Department of Electrical and Computer Engineering
ECE 3326: Optimization Methods

Syllabus

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CONTENT

In ECE 3326 you will study a collection of classic algorithmic techniques that are useful for solving engineering problems. These algorithms include exhaustive approaches, divide and conquer, dynamic programming, greedy algorithms, backtracking, branch and bound, and iterative improvement. We will also cover algorithm analysis, asymptotic notation, recursion, and computational complexity. Data structures covered include vectors, strings, stacks, queues, trees and graphs.

PREREQUISITES

Students in ECE 3326 may be majoring in electrical engineering, computer engineering, or both. Students come to Northeastern with varying amounts of programming experience in languages like C, C++, and Java, and have a range of programming experiences while on coop. Students taking this class therefore have a wide range of backgrounds and abilities.

To take ECE 3326 you must:

1. have successfully completed Algorithms and Data Structures for Engineers,
2. know how to write programs in C++ using arrays, loops, conditional statements, functions, parameters, and simple I/O,
3. know how to use object-oriented techniques, including classes, constructors, destructors, copy-constructors, public and private members, reference parameters, and function overloading,
4. know how to use introductory data structures, including arrays, pointers, vectors, stacks and queues, and
5. know how to translate high-level descriptions of algorithms in pseudo-code into working C++.

To review object-oriented programming, read Chapters $1-11$ and 13 in the book by Friedman and Koffman. To review introductory data structures, read Chapters $4-8$ in the book by Ford and Topp.

STRUCTURE AND REQUIREMENTS

The course is built around approximately 6 programming projects. Every two weeks, I will introduce a new project. Lectures will cover the algorithms and data structures needed to solve the problem, and I will answer your questions about the assignment.

Each project will have two parts. In the first part, you will implement the basic infrastructure, i.e. the classes and data structures, for the project. In the second part, you will develop, implement and evaluate algorithmic techniques. There will also be written homework assignments due as part of each project.

Projects can be completed in groups of one or two students. There will be one project submission for each group. However each student must completely understand everything about the solutions they turn in.

Lectures will cover much, but not all, of the required material for the course. There will be reading assignments that accompany each lecture, and you are also responsible for this material.

There will be a weekly quiz. Each quiz will evaluate your understanding of the material covered on past projects and lectures. There will be no midterm or final exam.

We will meet once per week in the computer lab. You will spend this time working on your projects. The instructor and the TAs will be available to answer questions and give you feedback on your work.

GRADING

Your final grade for the class will be based on the following breakdown: 70% quizzes, 30% projects, and a factor for lab attendance and performance. Quizzes and projects are graded on an absolute scale from A to F (A = 10, A- = 9, etc.) The class is not graded on a curve. Your grades are rounded down when computing your final grade. For example, an average grade between a B and a B+ will result in a final grade of a B.

Your lowest two quiz scores from the first 9 quizzes will be dropped; you cannot drop any quiz after the first 9. If you receive a grade of C- or lower on a quiz, you can raise your score within one week of receiving your grade by coming to office hours, retaking the quiz, and carefully explaining the correct solution. Quiz scores are only raised a small amount (e.g. from a C- to a C).

Labs are graded based on attendance, preparation, and participation. Your lab score cannot improve your grade, but poor performance will reduce your final grade.

You are required to attend all lectures, complete all projects, and regularly do the reading.

POLICIES

All assignments have fixed due dates. No late homework will be accepted.

If you miss a quiz, you will not be allowed to retake it. All requirements must be completed during the semester. No incompletes will be given.

Class attendance is required. If you miss a class, you are responsible for all material that was covered, announcements that were made, and handouts that were distributed in class.

I encourage you to ask questions in class and participate in discussions. However, if I can hear you talking to your neighbor, then your voice is too loud.

If you have a question about the grading of a homework problem you should first contact the teaching assistant directly. If the issue is not resolved to your satisfaction, please contact me.

Changes to homework and quiz scores will only be made in the first week after the graded work has been returned to you.

You should check the class website daily for announcements and other information.

You are encouraged to discuss homework assignments with one another, but all writing of code must be done individually or within your group. You must not look at another student's code, or allow another student to see your code. Copying someone else's work and presenting it as your own, or submitting the same solution as someone else, is not allowed.

You must adhere to Northeastern University's Policy on Academic Integrity. If you violate this policy will receive a lower grade in the course, and may receive an F. You will also be referred to NU's Office of Student Conduct where penalties range from deferred suspension to expulsion from the university.

Exceptions to any course policy may be made if you have a personal emergency that prevents you from participating in the course. In this case you must make arrangements with me as soon as possible, preferably within 24 hours.

TEXTBOOKS

The course textbooks are:

Introduction to the Design and Analysis of Algorithms by Levitin, 2nd Ed, Addison Wesley, 2007.

Data Structures With C++ Using STL by Ford and Topp, 2nd Ed, Prentice Hall, 2002.

Problem Solving, Abstraction, and Design Using C++ by Friedman and Koffman, 5th Ed, Addison-Wesley, 2006.

POLICY ON ACADEMIC INTEGRITY

Northeastern University is committed to the principles of intellectual honesty and integrity. All members of the Northeastern community are expected to maintain complete honesty in all academic work, presenting only that which is their own work in tests and all other assignments. If you have any questions regarding proper attribution of the work of others, please contact me prior to submitting the work for evaluation.

Academic integrity is important for two reasons. First, independent and original scholarship ensures that students derive the most from their educational experience and the pursuit of knowledge. Second, academic dishonesty violates the most fundamental values of an intellectual community and depreciates the achievements of the entire university community.

Accordingly, Northeastern University views academic dishonesty as one of the most serious offenses that a student can commit while in college. The following is a broad overview of what constitutes academic dishonesty, but is not meant to be an all-encompassing definition.

Cheating: Intentionally using or attempting to use unauthorized materials, information or study aids in any academic exercise.

Plagiarism: Intentionally or knowingly representing the words or ideas of another as ones own in any academic exercise without providing proper documentation of source by way of a footnote, endnote, or intertextual note.

Unauthorized Collaboration: This refers to instances when students, each claiming sole authorship, submit separate reports which are substantially similar to one another. While several students may have the same source material (as in case write-ups), the analysis, interpretation, and reporting of the data must be each individuals.