

A SHORT COURSE ON MATLAB AND ITS APPLICATIONS

WITH EMPHASIS ON HARDWARE INTERFACING TECHNIQUES, IMAGE PROCESSING AND CONTROL SYSTEMS IMPLEMENTATION

Introduction

MATLAB is one of the most popular numerical computing environment and programming language used for research and development both in the academia and industry world wide. This course is designed to cover the basic tools, commands, programming syntax, and several applications in MATLAB. The course will cover both theory and hand-on practice. Course material such as presentation slides/handouts shall be provided.

Course Contents

PART I (BASICS)

- Basic introduction, overview of MATLAB product family and toolboxes.
- MATLAB desktop, variables, arrays, relational and logical operations, character strings.
- Control flow, matrix computations, plotting functions, writing M-files and M-functions.

PART II (ANALYSIS OF LTI SYSTEMS AND NUMERICAL SOLUTIONS)

- Introduction to MATLAB's control toolbox, basic analysis commands for an LTI system.
- Numerical techniques for simulating a first order LTI system in MATLAB (Euler/RK).
- Numerical techniques for simulating a higher order LTI system in MATLAB (Euler/RK).

PART III (SIMULINK)

- SIMULINK family overview, setting simulation parameters and basic work environment.
- Simulation of linear and nonlinear systems.
- Simulation of a PID controller based closed-loop control system.

PART IV (HARDWARE INTERFACING TECHNIQUES)

- Serial Port overview, pin assignments, data format in MATLAB.
- Creating serial port objects in MATLAB, setting communication configuration parameters.
- Serial communication between MATLAB and microcontroller for data post-processing.

PART V (IMAGE PROCESSING IN MATLAB)

- Digital image representation, reading, displaying and saving images.
- Color, gray-scale and binary images.
- Image indexing and block partitioning.
- A simple image encryption system.
- Using the Discrete cosine transform and its application in MATLAB.
- Using the Wavelet Transform in MATLAB.
- Implementation of Spread Spectrum watermarking in MATLAB.

Duration: 25 Hours