MATLAB Fundamentals

Training Objectives

This three-day course provides a comprehensive introduction to the MATLAB® technical computing environment. No prior programming experience or knowledge of MATLAB is assumed. Themes of data analysis, visualization, modeling, and programming are explored throughout the course. Topics include:

- Working with the MATLAB user interface
- Entering commands and creating variables
- Analyzing vectors and matrices
- Visualizing vector and matrix data
- Working with data files
- Working with data types
- Automating commands with scripts
- Writing programs with branching and loops
- Writing functions

Prerequisites

Undergraduate-level mathematics and experience with basic computer operations

Products

- MATLAB

Course Outline

Day 1 of 3

Working with the MATLAB User Interface (2.0 hrs)

Objective: Become familiar with the main features of the MATLAB integrated design environment and its user interfaces. Get an overview of course themes.

- Reading data from files
- Saving and loading variables
- Plotting data
- Customizing plots
- Exporting graphics for use in other applications

Variables and Commands (2.5 hrs)

Objective: Enter MATLAB commands, with an emphasis on creating variables, accessing and manipulating data in variables, and creating basic visualizations. Collect MATLAB commands into scripts for ease of reproduction and experimentation.

- Entering commands
- Creating numeric and character variables
- Making and annotating plots
- Getting help
- Creating and running live scripts

Analysis and Visualization with Vectors (2.5 hrs)

Objective: Perform mathematical and statistical calculations with vectors. Use MATLAB syntax to perform calculations on whole data sets with a single command. Organize scripts into logical sections for development, maintenance, and publishing.

- Performing calculations with vectors
- Accessing and modifying values in vectors
- Formatting and sharing live scripts

Day 2 of 3

Analysis and Visualization with Matrices (2.0 hrs)

Objective: Use matrices as mathematical objects or as collections of (vector) data. Understand the appropriate use of MATLAB syntax to distinguish between these applications.

- Creating and manipulating matrices
- Performing calculations with matrices
- Calculating statistics with matrix data
- Visualizing matrix data

Tables of Data (1.5 hrs)

Objective: Import data as a MATLAB table. Work with data stored as a table.

- Storing data as a table
- Operating on tables
- Extracting data from tables
- Modifying tables

Conditional Data Selection (2.0 hrs)

Objective: Extract and analyze subsets of data that satisfy given criteria.

- Logical operations and variables
- Finding and counting
- Logical indexing

Organizing Data (1.5 hrs)

Objective: Organize table data for analysis. Represent data using appropriate native MATLAB data types.

- Combining tables of data
- Table metadata
- Dates and durations
- Discrete categories

Day 3 of 3

Analyzing Data (3.0 hrs)

Objective: Perform typical data analysis tasks in MATLAB, including importing data from files, preprocessing data, fitting a model to data, and creating a customized visualization of the model.

- Importing from spreadsheets and delimited text files
- Dealing with missing data
- Plotting functions
- Customizing plots

Increasing Automation with Programming Constructs (2.0 hrs)

Objective: Create flexible code that can interact with the user, make decisions, and adapt to different situations.

- Programming constructs
- User interaction
- Decision branching
- Loops

Increasing Automation with Functions (2.0 hrs)

Objective: Increase automation by encapsulating modular tasks as user-defined functions. Understand how MATLAB resolves references to files and variables. Use MATLAB development tools to find and correct problems with code.

- Creating functions
- Calling functions
- Setting the MATLAB path
- Debugging
- Using breakpoints
- Creating and using structures