

# MATLAB Fundamentals

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## Prerequisites

Undergraduate-level mathematics and experience with basic computer operations

### Day 1 of 3

<b>Working with the MATLAB User Interface</b>	<p><b>Objective:</b> Become familiar with the main features of the MATLAB integrated design environment and its user interfaces. Get an overview of course themes.</p> <ul style="list-style-type: none"><li>Reading data from files</li><li>Saving and loading variables</li><li>Plotting data</li><li>Customizing plots</li><li>Exporting graphics for use in other applications</li></ul>
<b>Variables and Commands</b>	<p><b>Objective:</b> 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.</p> <ul style="list-style-type: none"><li>Entering commands</li><li>Creating numeric and character variables</li><li>Making and annotating plots</li><li>Getting help</li><li>Creating and running live scripts</li></ul>
<b>Analysis and Visualization with Vectors</b>	<p><b>Objective:</b> 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.</p> <ul style="list-style-type: none"><li>Performing calculations with vectors</li><li>Accessing and modifying values in vectors</li><li>Formatting and sharing live scripts</li></ul>

### Day 2 of 3

<b>Analysis and Visualization with Matrices</b>	<p><b>Objective:</b> Use matrices as mathematical objects or as collections of (vector) data. Understand the appropriate use of MATLAB syntax to distinguish between these applications.</p> <ul style="list-style-type: none"><li>Creating and manipulating matrices</li><li>Performing calculations with matrices</li><li>Calculating statistics with matrix data</li><li>Visualizing matrix data</li></ul>
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### Day 2 of 3

<b>Tables of Data</b>	<p><b>Objective:</b> Import data as a MATLAB table. Work with data stored as a table.</p> <ul style="list-style-type: none"><li>Storing data as a table</li><li>Operating on tables</li><li>Extracting data from tables</li><li>Modifying tables</li></ul>
<b>Conditional Data Selection</b>	<p><b>Objective:</b> Extract and analyze subsets of data that satisfy given criteria.</p> <ul style="list-style-type: none"><li>Logical operations and variables</li><li>Finding and counting</li><li>Logical indexing</li></ul>
<b>Organizing Data</b>	<p><b>Objective:</b> Organize table data for analysis. Represent data using appropriate native MATLAB data types.</p> <ul style="list-style-type: none"><li>Combining tables of data</li><li>Table metadata</li><li>Dates and durations</li><li>Discrete categories</li></ul>

### Day 3 of 3

<b>Analyzing Data</b>	<p><b>Objective:</b> 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.</p> <ul style="list-style-type: none"><li>Importing from spreadsheets and delimited text files</li><li>Dealing with missing data</li><li>Plotting functions</li><li>Customizing plots</li></ul>
<b>Increasing Automation with Programming Constructs</b>	<p><b>Objective:</b> Create flexible code that can interact with the user, make decisions, and adapt to different situations.</p> <ul style="list-style-type: none"><li>Programming constructs</li><li>User interaction</li><li>Decision branching</li><li>Loops</li></ul>

**Increasing  
Automation  
with  
Functions**

**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