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

Introduction to Analysis
MATLAB Overview
Hello World

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

Topic 1 - Introduction to Analysis

- Mechanical Engineering Analysis

- Areas of Mechanical Engineering

- Mathematics and Engineering

- Major Topics

Introduction to Analysis
MATLAB Overview
Hello World

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

Mechanical Engineering Analysis

- Analysis

- Design

Introduction to Analysis
MATLAB Overview
Hello World

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

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

Introduction to Analysis
MATLAB Overview
Hello World

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

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

- _____

Introduction to Analysis
MATLAB Overview
Hello World

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

Areas of Mechanical Engineering

- _____

- _____

- _____

- _____

- _____

Introduction to Analysis
MATLAB Overview
Hello World

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

Mathematics and Engineering

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

- _____

- _____

- _____

- _____

  and

  _____

- _____

Introduction to Analysis
MATLAB Overview
Hello World

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

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

-

-

-

Introduction to Analysis
MATLAB Overview
Hello World

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

Topic 2 - MATLAB Overview

- What is MATLAB?

- Why use it? Why Not?

- Review Basic Use

- Hello World

Introduction to Analysis
MATLAB Overview
Hello World

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
- *MATrix LABoratory*
- *Technical Computing Language* - Mathworks

Introduction to Analysis
MATLAB Overview
Hello World

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

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*

Introduction to Analysis
MATLAB Overview
Hello World

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

Review Basic Use

Useful Commands(type in Command Window)

» `clear variables`

» `clc`

» `close all`

»

Introduction to Analysis
MATLAB Overview
Hello World

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

Review Basic Use

Common Mathematics Functions

- sqrt()

- exp()

- log()

- log2()

- log10()

Introduction to Analysis
MATLAB Overview
Hello World

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

Review Basic Use

Other Useful Functions

- round()
- floor()
- int8()
- sign()

- mod()

- rem()

- fzero()

Built-in Constants

- pi
- i
- j

- inf

- NaN

Introduction to Analysis
MATLAB Overview
Hello World

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

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

Introduction to Analysis
MATLAB Overview
Hello World

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

Hello World

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

```
» Hello World
```

Introduction to Analysis
MATLAB Overview
Hello World

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

Topic 3 - Hello World

- What is a Program?

- Writing Your First Program

- Step by Step Instructions

Introduction to Analysis
MATLAB Overview
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*

Introduction to Analysis
MATLAB Overview
Hello World

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

What is a Program?

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

Introduction to Analysis
MATLAB Overview
Hello World

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

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*!

Introduction to Analysis
MATLAB Overview
Hello World

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

Step by Step Instructions

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

Introduction to Analysis
MATLAB Overview
Hello World

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

Step by Step Instructions

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

Go down to **script**

Introduction to Analysis
MATLAB Overview
Hello World

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

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.

Introduction to Analysis
MATLAB Overview
Hello World

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

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.

Introduction to Analysis
MATLAB Overview
Hello World

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

Step by Step Instructions

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

Make sure you are in the *Editor* window.

Introduction to Analysis
MATLAB Overview
Hello World

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

Step by Step Instructions

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