Engineering Problem Solving and Computation
GE 1101 COURSE OUTLINE
Spring 2003

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Office hours: Wednesdays 11:30-1:00, Additional times to be arranged according to your schedules.

COURSE GOALS:

This course is designed to help students:

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

COURSE OBJECTIVES:

To become skilled at applying the selected computational tool C++ to solve 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 a specific software package (Microsoft Visual C++) which can be used throughout the Northeastern experience and beyond for both classroom and real-world problems.

REQUIRED MATERIALS:

Applications Programming in C++, Johnsonbaugh and Kalin, Prentice-Hall, 1999.
Two 3.5" diskettes with labels; Optional: Zip® disk. Come to lab prepared to back up all computer work.

Skills and perspectives relate directly to the shared goals of Northeastern University's Academic Common Experience (ACE) initiative.

HARDWARE/SOFTWARE:

The course will be conducted assuming that students will use the Microsoft Visual Studio C++ Version 6.0 application on NUNet. For home use, Microsoft Visual C++ can be purchased at the N.U. Bookstore and in many other places. Other C++ development applications will not be used or taught in this course.

COMPUTER BACKGROUND:

No prior programming experience is assumed, except for techniques learned in GE 1102 and GE 1103.

COURSE MEETING:

208 Snell Engineering. Each Monday, a full class session is *planned* to be dedicated to Lab work. This may be modified according to the progression of the course.

EVALUATION:

Final course grades will be computed using the following percentages:

10%	Daily Assignments & Attendance
35%	Weekly Lab Projects (~8)
35%	Written Quizzes (~8)
20%	Final Exam or Project to be determined by professor

Daily Assignments. Each week there will be Daily Assignments due to keep you up to date with the material and to help identify where difficulties arise. Sometimes these will be checked off, and other times they will be fully graded for accuracy. If they are only checked off, they will be scored on a 3-point scale:

3 = you did the whole assignment and it is correct or nearly all correct.
2 = you made an attempt **before** coming to class, you came on time and you had some answers correct.
1 = you turned in a blank piece of paper with your name to get attendance credit or you turned it in late.
0 = you did not attend class, you handed it in more than 24 hours later. We will still correct it for you.

Weekly Lab Projects. There will be weekly (or so) lab projects requiring use of the computer and associated software. These are due at the beginning of class on the date due. Weekly assignments will not ever be accepted after one week past the due date, or any time after the solution has been provided, presented, or discussed, *if accepted at all*. Three points out of 35 will be deducted for each day past the due date. In averaging your score for weekly assignments, *no* grades will be dropped.

Presentation Note: All assignments must be presented in a neat, organized, and professional manner. In accordance with the College of Engineering standards, work should be submitted with some form of professional correspondence, such as a memo, fax sheet, cover letter, list of contents or summary sheet. Each packet of submitted work should contain hard copies of all programs, output files, flowchart or pseudocode, and a disk containing only copies of program files. All work must be submitted in a properly labeled and bound folder; The grade will be affected on assignments that are presented otherwise.

Weekly Quizzes. There will be weekly (or so) written quizzes, also to help you keep pace with the course material and to help determine the knowledge base of each student. Topics will be drawn from the reading listed on the Course Schedule and from the previous week's material and daily assignments.

DETERMINING WHAT DAY IS WHAT

The course will start on Week 0, with class meeting on Days 0.1 and 0.2. Next Monday 3/31 is day 1.1, etc. Each week and class are numbered for consistency. *Typically*, Lab work time will occur on Day 1 each week, Quizzes on Day 2 and Lab Projects will be due on Day 3.

ETHICAL BEHAVIOR:

Plagiarism, cheating, and unauthorized collaboration will not be tolerated. These matters will be handled in accordance with Northeastern 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 GE 1001 course material, and with professional engineering codes of ethics (see, for example, the NSPE Code of Ethics presented in the Voland Engineering by Design textbook on pages 511-514).

Although students may 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, any document, or portion thereof is not allowed.*** In **specified** cases, students may be working on assignments in pairs and submitting their teams' work. Nonetheless, each student or team is expected to prepare and submit their own programs, reports, diagrams, and other materials. If two sets of work are suspiciously similar, a penalty may be assessed to all involved. It is also dishonest to place the name of a partner on work in which the partner did not make significant contribution.

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 directives. 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.

FINDING THE TEACHING ASSISTANT:

TA: Jihyun Lee
Phone: X 7780
Office: 263 Egan
E-mail: jlee@ece.neu.edu
Office Hours: TBA: _____

FINDING MICROSOFT C++ AT NU:

Start ➔ NUNet ➔ Applications ➔ Programming
➔ Microsoft Visual Studio V.6 ➔ Microsoft C++ 6.0

Good Luck, Work Hard, and Enjoy!

PROPOSED TOPICS &
MATERIAL TO BE COVERED

Week 0 (3/24) Read Chapter 0: **Computer Systems and Program Development**

Topics: Computer Organization, Number Representations, Assembly, Compilation, Why C++?

Week 1 (3/31) Read Chapter 1: **Introduction to Data types and Operators**

Topics: Algorithm Development, Flow Charting, Directing Program Flow, Data Types, Operators, Some Commands, Programming Theory and Dissection

Week 2 (4/7) Read Chapter 2: **Control Flow**

Topics: Control Flow Structures, Input from and Output to files

Week 3 (4/14) Read Chapter 2: **Control Flow (continued)**

Topics: More Control Flow and Operators, Introduction to Functions

Week 4 (4/21) Read Chapter 3: **Functions**

Topics: Functions, Arguments and Parameters, Scope of Variables

Week 5 (4/28) Read Chapter 3: **Functions (continued)**

Topics: More Fun with Functions

Week 6 (5/5) Chapter 4.1 – 4.2, 4.4 – 4.8: **Arrays**

Topics: Functions ➔ Arrays;

Week 7 (5/12) Read Chapter 4.9 – 4.10: **Arrays (continued)**

Topics: Arrays, Character Strings, Arrays in Functions

Week 8 (5/19) Review Chapter 4: **Arrays (still more)**

Topic: More Arrays2-D Arrays

Week 9 (5/26) Read Chapter 4.3: **Arrays (& Pointers)**

Topic: Pointers

Note: Holiday 26 May

Time Permitting   Read Chapter 5

Topics: Introduction Object-Oriented Programming

Week 10 (6/2) Final Exams

OVERVIEW OF PROPOSED COURSE TOPICS*
& ENGINEERING PROBLEM-SOLVING COMPETENCIES

PROBLEM-SOLVING: EVERY WEEK:

- ❑ Problem Definition (Outputs, Inputs, Diagram)
- ❑ Flow Chart Development and Logic Tracing
- ❑ Testing (Hand Calculations)
- ❑ Coding and Writing Programs
- ❑ Debugging (Verification and Validation)
- ❑ Interpreting (Letters, Memos, Summaries)

C++ ADD A LITTLE MORE EACH WEEK:

- ❑ Program Structure
- ❑ Variables and Constants
- ❑ Keyboard Input and Screen / File Output
- ❑ Mathematical Operations – order of, mixed
- ❑ If Statements / Control Structures
- ❑ Loops and Flow Control
- ❑ Input Files / Data Input
- ❑ Functions – multiple inputs, single output
- ❑ Arrays, Functions with arrays
- ❑ Pointers (functions with multiple outputs)

Notes:

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* Sequence and inclusion of topics is subject to change according to the course progress.