

The Grove School of Engineering STEM Institute
MATLAB
Course Syllabus
Summer 2008

Textbook: Introduction to Matlab 7 for Engineers, by William J. Palm III, McGraw Hill 2005.
(A copy of the book will be given to each student and it has to be returned at the end of the term)

Instructor: Abdelkrim Bouchouata
Phone: 212-650-5360
Email: abouchouata@ccny.cuny.edu
Office: T-581
Office Hours: 1:00 pm – 3:00 pm Mon. – Fri.

TA email Jairo Florez, jflorez00@ccny.cuny.edu

Objectives:

- Understand the Matlab Desktop, Command window and the Graph Window
- Be able to do simple and complex calculation using Matlab
- Be able to carry out numerical computations and analyses
- Understand the mathematical concepts upon which numerical methods rely
- Ensure you can competently use the Matlab programming environment
- Understand the tools that are essential in solving engineering problems

Topics Covered:

- 1. Chapter 1: Introduction to Matlab**
 1. Matlab Interactive Sessions
 2. Menus and the toolbar
 3. Computing with Matlab
 4. Script files and the Editor Debugger
 5. Matlab Help System
 6. Programming in Matlab

- 2. Chapter 2: Arrays**
 1. Arrays
 2. Multidimensional Arrays
 3. Element by Element Operations
 4. Polynomial Operations Using Arrays
 5. Cell Arrays
 6. Structure Arrays

- 3. Chapter 3: Functions & Files**
 - a) *Elementary Mathematical Functions*
 - b) *User Defined Functions*

- c) *Advanced Function Programming*
- d) *Working with Data Files*

4. Chapter 4: Programming Techniques

- a) *Program Design and Development*
- b) *Relational Operators and Logical Variables*
- c) *Logical Operators and Functions*
- d) *Conditional Statements*
- e) *Loops*
- f) *The Switch Structure*
- g) *Debugging Mat Lab Programs*

5. Chapter 5: Plotting

- a) *XY- plotting functions*
- b) *Subplots and Overlay plots*
- c) *Special Plot types*
- d) *Interactive plotting*
- e) *Function Discovery*
- f) *Regression*
- g) *3-D plots*

6. Chapter 6: Linear Algebraic Equations

- a) *Elementary Solution Methods*
- b) *Matrix Methods for (LE)*
- c) *Cramer's Method*
- d) *Undetermined Systems*
- e) *Order Systems*

7. Chapter 7: Probability and Statistics

1. *Interpolation*
2. *Statistics, Histogram and probability*
3. *The Normal Distribution*
4. *Random number Generation*
5. *Interpolation*

8. Symbolic Processing With Matlab

1. *Symbolic Expressions and Algebra*
2. *Algebraic and Transcendental Equations*
3. *Calculus*
4. *Symbolic Linear Algebra*

9. Image Processing

1. Vector Graphics
2. Morphological Image Processing
3. Filtering

10. Remote Sensing

11. Final Project: Design a Discrete-Time Low Pass Filter Using MatLab to Remove Noise from $x(t)$ function. The filter must pass all frequencies up to 100 Hz. Allowable amplitude distortion (ripple) is $\pm 2\%$. Above 175 Hz, the filter must have an attenuation of at least **40dB**, $20 * \log_{10}(\sigma_2) = -40$

Grading Policy:

In-term Exams:	20%
Homework:	20%
Final exam*:	40%
Presentation: Team Work on an engineering subject	20%

Homework Policy: You will receive a zero for homework turned in after the due date, end of class.

When a homework assignment involves programming, you will need to *supply me or the grader with electronic copy of any .m files you create and a diary file showing the execution/output of your Matlab session(s)*.

Additional References:

1. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, Numerical Linear Algebra and Applications, Brooks/Cole, 1994 (out of print)
3. L. Elden, Matrix Methods in Data Mining and Pattern Recognition, SIAM Press, 2007

Misc. Useful Information:

- NA-digest, <http://www.netlib.org/na-digest-html>
- Society for Industrial and Applied Mathematics (SIAM), see <http://www.siam.org>
- Google “Matlab Primer” or “Matlab Tutorial” and you should be able to access lots of free Matlab
- As an alternative to Matlab, you may download and use the free software (linux, mac, or windows)

Note: Your TA, Jairo Florez will be available to meet with you everyday after 4:00pm in the Software Training Center Lab, Room, T-2M-3 (Grove School of Engineering)