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**AMERICAN INTERNATIONAL UNIVERSITY–BANGLADESH (AIUB)**

**FACULTY OF ENGINEERING**

**DEPARTMENT OF COMPUTER ENGINEERING**

**DATA COMMUNICATION LABORATORY**

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**Group: 4**

**LAB REPORT ON**

***Introduction to MATLAB***

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**Submitted By:**

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**Abstract:**

This experiment is designed:

1. To understand the use of MATLAB for solving communication engineering problems.
2. To develop understanding of MATLAB environment, commands, and syntax.

**Theory:**

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows the user to solve many technical computing problems, especially those with matrix and vector operations, in less time than it would take to write a program in a scalar noninteractive language such as C or Fortran. MATLAB features a family of application-specific solutions which are called toolboxes. It is very important to most users of MATLAB, that toolboxes allow us to learn and apply specialized technology. These toolboxes are comprehensive collections of MATLAB functions, so-called M files, that extend the MATLAB environment to solve particular classes of problems. MATLAB is a matrix-based programming tool. Although matrices often need not to be dimensioned explicitly, the user has always to look carefully for matrix dimensions. If it is not defined otherwise, the standard matrix exhibits two dimensions’ n × m. Column vectors and row vector are represented consistently by n × 1 and 1 × n matrices, respectively.

MATLAB operations can be classified into the following types of operations:

* Arithmetic and logical operations.
* Graphical functions.
* Mathematical functions.
* Input/output operations.

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| x=0:pi/100:2\*pi;  y=sin(x);  plot(x,y) | **Figure 1 : Sine plot** |
| x=0:pi/100:2\*pi;  y=sin(x);  plot(x,y)  xlabel('x');  ylabel('y');  title('y=sin(x)')  x1=0:pi/100:2\*pi;  y1=sin(x1);  y2=sin(x1-0.25);  y3=sin(x1-0.5);  plot(x1,y1,x1,y2,x1,y3) | **Figure 2: Multiple graphs with a single call to plot** |

**Results:**

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| --- | --- |
| t=-pi:pi/100:pi;  s=cos(t);  plot(t,s)  axis([-pi pi -1 1])  xlabel('-\pi \leq t \leq \pi')  ylabel('cos(t)')  title('The Cosine Function')  text(-2, -0.5,'This is a note at position (-2,-0.5)') | **Figure 3 : Example for controlling the axes** |
| t=linspace(0,2\*pi,1000);  A1 =2;  A2=4;  A3=3;  phi=3\*pi;  signal1=A1\*cos(t+phi);  signal2=A2\*cos(t+phi);  signal3=A3\*cos(t+phi);  plot(t,signal1,'r','LineWidth',2);  hold on;  plot(t,signal2,'g','LineWidth',2);  plot(t,signal3,'b','LineWidth',2);  xlabel('Time');  ylabel('Amplitude');  title('Cosine Signals with Phase Difference of 3pi');  legend('Signal 1','Signal 2','Signal 3');  grid on; | **Figure 4 : Cosine signals (Phase diff. 3π, Amplitude. 2,4,3)** |

**Discussion & Conclusion:**

In the experiment, MATLAB was effectively utilized, and insights into its matrix-based programming capabilities were gained. Despite initial plotting challenges, success was ultimately achieved in generating sinusoidal graphs and mastering various MATLAB functions and operations, with progress being meticulously documented with screenshots. Competence in MATLAB's versatile features was demonstrated through the success of the experiment.

**References:**

[1] B. R. Hunt, R. L. Lipsman, J. M. Rosenberg, K. R. Coombes, J. E. Osborn, and G. J. Stuck, A guide to MATLAB: For Beginners and Experienced Users. Cambridge University Press, 2006. Accessed: Sept.21, 2023. [Online].Available:  
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[2] A. Bensky, Wireless Positioning Technologies and Applications, second edition. Artech House, 2016. Accessed: Sept. 21, 2023. [Online]. Available: <https://books.google.ie/books?id=rS6pCwAAQBAJ&printsec=frontcover&dq=Wireless+Positioning+Technologies+and+Applications,+Second+Edition&hl=&cd=1&source=gbs_api#v=onepage&q=Wireless%20Positioning%20Technologies%20and%20Applications%2C%20Second%20Edition&f=false>