetry: Microstrip Low-Pass Filter Example
- Symmetry: Beatty Standard Example
- Seed the Mesh
- Use Square Corners
- Use Large Segment Angles
- Choosing Port Length
- Drawing 2D Objects Within 2D Objects
- Defining Holes in 2D Objects
- Useful HFSS UNIX Commands
- Batch Model Solving: Solving a Single Problem
- Bath Mode Solving: Solving Multiple Problems
- Setting Process Priority: nice Command
- UNIX Environment Variables
- UNIX projpct Command

### Ordering Information

To order the HFSS User Training (85180A+24D) course in the U.S. call 1-800-HPCLASS (800-472-5277).

HP's Customer Registration Center can provide you with price and enrollment information about scheduled courses or a dedicated course (85180A+24A) which can be customized to meet your specific needs.

Outside the U.S., contact your nearest local HP sales office.

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Publication Number 5965-6717E

Printed in USA 10/96

**Course Number: 85180A+24D (scheduled)  
85180A+24A (dedicated)**