

CETPA INFOTECH PVT. LTD.

CURRICULUM OF MATLAB

MODULE 1

INTRODUCTION TO MATLAB

- Historical Background
- Applications
- Scope of MATLAB
- Importance to Engineers
- Features
- MATLAB Windows (Editor, Work space, Command history, Command Window)
- Operations with variables
- Naming and Checking Existence
- Clearing Operations

DATA AND DATA FLOW IN MATLAB

- Matrix Operations & Operators
- Reshaping Matrices
- Importing Exporting Of Data
- Arrays
- Data types
- File Input-Output
- Communication with external devices

EDITING AND DEBUGGING M FILES

- Writing script files
- writing functions
- Error Correction
- M-Lint Automatic Code Analyzer
- Saving files

PROGRAMMING

- Flow control
- Conditional Statements
- Error Handling
- Work with multidimensional array
- Cell Array & Characters
- Developing user defined function
- Scripts and other Functions
- Basic Technical Level Computing with MATLAB

MATLAB GRAPHICS

- Simple graphics
- Graphic Types
- Plotting functions
- Creating plot & Editing plot (2D and 3D)
- Graphics Handles
- GUI (Graphical User Interface)

SIMULINK

- Introduction
- Importance
- Model Based Design
- Tools
- Mathematical Modeling
- Converting Mathematical Model into Simulink Model
- Running Simulink Models
- Importing Exporting Data
- Solver Configuration
- Masking Block/Model
- Basic Technical Level Computing with MATLAB

CONTROL SYSTEM TOOLBOX

- General instructions
- Create linear models
- Classes of Control System Toolbox
- Discussion on state space representation
- Transfer function
- System gain and dynamics
- Time & Frequency domain analysis
- Classical design, State Space Model
- Transfer function representation, System response
- LTI viewer detail and explanation about LTI viewer
- Designing of compensator
- Use of SISO design

PROJECT ON CONTROL & SIMULINK SIGNAL

PROCESSING TOOLBOX

- Basics of Signal Processing
- Representing Signals
- Analysis of different Signals
- Complex Signals
- Filter Designing
- Using the Filter Designing GUIs
- Analyzing the filter plots
- Filter Designing using Script Files
- Speech Recording
- Speech Processing
- Other Signal Processing Functions

COMMUNICATION TOOLBOX

- Signal Sources
- BER Tool
- Modulation
- Special Filter
- Channels
- Equalizers

❖ **Project Based on Signal & communication**

MODULE 2

IMAGE PROCESSING TOOLBOX

- Reading and Writing Image Data
- Displaying and Exploring Image
- Spatial Transformation
- Image Registration
- Designing and implementing 2D linear Filters for Image Data
- Morphological Operations
- Transforms
- Analyzing and Enhancing Images
- ROI based Processing
- Neighborhood and Block operations

COMPUTER VISION SYSTEMS TOOLBOX

- Input, Output, and Conversions
- Display and Graphics
- Registration and Stereo Vision
- Motion Estimation and Tracking
- Geometric Transformations
- Filters, Transforms, and Enhancements

❖ Project Based on Image & Computer Vision

FUZZY LOGIC TOOLBOX

- Basic introduction to fuzzy logic
- Fuzzy Versus Non-fuzzy Logic
- Foundations of Fuzzy Logic
- Fuzzy Inference Systems
- Building Systems with Fuzzy Logic Toolbox Software
- Building Fuzzy Inference Systems Using Custom Functions
- Working from the Command Line
- Working in Simulink Environment
- Simulating Fuzzy Inference Systems Using the Fuzzy Inference Engine

NEURAL NETWORK TOOLBOX

- Network Objects, Data, and Training Styles
- Multilayer Networks and Backpropagation Training
- Control Systems
- Radial Basis Networks
- Self-Organizing and Learning
- Vector Quantization Nets
- Adaptive Filters and Adaptive Training

STATEFLOW IN SIMULINK

- Stateflow Chart Concepts
- Stateflow Chart Notation
- Stateflow Chart Semantics
- Building Mealy and Moore Charts
- Using Actions in Stateflow Charts
- Stateflow Design Patterns
- Truth Table Functions for Decision-Making Logic
- Using Simulink Functions in Stateflow Charts
- Debugging and Testing Stateflow Charts
- Exploring and Modifying Charts
- Semantic Rules Summary
- Semantic Examples

ANALYSIS OF C MEX FILES

- C/C++ Source MEX-Files
- Examples of C/C++ Source MEX-Files
- Debugging C/C++ Language MEX-Files
- Handling Large mxArray
- Memory Management
- Large File I/O

MODULE 3: EMBEDDED MATLAB

INTRODUCTION TO EMBEDDED SYSTEM FOR MATLAB

- Basic components of Embedded System
- Hardware Classification of Embedded System
- Programming Language Classification of Embedded System
- Advantage & Disadvantage of Low level & High level Programming Languages.
- Type of Microcontroller
- Memory Classification

EMBEDDED SYSTEM DEVELOPMENT TOOLS

- Assembler
- Interpreter
- Compiler
- Simulator
- Emulator
- Debugger

AVR ARCHITECTURE & INSTRUCTIONS

- Classification of Von-Neumann and Harvard Architecture
- Difference between RISC and CISC
- Memory Classification (Primary & Secondary)
- Data Transfer Instructions
- Arithmetic Instructions
- Logical Instructions
- Conditional Instructions

I/O PORT PROGRAMMING

- Led Interfacing
- 7 Segment Display Types
- 7 Segment Interfacing

I/O PORT PROGRAMMING

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MOTORS INTERFACING & SENSORS

- Introduction to Motors
- DC Motor Interfacing
- Stepper Motor Interfacing
- Introduction to Sensing Devices
- Different Type of Sensors

INTRODUCTION TO MATLAB ARDUINO TOOL

- Introduction to Arduino Boards and Shields
- Arduino IDE Introduction
- Programming in Arduino
- Arduino Interfacing With MATLAB

PERIPHERAL INTERFACING WITH MATLAB ARDUINO

- Led Interfacing
- 7 Segment Interfacing
- DC motor Interfacing
- Stepper motor Interfacing

INTRODUCTION TO SIMULINK ARDUINO TOOL LIBRARY

- Arduino Interfacing With Simulink
- Standalone Application Development Using Simulink

- ❖ Projects on Interfacing between Arduino, MATLAB and Simulink

MODULE 4: VLSI MATLAB

INTRODUCTION TO VLSI

- Need, Scope, Use and History of VLSI.
- Introduction to Chip Design Process.
- Description of Hardware Description Languages.
- Applications of VLSI
- Top Down Design Methodology
- Bottom Up Design Methodology

VLSI DESIGN FLOW AND HDL'S

- Design Process and Steps.
- Design Simulation and Design Synthesis.
- Introduction to VHDL
- Introduction to Verilog HDL
- Difference between Verilog HDL & other Programming HDL's

TOOLS USED FOR HDL'S

- Different Tools Available in Industry
- Working on Xilinx Project Navigator
- Working on Simulator

INTRODUCTION TO VARIOUS HDL MODELING STYLE

- Gate Level Modeling Style
- Data Flow Modeling Style
- Behavioral Modeling Style
- Switch Level Modeling Style

KEYWORDS & DATA TYPES IN VERILOG HDL

- Module
- Initials
- Always
- Data Types

HARDWARE IMPLEMENTATION USING HDL'S

- FPGA
- CPLD
- RTL

HDL'S - MATLAB INTERFACING

- MATLAB HDL Coder
- Code Generation using HDL coder in MATLAB
- Learning MATLAB TOOL related programming
- Fixed point conversions
- HDL code generations

❖ **Hardware Implementation on FPGA using MATLAB**

- Synthesize Code from MATLAB to Verilog HDL
- Learning MATLAB HDL Verifier
- Learning ModelSim using MATLAB
- Using MATLAB HDL Verifier to operate FPGA in Loop.

❖ **Project on VLSI MATLAB**

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