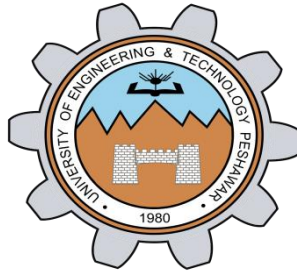


Lab Report No 1



Digital Signal Processing

Submitted By: Ali Asghar

Registration No: 21PWCSE2059

Section: C

“On my honor , as student of University of Engineering and Technology, I have neither given nor received unauthorized assistance on this academic work”

Student Signature:

Department of Computer Systems Engineering

University of Engineering and Technology Peshawar

Demonstration of Concepts	Poor (Does not meet expectation (1)) The student failed to demonstrate a clear understanding of the assignment concepts	Fair (Meet Expectation (2-3)) The student demonstrated a clear understanding of some of the assignment concepts	Good (Exceeds Expectation (4-5)) The student demonstrated a clear understanding of the assignment concepts	Score 30%
Accuracy	The student completed (<50%) tasks and provided MATLAB code and/or Simulink models with errors. Outputs shown are not correct in form of graphs (no labels) and/or tables along with incorrect analysis or remarks.	The student completed partial tasks (50% - <90%) with accurate MATLAB code and/or Simulink models. Correct outputs are shown in form of graphs (without labels) and/or tables along with correct analysis or remarks.	The student completed all required tasks (90%-100%) with accurate MATLAB code and/or Simulink models. Correct outputs are shown in form of labeled graphs and/or tables along with correct analysis or remarks.	30%
Following Directions	The student clearly failed to follow the verbal and written instructions to successfully complete the lab	The student failed to follow the some of the verbal and written instructions to successfully complete all requirements of the lab	The student followed the verbal and written instructions to successfully complete requirements of the lab	20%
Time Utilization	The student failed to complete even part of the lab in the allotted amount of time	The student failed to complete the entire lab in the allotted amount of time	The student completed the lab in its entirety in the allotted amount of time	20%

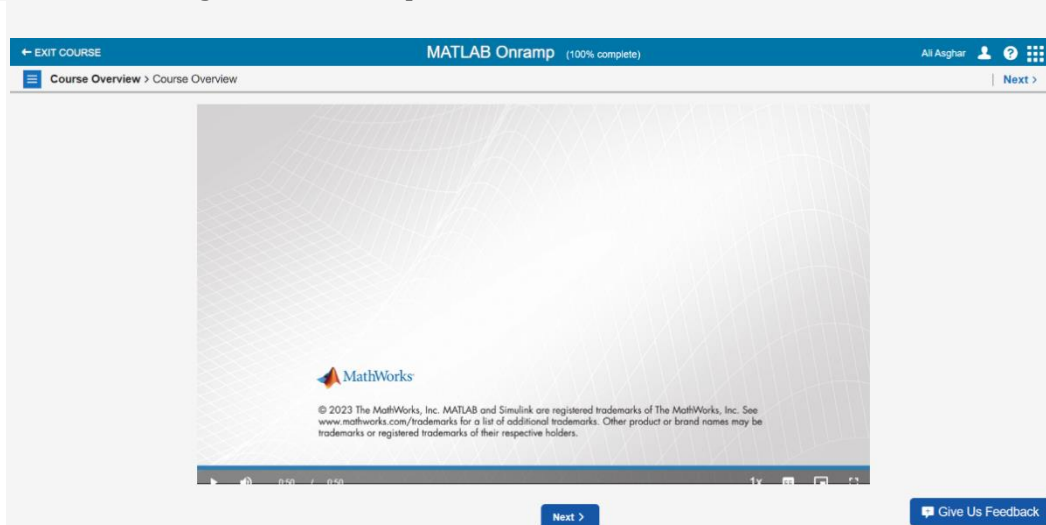
Lab 1: Matlab Training

Visit the following website: <https://www.mathworks.com/learn/tutorials/matlab-onramp.html>

and perform the following tasks and attach the Certificate acquired from MathWorks as part of the lab Report

1. Course Overview

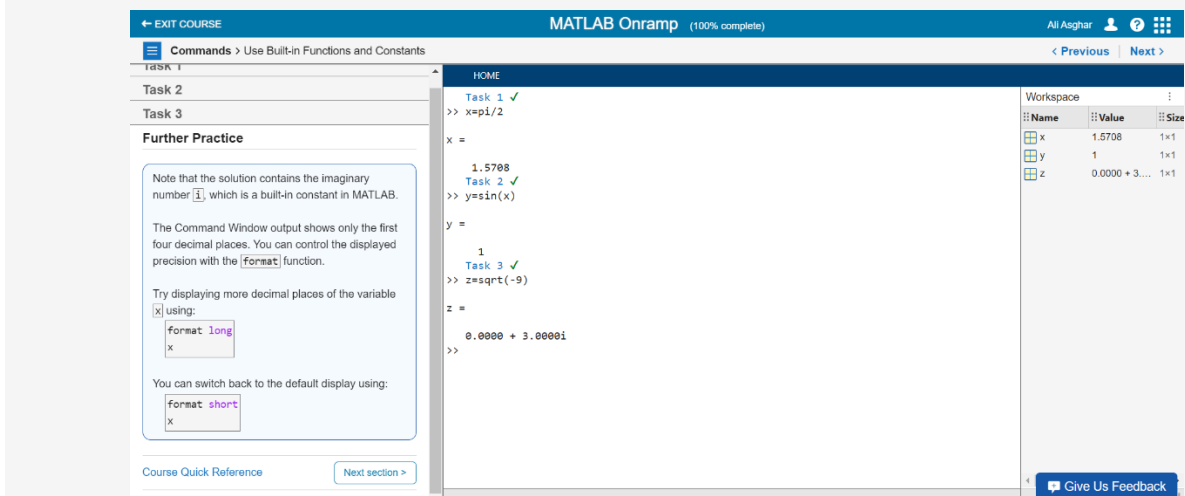
- Objective: Familiarize yourself with the course.
- Remarks along with final snapshot



Remarks: I learned about the content of this course.

2. Commands

- Objective: Enter commands in MATLAB to perform calculations and create variables.
- Remarks along with final snapshot



Remarks: I learned about basic commands of MATLAB in this introductory module.

3. Vectors and Matrices

- Objective: Create MATLAB variables that contain multiple elements.
- Remarks along with final snapshot

Task 3

Most array creation functions accept the same inputs as `rand`. For example, the `zeros` and `ones` functions create matrices of all zeros and all ones, respectively.

```
x = ones(2,3)
```

TASK

Create a matrix of all zeros that has 6 rows and 3 columns (6-by-3) by using the `zeros` function. Assign the result to a variable named `z`.

Hint | See Solution | Reset
Course Quick Reference

Submit Next task

Test Results: Correct!

- Did you create a variable named `z` with the correct size?
- Did you store the correct values in `z`?

Further Practice

Remarks: In this module, I performed some operations on Vectors and Matrices in MATLAB. I got familiar with Vectors and Matrices manipulation.

4. Importing Data

- Objective: Bring data from external files into MATLAB.
- Remarks along with final snapshot

Task 1

Sort the table from smallest to largest mass. Then update the code in the script before clicking Submit.

Hint | See Solution | Reset
Course Quick Reference

Submit Next task

Test Results: Correct!

- Did you sort the table correctly?

Further Practice

Remarks: I learned about importing data from external files in MATLAB in this module.

5. Indexing into and Modifying Arrays

- Use indexing to extract and modify rows, columns, and elements of MATLAB arrays.
- Remarks along with final snapshot

The screenshot shows the MATLAB Onramp interface for the 'Array Indexing and Modification' task. The task is titled 'Change Values in Arrays'. The workspace displays a 7x4 matrix 'data' with values ranging from 3.0000 to 10.1570. The task instructions are: 'Change the element in the first row and last column of data to 0.5'. The user has entered the code 'v2(1) = 0.5' and 'data(1,4)=0.5'. The test results show 'Correct!' and confirm that the element (1,4) in data was changed to 0.5 and that all other elements remained unchanged. The workspace also shows a variable 'v2' with the value 0.5.

Remarks: I learned the technique of array indexing to extract and modify rows, columns, and elements of MATLAB arrays.

6. Array Calculations

- Objective: Perform calculations on entire arrays at once.
- Remarks along with final snapshot

The screenshot shows the MATLAB Onramp interface for the 'Array Calculations' task. The task is titled 'Perform Array Operations on Vectors'. The workspace displays a 7x1 vector 'va' with values ranging from 2 to 12. The task instructions are: 'Create a variable named mass that contains the element-wise product of density and va'. The user has entered the code 'vm=max(va)', 'vr=round(va)', and 'mass=density.*va'. The test results show 'Correct!' and confirm that a variable named 'mass' was created and that the element-wise product of density and va was stored in mass. The workspace also shows a variable 'mass' with the values [1.2125, 7.8325, 2.2372, 9.7411, 22.3220, 36.4880, 12.3838].

Remarks: I learned some quick matrix operations in MATLAB. Some worth mentioning are scalar and element-wise multiplication.

7. Calling Functions

- Objective: Call functions to obtain multiple outputs
- Remarks along with final snapshot

The screenshot shows the MATLAB Onramp interface for a task titled "Request Multiple Outputs in Function Calls". The task description states: "You can find the maximum value of a vector and its corresponding index value using the `max` function. The first output from the `max` function is the maximum value of the input vector. When called with two outputs, the second output is the index value." The code provided is `[vMax,idx] = max(v2)`. The task instructions ask to create variables `vMax` and `ivMax` containing the maximum value and index of the `v2` vector, respectively. The test results show that the user has correctly completed the task. The workspace shows the variables `v2` (a 7x1 vector), `dsizes` (a 7x2 matrix), `dr` (a scalar), `dc` (a scalar), `vMax` (a scalar), and `ivMax` (a scalar).

Remarks: I learned how to get multiple return values from built-in functions.

8. Obtaining Help

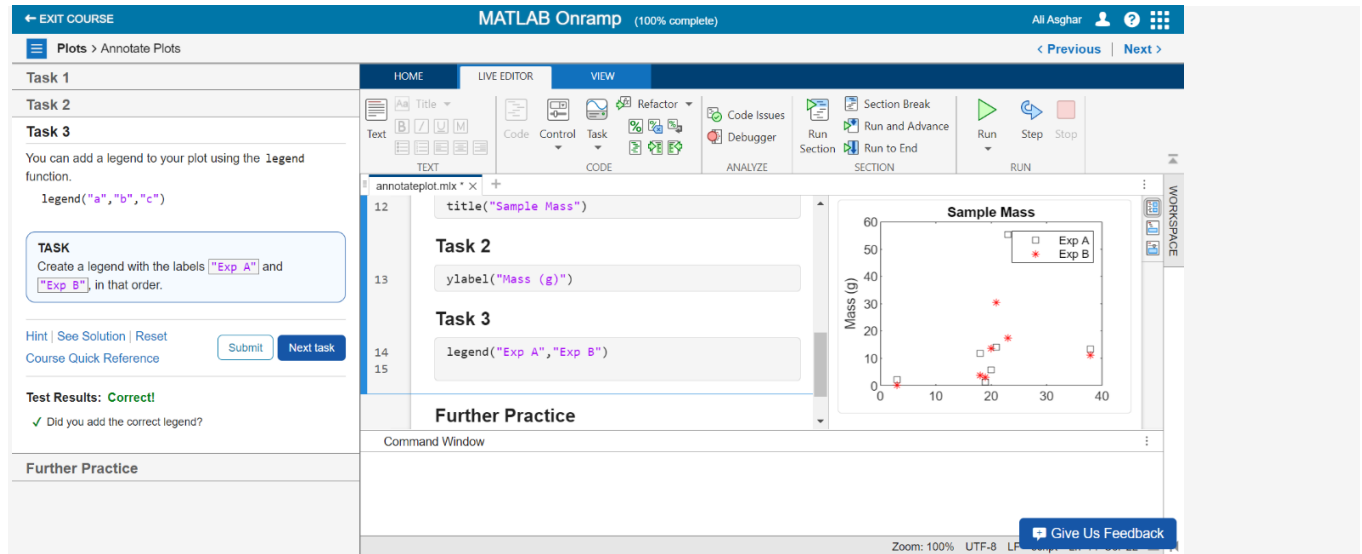
- Objective: Use the MATLAB documentation to discover information about MATLAB features.
- Remarks along with final snapshot

The screenshot shows the MATLAB Onramp interface for a task titled "Use MATLAB Documentation (Practice)". The task description states: "The MATLAB documentation contains examples and information that can help you when working on your own problems." The task instructions ask to use the documentation for `randi` to help complete the task. The task instructions ask to create a matrix named `x` that: contains random integers in the range from 1 to 20, has 5 rows, and has 7 columns. The test results show that the user has correctly completed the task. The workspace shows the variable `x` (a 5x7 matrix).

Remarks: I learned how to get help from MATLAB's online documentation.

9. Plotting Data

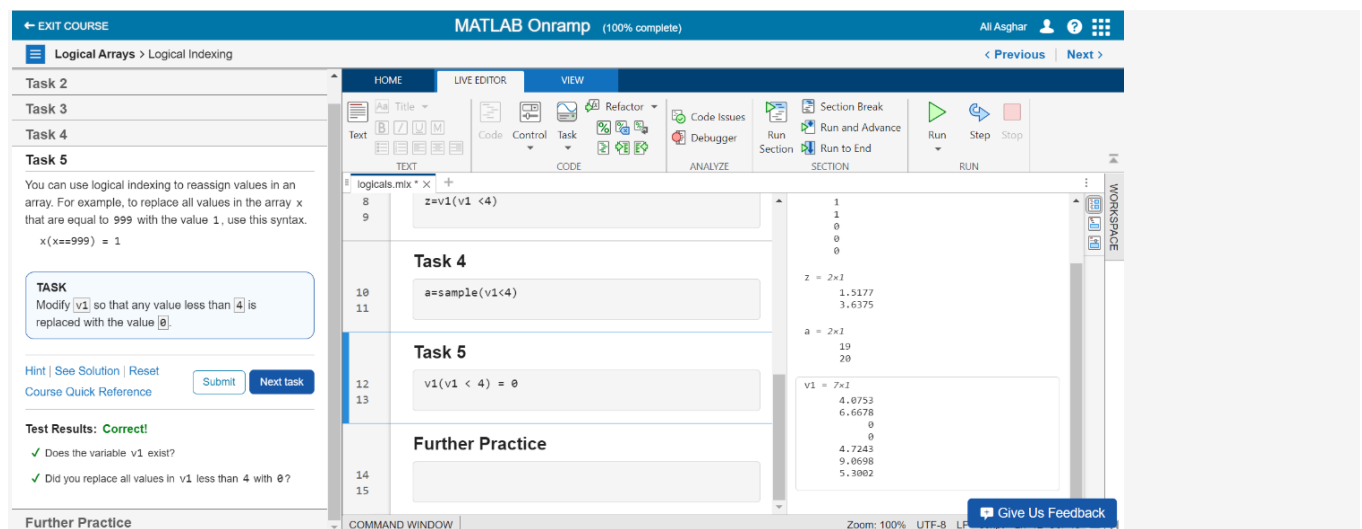
- Visualize variables using MATLAB's plotting functions.
- Remarks along with final snapshot



Remarks: I learned how to plot data using different styles.

10. Logical Arrays

- Objective: Use logical expressions to help you to extract elements of interest from MATLAB arrays.
- Remarks along with final snapshot



Remarks: I acquired the ability to utilize relational operators and logical indexing in MATLAB arrays to extract specific elements of interest.

11. Programming

- Objective: Write programs that execute code based upon some condition.
- Remarks along with final snapshot

The screenshot shows the MATLAB Onramp interface for the 'For Loops' task. The left sidebar contains a 'TASK' section with instructions: 'Wrap the code on lines 4–5 of the live script in a for loop so that the code executes 10 times.' and 'Name your loop counter idx. For the first execution of the loop, idx should have a value of 1, and it should increase by 1 in each consecutive iteration.' Below the task are 'Test Results' showing 'Correct!' and two green checkmarks for questions about the plot and points. The main workspace shows a live script with a for loop:

```
for c = 1:3
    disp(c)
end
```

 The right pane shows a scatter plot with 10 points. The bottom status bar indicates '3 usages of "idx" found'.

Remarks: I learned how to use branching(if-else) and loops in MATLAB.

12. Final Project

- Objective: Bring together concepts that you have learned with a project.
- Remarks along with final snapshot

The screenshot shows the MATLAB Onramp interface for the 'Final Project' task. The left sidebar contains a 'TASK' section with instructions: 'Create a variable movaway that contains the elements in starnames corresponding to where speed is greater than 0.' Below the task are 'Test Results' showing 'Correct!' and three green checkmarks for questions about the variable and its elements. The main workspace shows a live script with a for loop and a legend:

```
for idx = 1:10
    plot(idx, density(idx), "s")
end
hold off
legend(starnames)
```

 The right pane shows a line plot with multiple series. The bottom status bar indicates 'Zoom: 100% UTF-8'.

Remarks: Lastly, I brought all the pieces together and completed the final project.

13. MathWorks Certificate



Course Completion Certificate

Ali Asghar

has successfully completed **100%** of the self-paced training course

MATLAB Onramp

A handwritten signature in black ink, reading 'Craig L. Santos'.

DIRECTOR, TRAINING SERVICES

26 September 2023