

# **MENG366 SYSTEM DYNAMICS AND CONTROL LABORATORY**

## **LABORATORY 1: INTRODUCTION TO COMPUTER SIMULATION**

### **1. OBJECTIVE**

In this laboratory exercise, you will learn to use MATLAB and Simulink to build basic feedback control systems, and to run the simulations to observe their impulse and step responses.

### **2. COMPONENTS & EQUIPMENT**

PC with MATLAB and Simulink toolbox installed.

### **3. BACKGROUND**

MATLAB is a proprietary multi-paradigm programming language and numeric computing environment developed by MathWorks. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages.

Although MATLAB is intended primarily for numeric computing, an optional toolbox uses the MuPAD symbolic engine allowing access to symbolic computing abilities. An additional package, Simulink, is a MATLAB-based graphical programming environment for modeling, simulating and analyzing multidomain dynamical systems. Its primary interface is a graphical block diagramming tool and a customizable set of block libraries. It offers tight integration with the rest of the MATLAB environment and can either drive MATLAB or be scripted from it.

As of 2020, MATLAB and Simulink have more than 4 million users worldwide in various backgrounds of engineering and science, especially in automatic control and digital signal processing for multidomain simulation and model-based design.

## 4. LAB DELIVERIES

Include the following elements in the report document:

Section	Element	
1	<b>Theory of operation</b> <i>Include a brief description of every element and phenomenon that appear during the experiments.</i>	
2	<b>Prelab report</b> 1. None	
3	<b>Results of the experiments</b>	
	<b>Experiments</b>	<b>Experiment Results</b>
	1	MATLAB code and simulation results Experiment 1.
2	Simulink block diagram and simulation results Experiment 2.	
4	<b>Answer the questions</b>	
	<b>Questions</b>	<b>Questions</b>
	1	Why use MATLAB and Simulink for system simulations?
2	What are the major differences between MATLAB and Simulink simulations?	
5	<b>Conclusions</b> <i>Write down your conclusions, things learned, problems encountered during the lab and how they were solved, etc.</i>	
6	<b>Images</b> <i>Paste images (e.g. scratches, drafts, screenshots, photos, etc.) in Postlab report document (only .docx, .doc or .pdf format is accepted). If the sizes of images are too large, convert them to jpg/jpeg format first, and then paste them in the document.</i>	
	<b>Attachments (If needed)</b> <i>Zip your projects. Send it as attachments, or provide link to the zip file on Google Drive / Dropbox, etc.</i>	

## 5. REFERENCES & ACKNOWLEDGEMENT

1. Norman S. Nise, "Control Systems Engineering", 7<sup>th</sup> Ed.
2. <https://en.wikipedia.org/wiki/MATLAB>
3. <https://en.wikipedia.org/wiki/Simulink>