

**GE U111 Engineering Problem Solving & Computation, Spring 2004**  
**College of Engineering**  
**Northeastern University**

**Instructor:**

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Office Hours: TBD

**Class Hours and Location:**

Section 1: MTh 11:45am-1:25pm, 429 Dana  
Section 2: MW 2:50pm-4:30pm, 429 Dana

**Course Goals:**

This course is designed to help students:

- Develop skills in algorithmic thinking by preparing computer programs to analyze and present engineering data.
- Properly evaluate and interpret the results of their work.
- Learn to write the types of programs needed for engineering problem solving (in C++ and Matlab).
- Become familiar with a wide variety of interesting and challenging engineering problems that can be solved with programmable algorithms.
- Learn how to structure software.

**Course Objectives:**

Learn how to apply selected computational tools to solve Matlab engineering problems from a variety of disciplines. Specific skills include:

- Formulate engineering problems for numerical solutions.
- Select appropriate techniques and computational tools to arrive at a numerical answer.
- Employ computational concepts and skills such as variables, functions, flowcharting, looping, and conditional branching.
- Apply computational techniques for analyzing data and for graphical presentation of results.
- Present computational projects with organization and clarity.
- Debug code and verify solutions.
- Demonstrate facility with two specific software packages (Matlab and Microsoft Visual C++) which can be used throughout the Northeastern experience and beyond for both classroom and real-world problems.

**Required Textbooks and Materials:**

- [1] "Applications Programming in C++," by Richard Johnsonbaugh & Martin Kalin, Prentice Hall, 1999.  
On reserve at Snell Library.
- [2] "Introduction to Matlab 6, 2<sup>nd</sup> edition," by Delores M. Etter, Prentice Hall, 2004.
- [3] Two (2) 3.5" diskettes or Zip<sup>®</sup> disk. Come to lab prepared to back up all computer work.

### Reference Books (on reserve at Snell Library) and Software Used:

- [1] "C: A Reference Manual, 4<sup>th</sup> edition," by Harbison and Steele, Prentice-Hall, 1995.
- [2] "Matlab Programming for Engineers," by S. Chapman, Brooks/Cole, 2000.
- [3] Software: *Mathworks*<sup>®</sup> *Matlab* and *Microsoft*<sup>®</sup> *Visual C++*.

### Grading Policy:

Programming Assignments:	45%, due at the beginning of class on due date
Quizzes:	40%, in-class.
Final Exam or Project:	15%

- No late homeworks will be accepted after solutions have been handed out and/or posted on the class website. 10% will be deducted for each day past the due date.
- No make-up quizzes will be given.
- **NOTE:** All assignments must be presented in a neat, organized, and professional manner. All work must be submitted with a cover sheet, list of contents, and summary sheet. Each packet of work submitted should contain hard copies of all programs, output files, flowchart or pseudocode, and a disk with copies of program files. All work must be submitted in a folder properly labeled and bound; assignments presented otherwise will be returned with penalty.
- In partial fulfillment of the student portfolio requirements, we recommend that one or more programming project / assignments be included as an example of the student's work in this course.

### Final Examination date:

April 23, 2004, 10:30 am, room: TBD

### Email and Course Web Page:

- **You are required to send me an email with your legal name (and preferred name, if applicable), email address, and course title and section (GE U111–MTh or MW) no later than 01/09/2003 so that I can construct an email list for this class.**
- All students are required to check their email everyday for any class updates or notices.
- Any changes or updates to the class syllabus or schedule will also be posted on the class website. Copies of assignments, solutions, and any handouts will be posted there as well.

### Ethical Behavior:

Plagiarism and cheating will not be tolerated; they will be dealt in accordance with University policies described in the Student Handbook. All engineering majors should be familiar with the Honor Code of our College of Engineering that is included in the GEU 100 course material, and with professional engineering codes of ethics (see, for example, the NSPE Code of Ethics presented in the Engineering by Design textbook on pages 511-514). Although students are encouraged to discuss homework assignments and work together to develop a deeper understanding of the topics presented in this course, submission of others' work as your own is not permitted. **Copying of computer code or any document is not allowed.** Each student is expected to prepare and submit his/her own programs, reports, drawings, and other materials. If two students' work is suspiciously similar, a penalty may be assessed to both students. If a situation arises in which you are uncertain if cooperation with another student would constitute cheating or some other violation of the honor code, please ask the instructor for guidance and clarification of these rules. Violators will be referred to the Student Court for review, where penalties may include but are not restricted to: zero credit on the work, student placed on probation, and submission of information on judgment in the student's permanent record.

### Special Needs:

Any student requiring any special accommodations because of a disability, please see me during office hours or send me an email immediately so that appropriate arrangements can be made. If special testing arrangements are required, you **MUST** bring your DRC letter to me immediately so that examination rooms can be reserved on your behalf.

**Topical Outline: (JK = “Applications Programming in C++, Etter = Introduction to Matlab 6)**

Computer Systems and Program Development Computer organization Number representations Assembly Compilation	Chapter 0 (JK)
Introduction to Data Types and Operators Algorithm development Flow charting Directing program flow Data types Operators Some commands	Chapter 1 (JK)
Control Flow Control flow and operators Formatting	Chapter 2 (JK)
Functions Arguments and parameters Scope of variables Call by value	Chapter 3 (JK)
Arrays Character strings Arrays in functions 2-D arrays Pointers	Chapter 4 (JK)
Problem Solving	Chapter 1 (Etter)
Matlab Environment Scalars, vectors, and matrices Plotting capabilities Matlab functions and operations	Chapter 2 (Etter)
Matrix Computations Matrix operations Linear algebra	Chapter 4 (Etter)
Matlab Functions User-written functions Random numbers	Chapter 3 (Etter)