

**1. Course number and name**

EE 221: Numerical Computing for Engineers

**2. Credits and contact hours**

2 credits, 2 lecture hours

**3. Instructor's or course coordinator's name**

Ahmed Abu Hajar

**4. Textbook, title, author, and year**

*Mastering MATLAB*. Special Edition for WSU. Prentice Hall. 2000. ISBN: 978-1-323-15232-4.

*Other supplemental materials*

Cleve B. Moler, 2004. *Numerical Computing with MATLAB*. SIAM. Philadelphia, PA. <<http://www.mathworks.com/moler/>>.

Steven C. Chapra. 2005. *Applied Numerical Methods with MATLAB*, McGraw-Hill, NY.

Steven C. Chapra and Raymond P. Canale, 2006. *Numerical Methods for Engineers* (5th ed.). McGraw-Hill, NY.

Robert J. Schilling and Sandra L. Harris. 2000. *Applied Numerical Methods for Engineers*. Brooks/Cole, Pacific Grove, CA.

Steven J. Chapman. 2002. *MATLAB Programming for Engineers*. Brooks/Cole, Pacific Grove, CA.

Duane Hanselman and Bruce Littlefield. 2005. *Mastering MATLAB 7*. Prentice-Hall. Upper Saddle River, NJ.

Desmond J. Higham and Nicholas J. Higham. 2005. *MATLAB Guide* (2nd ed.). SIAM, Philadelphia, PA.

**5. Specific course information**

- a. *Catalog description*: Solutions to engineering problems making extensive use of modern software tools (MATLAB).
- b. *Prerequisites or corequisites*: Math:220, Math:172, Linear algebra, calculus II and complex numbers.

**6. Specific goals for the course**

By the end of the course, students will be able to

- Competently use the MATLAB programming environment (2a, 2b, 2c, 2d, 2e, 2g).
- Understand the vector-matrix paradigm underlying MATLAB (6a, 6b, 6c).
- Understand the consequences of finite precision on numeric computational and understand the inherent limits of many numerical methods (2b, 6a, 6b, 6c, 7a, 7b, 7f, 7g).
- Translate a textual or mathematical descriptions of a solution into a well-written computer based solution using MATLAB (1a, 1b, 1c, 1d, 1e).
- Choose between various numerical methods to use the right method for a particular problem (6b, 7a, 7b, 7f, 7g).

- Understand the mathematical concepts upon which numerical methods rely.

**7. Brief list of topics to be covered**

- Introduction to MATLAB:
  - Running interactively
  - Syntax (including colon notation), vectors, matrices
  - Mathematical operations, built-in commands
  - Complex numbers, strings
  - Plotting
- Programming:
  - m-files
  - Flow control, relational operators
  - Scope
  - Variable number of function arguments
  - Style, comments, organization
  - Debugging
- Finite precision, inherent algorithmic errors
- Root-finding
- Solving systems of equations:
  - Review of linear algebra and related operations
  - Gaussian elimination
- Least-squares fitting
- Numerical integration

