Topic 0

The Course

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Introduction

- *Computer programming* and numerical methods are an essential part of the work of many scientists and engineers.

- The course attempts to place emphasis on numerical methods in Non-Relativistic and Relativistic Quantum Mechanics.

- We will learn **MATLAB** Programming Language at basic level
  
  - **MATLAB is a high-level computer language for scientific computing and data visualization built around an interactive programming environment.**
The Course

- Course web page
  
  http://www.gantep.edu.tr/~bingul/ep547

- Also search Google and Wikipedia for any of the expressions used in this course.
Course Content

- Basic MATLAB Tutorial
- Solutions of Linear Algebraic Equations
- Symbolic and Numerical Differentiation / Integration
- Roots of Equations & Optimisation
- Numerical Methods for Ordinary Differential Equations
- Boundary Value & Eigen Value Problems
- Fourier Transform
- Monte Carlo Methods

- Overview of QM
- Numerical Solutions of Schrödinger Equation
- Example Applications
Computer Labs

- We’ll use MATLAB under Windows operating system
- Every week you should write a few programs yourself in the lab (and more in your free time).
- So you may need to save them on a flash drive or on the internet.

DO NOT FORGET TO BRING YOUR LAPTOP or FLASH DISK WITH YOU
What is MATLAB?

See http://en.wikipedia.org/wiki/MATLAB

- MATLAB is a high-performance language for technical computing.
- It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.

- Typical uses include
  - Math and computation
  - Algorithm development
  - Data acquisition Modeling,
  - simulation, and prototyping
  - Data analysis,
  - Scientific and engineering graphics
  - ...
MATLAB 7 Installation

Follow the instructions ...
MATLAB 7 Run

To get started, select MATLAB Help or Demos from the Help menu.

```
>> 2+3
ans =
5

>> a = sqrt(2)

a =
1.4142
```

Sayfa 10
A Very Basic MATLAB Tutorial

Arithmetic works as expected.
Note that the result is given the name "ans" each time

```
>> 2 + 3
ans = 5
```

```
>> 1234/5786
ans = 0.2133
```

```
>> 2^5
ans = 32
```

You can choose your own names

```
>> a = sqrt(2)
a = 1.4142
```
A semicolon (;) suppresses printout of intermediate results

>> x = 2 + 3i
x = 2.0000 + 3.0000i

>> y = sin(pi/2)
y = 1

>> A = [5 -3 4 2]
A = 5  -3   4   2

>> A = [5, -3, 4, 2]
A = 5  -3   4   2

**A semicolon (;) suppresses printout of intermediate results**

>> y = sin(pi/2);
>>

>> A = [5 -3 4 2];
>>
>> dizi = 1:7
dizi = 1    2    3    4    5    6    7

>> dizi2 = -5:2:5
dizi2 = -5    -3    -1    1    3    5

>> M = [9 8 7; 6 5 4; 3 2 1]
M =
    9    8    7
    6    5    4
    3    2    1
\begin{verbatim}
>> solve('2*x*x-10=0')
ans =
     5^(1/2)
     -5^(1/2)

>> int('sin(x)','x')
ans =
    -cos(x)

>> int('sin(x)','x',0,pi)
ans =
     2
\end{verbatim}
Using M-Files

Programs can be created with the MATLAB or Notepad editor and saved with the .m extension (M-files).

Here is an example m-file (saved on desktop as ciz.m):

```matlab
x = -10:0.1:10;
plot(x,sin(x))
hold on;
z = cos(x);
plot(x,z,'k')
```

```matlab
>> ciz
>>
```
References

