

# CHE/CEN I 38

# COMPUTER PROGRAMMING

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INTRODUCTION TO COMPUTER PROGRAMMING IN  
CHEMICAL ENGINEERING

# References

1. Prata, R. "Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers" Oxford University Press, 2010.
2. Hunt, B.R., Lipsman, L.R. and Rosemberg J. M. "A guide to MATLAB for Beginners and Experienced Users" Cambridge University Press, 2001.
3. Kubat, C. "MATLAB Yapay Zeka ve Mühendislik Uygulamaları" İkinci Baskı, Pusula Yayıncılık, 2014 McGraw Hill, International Edition 2012.

# Computer Programming

Process of writing instructions that get executed by computers. The instructions, also known as code, are written in a programming language, which the computer can understand and use to perform a task.

Lectures that will use  
computer programming

CEN 205 : Solving linear algebraic equations

CEN 202 : Finding roots of equations. Integration

CEN 236 : Finding roots of equations. Solving  
linear algebraic equations. Regression,  
interpolation, numerical integration, numerical  
differentiation, ODE solutions

Lectures that will use  
computer programming

CEN 309 : Interpolation, roots of equations of state

CEN 311 : Calculation of heat loss and graphical  
representation

CEN 331 : ODE solutions

CEN 306 : ODE solutions, graphical  
representation

Lectures that will use  
computer programming

CEN 338 : ODE solutions

CEN 342 : Optimization

CEN 407 : Controller design by means of Simulink

CEN 353 : Regression, graphical representation

Lectures that will use  
computer programming

CEN 354 : Plotting with Excel

CEN 455 : Regression, numerical integration,  
interpolation plotting, simulation with Simulink

CEN 417 : ALL OF THE ABOVE 😊

# MATLAB

- MATrix LABoratory
- Software Package for high-performance numerical computation and visualization
- Own high-level programming language
- External Interface to run Fortran and C programs

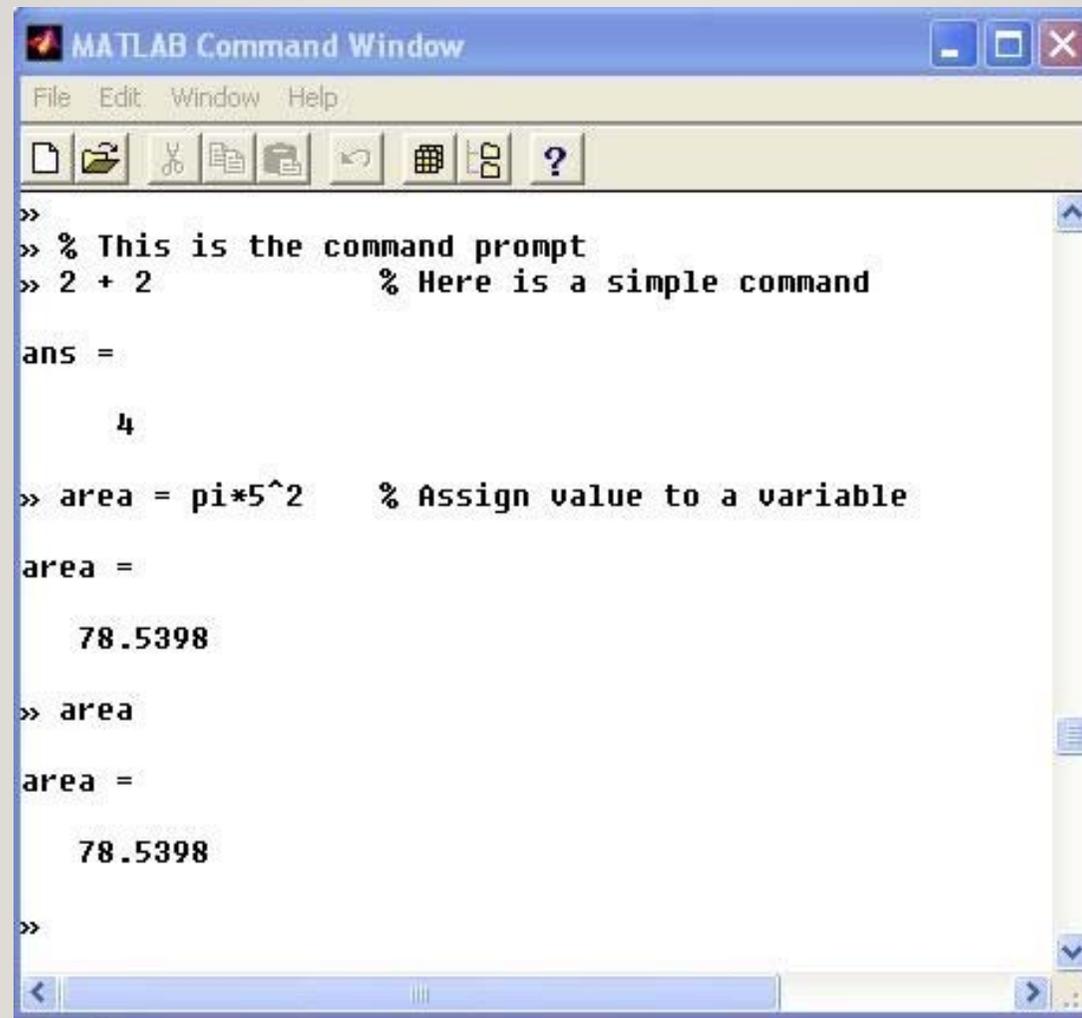
# MATLAB

- Matrix is the basic building block
- Fundamental data-type is the array
- Vectors, scalars, real and complex matrices are special cases of basic data type
- Built-in functions are optimized for vector operations
- Hence vectorized commands or codes run much faster

# MATLAB ENVIRONMENT

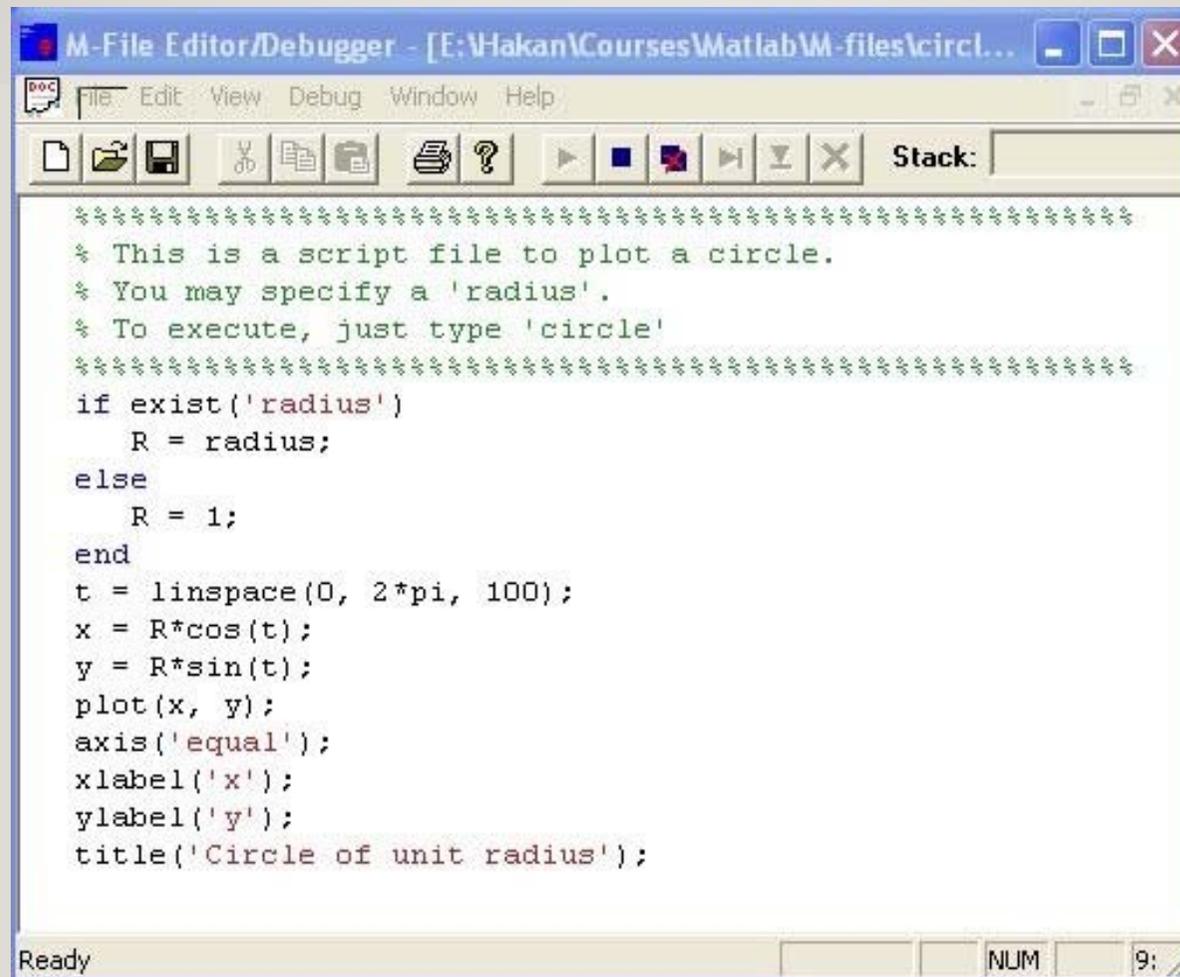
- MATLAB windows
  - Command window
  - Graphics window
  - Edit window

# Command Window

A screenshot of the MATLAB Command Window. The window has a blue title bar with the text "MATLAB Command Window" and standard window control buttons (minimize, maximize, close). Below the title bar is a menu bar with "File", "Edit", "Window", and "Help". Underneath the menu bar is a toolbar with icons for file operations (new, open, save, print, copy, paste, undo, redo, grid, zoom in, zoom out, help) and a question mark icon. The main area of the window contains the following text:

```
>>  
>> % This is the command prompt  
>> 2 + 2          % Here is a simple command  
  
ans =  
  
     4  
  
>> area = pi*5^2   % Assign value to a variable  
  
area =  
  
    78.5398  
  
>> area  
  
area =  
  
    78.5398  
  
>>
```

# EDIT WINDOW

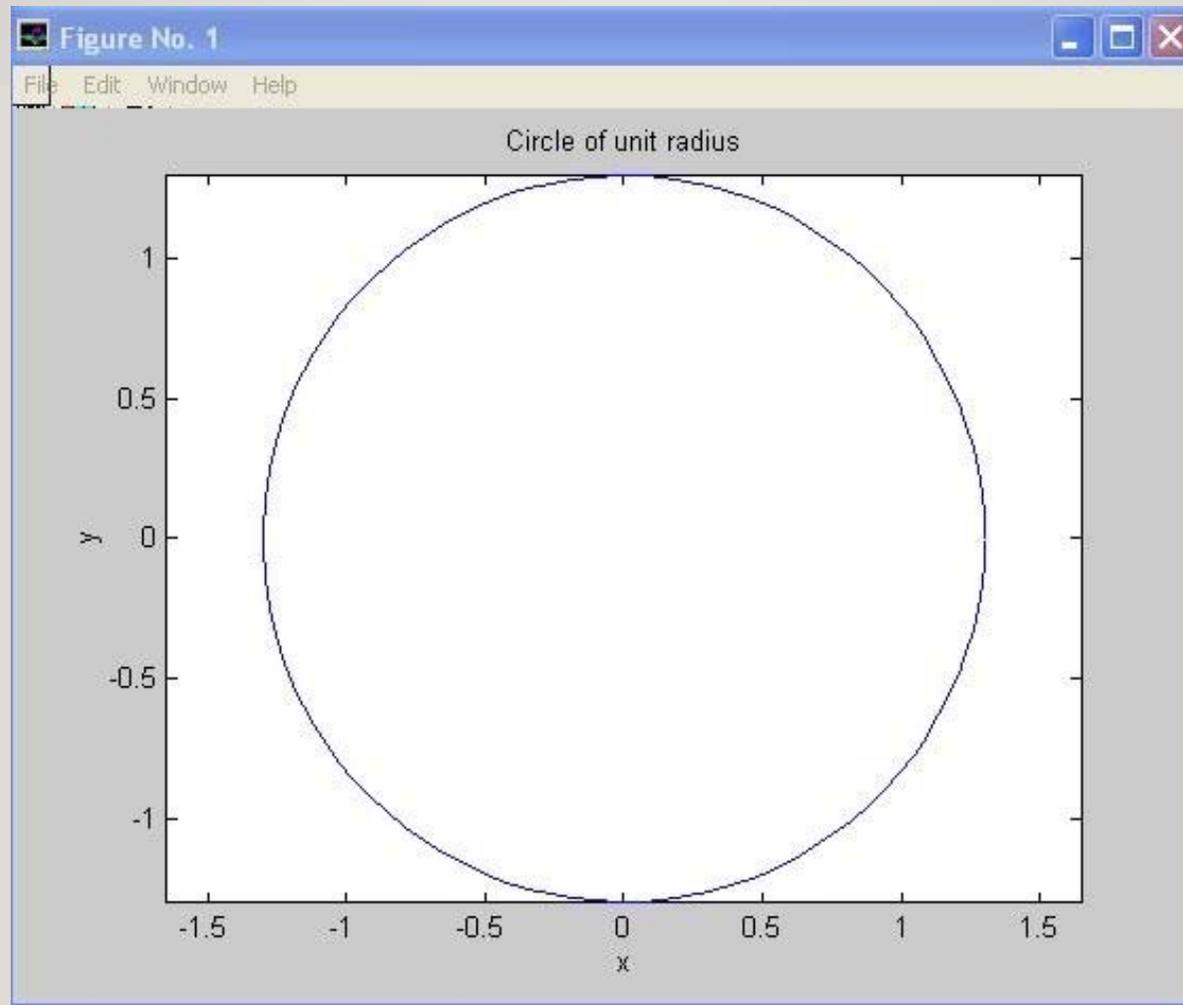


The screenshot shows the MATLAB M-File Editor/Debugger window. The title bar reads "M-File Editor/Debugger - [E:\Hakan\Courses\Matlab\M-files\circl...". The menu bar includes "File", "Edit", "View", "Debug", "Window", and "Help". The toolbar contains icons for file operations (New, Open, Save, Copy, Paste, Print, Help) and execution (Run, Stop, Step, Step In, Step Out, Exit). The main text area contains the following MATLAB code:

```
*****  
* This is a script file to plot a circle.  
* You may specify a 'radius'.  
* To execute, just type 'circle'  
*****  
if exist('radius')  
    R = radius;  
else  
    R = 1;  
end  
t = linspace(0, 2*pi, 100);  
x = R*cos(t);  
y = R*sin(t);  
plot(x, y);  
axis('equal');  
xlabel('x');  
ylabel('y');  
title('Circle of unit radius');
```

The status bar at the bottom shows "Ready" on the left and "NUM 9:" on the right.

# GRAPHICS (FIGURE) WINDOW



# Case sensitivity

- MATLAB differentiates between the lowercase and uppercase letters.
- A and a are different variables.

# Command History

- MATLAB saves previously typed commands in a buffer.
- Commands can be recalled with the up-arrow key.
- Also type first few characters and then press up-arrow key to recall commands.

# Directories

- For your programs to be automatically accessible to MATLAB save in a place in the “path”.
- “path” command specifies and adds the file paths.
- “cd” command changes the working directory.

# Variable Naming

- Names must begin with a letter
- After the first letter, any number of digits or underscores may be used
- But MATLAB remembers only the first 19 characters

# Remarks

- Comments: MATLAB takes anything following a % as a comment and ignores it.
- (;) A semicolon at the end of a command suppresses the screen output, although the result is saved in the variable ans.
- Use the command “more on” for paged-screen display (one screenful of output display at a time).