



Course: Introduction to MATLAB Syllabus

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Term: Spring

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Objective

MATLAB is A High-level interpreted **programming language**. This course will be a hands-on introduction to the MATLAB computing environment; its goal is to assist the first-year PhD student in economics in learning the basics of programming MATLAB in particular and building the logic of programming in general. We will cover some MATLAB Syntax and computation basics and variables, arrays, matrix manipulation, conditional statements, loops, functions, plots, and optimization during the class, with the goal of having students become comfortable enough to use MATLAB to solve mathematical problems and simple optimization problems. There are no formal prerequisites for this course. If the students are familiar with MATLAB, they will still benefit from the course. For new starters, they need to spend more extra time on self-study and experimentation. Students who complete this course will become familiar with general concepts in computer science, gain an understanding of the general concepts of programming, and obtain a solid foundation in the use of Matlab, which will be an essential skill for their future research.

Road Map

- 10 sessions, 2 hours session
- Last hour of each session will be a practice session: we will meet to solve an Exercise list that is the most important session.
- Last session is going to be an "Final Exam".
- Try and practice by yourself! There is NO BOOK to teach you.

Outline

1 Introduction

- 1.1 **MATLAB desktop, Script**
- 1.2 **Arithmetic operations**
- 1.3 **Variables, Arrays, Matrices**

2 Basic concepts

- 2.1 **External Data: import, export data**
- 2.2 **Basic Data Analysis**
- 2.3 **Build-in Functions**
- 2.4 **Basic concepts of Functions**

3 Conditional statement

- 3.1 **Logical operations**
- 3.2 **Relational operations**
- 3.3 **If-Else Structure**

4 Loops

- 4.1 **For and IF loop**
- 4.2 **WHILE Loops**
- 4.3 **Debugging**
- 4.4 **Write efficient codes**
- 4.5 **Application of loops: simulation**

5 Functions

- 5.1 **Local functions**
- 5.2 **Anonymous function**
- 5.3 **function handles**
- 5.4 **Symbolic Math Toolbox**

6 Plotting

6.1 Basic Plots

6.2 3-D Plots

6.3 Other Graphics

7 OptimizationProblem

7.1 Nonlinear Optimization

- Derivative-based optimization: `fminunc`, `fmincon`
- Derivative-free optimization: `fminsearch`

7.2 Systems of Nonlinear Equations

7.3 Nonlinear Least Squares