



UNIVERSITY  
of  
TECHNOLOGY,  
MAURITIUS

## School of Innovative Technologies and Engineering

Department of Applied Mathematical Sciences

Proficiency Course in MATLAB®

COURSE DOCUMENT

VERSION 1.0

*PCMv1.0*

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University of Technology, Mauritius

La Tour Koenig, Pointe aux Sables, Mauritius

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## **A. Course Information**

MATLAB® is a platform for algorithm development, data analysis, visualization and numerical computation. MATLAB® programming is commonly referred to as the language of technical computing by almost all engineers and researchers in academia and industry.

In Mauritius, almost all the undergraduate and postgraduate degrees in the fields of engineering and science require the use of MATLAB® for their final year project and various modules. MATLAB® may also be used as an essential teaching tool. However, there is no specific course directed to students or professionals to help in the process of programming in MATLAB®.

This course will provide the student with programming techniques in MATLAB®, whereby the student will design and code programs with an emphasis in the field of statistics.

## **B. Course Aims and Objectives**

The course aspires to introduce the essential and practicalities of programming through the MATLAB® environment to both students and professionals. It also provides a good foundation for those particularly wishing to broaden their programming skills so that they can explore the best possible opportunities on MATLAB®.

Upon successful completion of the course, students will be expected to have developed amongst others, a sound understanding in

- the basics of MATLAB®
- creating and executing straightforward programs in MATLAB®
- using the built-in statistical functions of MATLAB® for descriptive statistics, probability distributions, statistical plots, hypothesis testing and regression
- efficient use of MATLAB® for their own project work

## PART I – Regulations

### C. Entry Requirements

Two 'A' Level subjects including Mathematics

### D. Mode and Duration

#### Full Time

#### **First Week: (30 Hours)**

Five days with two sessions scheduled on each day:

Session 1: 08:30 - 11:30

Session 2: 12:30 - 15:30

#### **Second Week: (15 Hours)**

Working of mini project

#### Part Time

#### **First and Second Weeks: (30 Hours)**

Ten days with one session scheduled on each day:

Session 1: 16:30 - 19:30

#### **Third Week: (15 Hours)**

Working of mini project

### E. Teaching and Learning Strategies

Lectures, Tutorials and Practical Laboratory Sessions

### F. Attendance Requirements

A minimum of 80% of attendance is required for a candidate to be eligible for a Certificate of Attendance or a Certificate of Proficiency in MATLAB®.

### G. Credit System

The course is equivalent to 3 credits.

### H. Student Progress and Assessment

For the award of a Certificate of Proficiency, students will be required to submit a mini project at the end of the course. The passing mark for the mini project is 50%.

## I. Award

Category	Award
Pass mini project	Certificate of Proficiency in MATLAB®
Fail or no submission of mini project	Certificate of Attendance

## J. Organisation and Management

Course Director: Dr Kumar Dookhitram

Contact Details:

- Telephone Number: 207 52 50 (Ext. 306)
- Email: [kdookhitram@umail.utm.ac.mu](mailto:kdookhitram@umail.utm.ac.mu)

## Part II - Course Structure

### K. Structure (Full-Time)

<b>DAY 1: INTRODUCTION TO PROGRAMMING</b>	
Session 1	The MATLAB® Environment
Session 2	M- Files and Plotting
<b>DAY 2: CONTROL STATEMENTS</b>	
Session 1	Decision Makings and Looping
Session 2	Handling of Text
<b>DAY 3: SYMBOLIC MATH</b>	
Session 1	Equation Solving and Calculus
Session 2	Linear Algebra and Polynomials
<b>DAY 4: MATLAB® APPLICATION TO STATISTICS</b>	
Session 1	Descriptive Statistics
Session 2	Probability Distributions and Statistical Plots
<b>DAY 5: MATLAB® APPLICATION TO STATISTICS</b>	
Session 1	Hypothesis Testing
Session 2	Regression

## L. Module Outline

### DAY 1: INTRODUCTION TO PROGRAMMING

#### Session 1: MATLAB® Environment

- Computer components
- Programming languages
- Algorithm and flowchart
- MATLAB® Console
- A first basic program
- MATLAB® as a scientific calculator
- Syntax
- Variables and assignment
- Constants and expressions
- Arrays

#### Session 2: M- Files and Plotting

- MATLAB® editor
- Function arguments and return values
- Saving M-files
- Formatted console input and output
- Handling of string
- Plotting basic
- Existing functions
- 2-D and 3-D plots
- Waveforms generator
- Playing of sound, load and save

### DAY 2: CONTROL STATEMENTS

#### Session 1: Decision Makings and Looping

- Logical operators
- Decision statements – If, Else, Elseif, Switch
- Recursive statements – While, For

#### Session 2: Handling of Text

- Writing to text file
- Reading from a text file
- Randomizing and sorting a list
- Searching a list
- Exporting file from Excel

### DAY 3: SYMBOLIC MATH

#### Session 1: Equation Solving and Calculus

- Symbolic object and variable precision arithmetic
- Symbolic functions – sym, syms, solve, simplify, subs
- Solving basic algebraic and quadratic equations using symbolic
- Plotting symbolic equations
- Calculus using symbolic functions diff and int
- Symbolic functions – pretty, factor
- Solving differential equations using dsolve
- Finding limit of a function

Sum of a series using symsum

### **Session 2: Linear Algebra and Polynomials**

Symbolic representation of a matrix

Symbolic functions – simple, diag, tril, triu, det, inv, eig

Solving linear system and eigenvalue problem

Symbolic polynomial – coeffs, sym2poly, poly2sim

Division of polynomials, extraction of numerator and denominator

Symbolic functions – quorem, numden, sort

## **DAY 4: MATLAB® APPLICATION TO STATISTICS**

### **Session 1: Descriptive Statistics**

Measures of central tendency

Measures of dispersion

Function for group data

Percentiles and graphical descriptions

### **Session 2: Probability Distributions and Statistical Plots**

Probability density function

Cumulative distribution function

Random number generator

Distribution plots

Scatter plots

## **DAY 5: MATLAB® APPLICATION TO STATISTICS**

### **Session 1: Hypothesis Testing**

Median of two unpaired samples

Median of two paired samples

Mean of one normal sample

Mean of two normal samples

Mean of normal sample with known standard deviation

### **Session 2: Regression**

Linear Model

Regression analysis

Least-square line