MATLAB: Basics to Advanced

Module 1: MATLAB Basics

✔ Program Description

MATLAB is a numerical computing environment and fourth generation programming language. Developed by The MathWorks, MATLAB allows matrix manipulation, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs in other languages. Theory aside, just imagine it as a software that brings life to science, hence aptly called “The Language of Technical Computing”! This module is a pre-requisite for the MATLAB Advanced Module, but can also be taken up as a standalone workshop.

✔ Course Details

- Basics of MATLAB
- Command Window and M-editor programming
- Matrix Manipulations and Data logging
- Commonly used functions
- Data Acquisition, Processing and its Applications
- Simulink
- Toolbox Applications

Total Number of Hours required: 4
Module 2: MATLAB Advanced

✓ **Program Description**

It is said, “An image is worth a thousand words.” Just imagine - that would mean that editing a simple image can essay changes to a thousand words! This module basically deals with image processing, enhancement and its applications. Additional modules also include image-processing based robotics or (Vision Controlled Robotics), Video Processing, data compression methods and encryption techniques like steganography and water-marking. The most attractive feature of this course is the hands-on familiarization with professional image manipulation and its application in Biometrics (Face recognition/Iris Recognition/Signature Recognition/Thumbprint recognition).

✓ **Course Details**

- Introduction to images and machine vision
- Basics of image processing
- Image acquisition using MATLAB
- Familiarization with Image processing terminologies
  - Concepts like luminance, hue, intensity, texture, resolution, pixel
  - Exploring image types and understanding Image parameters
  - Dealing with Color Spaces
  - Importing and exporting images in MATLAB
  - Finding image pixel values and converting image formats
- Image Processing Approaches & Image Enhancement Techniques
  - Spatial and Frequency domain
  - Pros and Cons of Spatial and Frequency domain Approaches
  - Adjusting image intensity
  - Image histogram equalization
  - Using arithmetic functions to enhance images
  - Thresholding
  - Edge & Shape Detection
  - Template matching
  - Distinguishing colors
- Compression coding methods
- Coding Session (hands-on practice)
- Video Processing
- Hands-on familiarization with Biometric applications of MATLAB
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- Image Encryption Methods
  - Steganography
  - Water-marking

*Total Number of Hours required: 9*
Technicalities of the workshop

Number of workshop lecturers: 1

If number of students are greater than 30, number of workshop co-ordinators: 2

If number of students are less than 30, number of workshop co-ordinators: 1

All lecturers and co-ordinators will essentially be B.E. Final Year students.

MATLAB 7 will be needed to be installed on all computers to be used for hands-on practice during the workshop. No other software in particular is needed.

A short assignment will be extended to the students at the end of the workshop. They will be requested to mail their solution to the workshop lecturer for perusal.

Time Distribution

If taken on a 3 hours per day basis, total days required = 5 (including an hour for questions/doubts)