Lecture Module - Introduction and MATLAB Review

ME3001 - Mechanical Engineering Analysis

Mechanical Engineering

Tennessee Technological University

Module 1 - Introduction and MATLAB Review

Module 1 - Introduction and MATLAB Review

- Topic 1 - Introduction to Analysis
- Topic 2 - MATLAB Overview
- Topic 3 - Hello World

Topic 1 - Introduction to Analysis

- Mechanical Engineering Analysis
- Areas of Mechanical Engineering
- Mathematics and Engineering
- Major Topics

Mechanical Engineering Analysis

- Analysis
- Design

Mechanical Engineering Analysis

Define *Analysis*:
- detailed examination of the elements or structure of something, typically as a basis for discussion or interpretation. -Merriam-Webster

Define *Design*:
- A design is a plan or specification for the construction of an object or system or for the implementation of an activity or process, or the result of that plan or specification in the form of a prototype, product or process. The verb to design expresses the process of developing a design. -Wikipedia

Areas of Mechanical Engineering

This is not just another math class!

- we will study _____ of engineering systems and the _____ and _____ solutions to non-linear equations, systems of linear equations, and ordinary and partial differential equations
- mathematical methods for solving mechanical engineering problems with modern computing tools
- _____

Areas of Mechanical Engineering

- _____
- _____
- _____
- _____
- _____

Mathematics and Engineering

We will be doing some *applied mathematics* in this class!

- _____
- _____
- _____
- _____
  and
  _____
- _____

Major Topics

This class is different than a traditional mathematics class.

- By nature engineering problems are hard to solve on paper.
- So, will be using calculators but we will also be using...
-

Modern Computing Tools

-
-
-

Topic 2 - MATLAB Overview

- What is MATLAB?
- Why use it? Why Not?
- Review Basic Use
- Hello World

What is MATLAB?

- High Level programming language
  - language written in _____
  - Interactive Development Environment written in _____
  - Windows, Mac, and Linux compatible
- *MAT*rix *LAB*oratory
- *Technical Computing Language* - Mathworks

Why use it? Why Not?

- A powerful tool for engineers, scientists, and students
  - optimized for floating point arithmetic and linear algebra
  - extensive library of mathematical functions and operations
  - specialized functions and operations
    - Aerospace
    - Robotics
    - Communications
    - Image/Signal Processing
    - Embedded Systems and Controls
  - ability to use *symbolic programming*
- Ease of Access and Community
  - *Plug and Play*, it works out of the box
  - requires no programming experience to begin
  - online community for sharing code, *MATLAB Central*

Review Basic Use

Useful Commands(type in Command Window)

```
» clear variables
» clc
» close all
»
```

Review Basic Use

Common Mathematics Functions

- `sqrt()`
- `exp()`
- `log()`
- `log2()`
- `log10()`

Review Basic Use

Other Useful Functions

- `round()`
- `floor()`
- `int8()`
- `sign()`
- `mod()`
- `rem()`
- `fzero()`

Built-in Constants

- `pi`
- `i`
- `j`
- `inf`
- `NaN`

Review Basic Use

The Built in Help

- `» help fzero()`
- use the help to get information about the built in functions
- the full documentation is also available online

Hello World

This is the classic first exercise when learning a new programming language.

```
» Hello World
```

Topic 3 - Hello World

- What is a Program?
- Writing Your First Program
- Step by Step Instructions

What is a Program?

- This word has several defintions.
- In MATLAB a program is referred to as a *script*

What is a Program?

You need to setup and manage a directory for this class!

Writing Your First Program

1. Open the **MATLAB** application.
2. In the *Editor* window. Click on the **new** Button. Go down to **script**.
3. Write a proper **header** at the top of your script. Make sure to include your *Name*, the *Date*, the *Course*, and a *Description* of this program.
4. In the *Editor* window. Click on the **save** button. Now you will need to name your file and save it in your directory structure.
5. Now you are going to start **writing** your first program.
6. **Run** your program and *watch the magic*!

Step by Step Instructions

Step 1 - Open the **MATLAB** application.

Step by Step Instructions

Step 2 - In the *Editor* window. Click on the **new** Button.

Go down to **script**

Step by Step Instructions

Step 3 - Write a proper **header** at the top of your script.

Make sure to include your *Name*, the *Date*, the *Course*, and a *Description* of this program.

Step by Step Instructions

Step 4 - In the *Editor* window. Click on the **save** button.

Now you will need to name your file and save it in your directory structure.

Step by Step Instructions

Step 5 - Now you are going to start **writing** your first program.

Make sure you are in the *Editor* window.

Step by Step Instructions

Step 6 - **Run** your program and *watch the magic*!