

Title of Course: MATLAB

Class: M.Sc.II

Level: 7

Name of Co-ordinator: Mr. S.S. Nalavade

Department of Mathematics

1. Title: MATLAB
2. Year of implementation: 2020

Structure of Skill Development Course

Level	Theory Hours	Practical Hours	Total Hours	Credits	No. of students per batch
10	20	30	50	03	30

Syllabus

Learning Objectives:

1. To introduce MATLAB software for numerical computations.
2. To learn MATLAB commands and how to use them in programming.
3. To solve problems in Mathematics viz. Numerical Analysis and Linear Algebra using MATLAB.
4. To write programs with logic and flow control.
5. To analyze and visualize vectors and matrices.

Theory Syllabus (20 Hrs)

Unit I: Programming in MATLAB

- 1.1 Introduction to MATLAB
- 1.2 Basics of MATLAB

1.3 Matrices and Vectors

1.3.1 Input

1.3.2 Indexing(or subscripting)

1.3.3 Matrix manipulation

1.3.4 Creating vectors

1.4 Matrix and Array Operations

1.4.1 Arithmetic operations

1.4.2 Relational operations

1.4.3 Logical operations

1.4.4 Elementary math functions

1.4.5 Matrix functions

1.5 Character strings

1.5.1 Manipulating character strings

1.5.2 The eval function

1.6 Command-Line Functions

1.6.1 Inline functions

1.6.2 Anonymous functions

1.7 Script Files

1.8 Function Files

1.8.1 Executing a function

1.8.2 More on functions

1.8.3 M-Lint code analyzer

1.8.4 Sub functions

1.8.5 Nested Functions

1.8.6 Compiled(parsed) functions: The p-code

1.8.7 The profiler

1.9 Language-specific Features

1.9.1 Use of comments to create online help

1.9.2 Continuation

1.9.3 Global variables

1.9.4 Loops, branches and control flow

1.9.5 Interactive input

1.9.6 Recursion

1.9.7 Input/output

Unit II: Applications of MATLAB in Mathematics

2.1 Basics 2D Plots

2.1.1 Style options

2.1.2 Labels, title, legend and other text objects

2.1.3 Axis control, zoom in and zoom out

2.1.4 Modifying plots with the plot editor

2.1.5 Overplay plots

2.1.6 Specialized 2D plots

2.2 3-D Plots

2.2.1 View

2.2.2 Rotate view

2.2.3 Mesh and surface plots

2.2.4 Vector field and volumetric plots

2.2.5 Interpolated surface plots

2.3 Linear Algebra

2.3.1 Solving a linear system

2.3.2 Gaussian elimination

2.3.3 Finding eigenvalues and eigenvectors

2.3.4 Matrix factorizations

2.3.5 Advanced topics

2.4 Numerical Integration (Quadrature)

2.4.1 Double integration

2.5 Ordinary Differential Equations

2.5.1 A first order linear ODE

2.5.2 A second order nonlinear ODE

2.5.3 *ode23* versus *ode45*

2.6 Nonlinear Algebraic Equations

2.6.1 Roots of polynomials

Practical Syllabus (30 Hrs)**List of Experiments:-----24 hr**

- 1 Basic 2D and 3D plotting
 - 2 Study of basic Matrix Operations
 - 3 Finding Solution to linear system of equations
 - 4 Determination of eigen values and eigen vectors of a square matrix
 - 5 Factorization of Matrices
 - 6 Evaluation of double integral
 - 7 Solution to First and second order Ordinary differential equations
 - 8 Determination of Roots of a polynomial
- Project/ Field Visits/ Industrial Visit-----06 hr

Learning Outcomes: After completion of the course, students should be able to

- 1 use MATLAB for interactive computations.
- 2 generate plots and export them for use in presentations.
- 3 programme scripts and functions using MATLAB.
- 4 familiar with strings, matrices and their use.
- 5 design simple algorithms to solve problems.

Recommended Books:

1. Rudra Pratap, **Getting Started with MATLAB**, Oxford University Press, Indian edition, 2010
2. **MATLAB[®]7 Mathematics**, The Math Works, Inc., 2009
3. Strang G., **Linear Algebra and it's Applications**, Saunders HBJ College Publishers, third edition, 1988
4. Golub G.H. and C.F. Van Loan, **Matrix Computations**, The John Hopkins University Press, 1997
5. Gerald C.F. and P.O. Wheatley, **Applied Numerical Analysis**, Addison Wesley Publishing Company, fifth edition, 1994

BOS Sub Committee:

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