MATLAB TUTORIAL

This tutorial is meant for ELG 3311 students. It will give you a quick start to help you do your assignment questions. For further help, you can check the help library in MATLAB or any online help tutorial.

GOOD LUCK ☺

WHAT IS MATLAB?

MATLAB stands for MATrix Laboratory. MATLAB is an interactive, matrix-based system for scientific and engineering calculations.

When you need help

The on-line help of Matlab is very good. If you don't know where to start:

```
>> help
```

Specific help about a known topic (command, function, directory):

```
>> help fft
>> help toolbox\signals
```

Keyword search in the descriptions of the commands:

```
>> lookfor signal
>> lookfor processing
```

M-Files

Files that contain a computer code are called the *m-files*. There are two kinds of m-files: the *script files* and the *function files*. Script files do not take the input arguments or return the output arguments. The function files may take input arguments or return output arguments.

To make the m-file click on **File** next select **New** and click on **M-File** from the pull-down menu.

On-Line Commands

```
>> 3*4
ans = 12
```

To enter the matrix

```
            1 2
            3 4
```

and store it in a variable a, do this:

```
       >> a = [ 1 2; 3 4 ]
```

To redisplay the matrix, just type its name:

```
       >> a
```

Matlab also has many built-in functions:

```
>> sqrt(64)
ans = 8

>> sin(pi/2)
ans = 1

>> abs(-56)
ans = 56

>> e = ones(3,3)
e =
1 1 1
1 1 1
1 1 1

>> size(e)
ans =
3 3
```

Matrix manipulation is very easy:

```
>> f = d + e
f =
2 3 4
5 6 7
8 9 10
```

```
>> f'
ans =
2 5 8
3 6 9
4 7 10

>> ans(2,3)
ans = 9

>> g = d * e
g =
6 6 6
15 15 15
24 24 24

>> h = d + 3*e
h =
4 5 6
7 8 9
10 11 12

>> k = f(1:2,:)
k =
2 3 4
5 6 7

>> m = cos(k)
m =
-0.4161 -0.9899 -0.6536
0.2836 0.9601 0.7539

>> matrix_product = h * k
??? Error using ==> *
Inner matrix dimensions must agree.

>> matrix_product = k * h
matrix_product =
69 78 87
132 150 178
```

The following matrix operations are available in MATLAB:

+	addition
-	subtraction
*	multiplication
^	power

```
'    transpose
\    left division
/    right division
```

To make a graph of y = sin(t) on the interval t = 0 to t = 10 we do the following:

```
>> t = 0:.3:10;
>> y = sin(t);
>> plot(t,y)
```

The "colon" (:) operator:

```
>> numbers1 = 2:2:8
numbers1 =
2  4  6  8

>> numbers2 = 2:8
numbers2 =
2  3  4  5  6  7  8

>> numbers3 = numbers2(1:2:5)
numbers3 =
2  4  6

>> 2 : .5 : 4
ans =
2  2.5  3  3.5  4

>> 6 : -.5 : 4
ans =
6  5.5  5  4.5  4
```

Example on functions:

```
function y = cosgen(x,a,f,p)

%COSGEN Generation of a cosine wave
% y = cosgen(x,a,f,p)
% y - cosine of x
% a - amplitude
% f - frequency [hertz]
% p - phase [radians]
```

y = a*cos(2*pi*f*(x + p/(2*pi*f)));