

CSCI 340-2: Data Structures and Algorithm Analysis

Spring 2010

Main course web site: <http://faculty.cs.niu.edu/~freedman/340/>

Section 2: TTh 9:30-10:45 AM in PM-251
Instructor: Dr. Reva Freedman, PM-558
Email: freedman@cs.niu.edu
Phone: (815) 753-6944 (during office hours only)
Office hours: TTh 2:00-3:50 PM, or by appointment
TA: Robert Heineman, 12-2 MWF, PM-254, 753-3935

Please also feel free to consult the TA (or the instructor) for section 3:

Instructor: Dr. Minmei Hou, PM-562, MWF 2:00-4:00 PM
TA: Glenn Reschke, 8-10 WF, 5-7 Tue, PM-256, 753-3955

Textbook: Adam Drozdek, *Data Structures and Algorithms in C++*, 3rd edition.

Contacting the instructor: The best way to contact me is in person, followed by email. I rarely pull the messages from my phone voice mailbox. I will be happy to talk to you about questions or concerns at any time. I encourage you to address small problems before they become big problems, not the day before the exam.

I try to respond to email by the next business day, but there are occasional exceptions. Questions that can be answered from reference material may not be answered. I generally do not debug programs via email.

Late-breaking news, e.g., errors in assignments, will be sent to your official university email address. I will add a second address if you prefer. It is your responsibility to ensure that you have space in your inbox and to check it regularly.

Class attendance: You are responsible for all material covered in class. Although I try to make material available online, this is not an online class, and you are responsible for material covered in class and announcements made in class. If you miss a class, you must get notes from another student before the next class, *not from the instructor*. Research has shown that students who attend class regularly do better regardless of other behaviors. Class participation is encouraged and will make the class more interesting for you and for the other students. If you have a question, there are probably three other people with the same question who are even more shy than you.

Class decorum: In classes for freshmen, I state the following rule on the syllabus: “No activity that interferes with learning is permitted in class. For example, talking, eating, cell phone use, newspaper reading, and regularly being late or leaving early are not permitted.” In more advanced classes, I assume it is not necessary to state such a rule explicitly, but it still remains in force.

Exams and quizzes: There will be three exams. Exams will be closed-book, closed-notes. Dates of the first two exams will be announced at least one week in advance. The first exam will probably be in mid-February (date TBD). The second exam will probably be in week 11 (Tue. Mar. 30). The third exam will be given during the final exam slot (Thurs. May 6, 10-11:50).

You are expected to take the exams on the assigned time and date. Missing an exam is an

extremely serious matter: makeup exams will only be given if *all* of the following requirements are satisfied: (a) an unavoidable reason (e.g. car accident), (b) advance notification, (c) written documentation, (d) permission of instructor, (e) for final exam, permission of department.

If you have another final exam at the same time, please let me know ASAP. Also please notify me ASAP if you meet the university's criterion for rescheduling a final exam, namely that you have three finals on the same day and this course is the highest-numbered of the three. The university deadline for scheduling a makeup final is Monday of the last week of classes, i.e., Mon., April 26. Documentation is required to schedule a makeup final.

Assignments: There will be 6–10 assignments. If there are written assignments, they must be turned in at the *beginning* of the class period to be considered on time. Print programs using non-proportional type (e.g., Courier) in at least 10 point size. You may use proportional type for answers to questions, but make sure the type size is at least as large as this handout (i.e., 12 point). *This means that you may not print 2-up.* Homework should be turned in on 8 1/2 x 11 paper and must be stapled together. The upper right corner of the first page should contain (a) your name, (b) CS340, (c) the assignment number, (d) the date. If you cannot attend class, written assignments will be considered on time if they are left under my office door provided they are received *before* class time. Late assignments will be accepted with 20% of the base points deducted for each 24 hours (or portion thereof) late. You are responsible for getting late assignments to the TA.

Programming assignments and other online work must be submitted by the deadline using the link provided. Programs must run on *turing/hopper* regardless of where you developed them. For full credit you must follow the coding and documentation standards on the web page. Late assignments will be accepted with 20% of the base points deducted for each 24 hours (or portion thereof) late.

Academic honesty: You are expected to do your own work on the homework, programs and exams. Cheating includes, but is not limited to, copying work from other students, copying work from other textbooks, copying work from the Internet, or helping others to do the same.

All cheating will result in the filing of an academic misconduct form and will affect your course grade, with the possibility of failing the course. Note that a second academic misconduct offense may result in your expulsion from the university.

We may use mechanized source comparison on the assignments.

Grading: The course grade will be based on the exams and assignments. The exams will count 60% of your grade (each exam will count 20%). The assignments will count 40% of your grade. The assignments will be weighted according to length and difficulty. A scale of 90/80/70/60 will be used. You must get at least 68% in each of the exam and assignment portions to pass the class.

Special needs: If you have individual circumstances such as a disability, religious holiday, etc., please feel free to contact me at any time for suitable accommodations. Please note that circumstances that apply to all students are generally *not* special circumstances.

Course Content and Assignments

The list below is a *guideline* only. Exact assignments, due dates, and reading assignments will be found on the course web sites.

1. Introduction: Role of algorithms in computing; abstract data types; encapsulation; inheritance; polymorphism; C++ and object-oriented programming
= ch. 1

Assignment: Inheritance and polymorphism

Assignment: C++ standard library, vector or list container

2. Complexity analysis: Computational and asymptotic complexity; big-O notation; omega and theta notations; the best, average, and worst cases
= ch. 2

3. The Standard Template Library: Containers (strings, vectors, lists, maps and multimaps, sets and multisets); iterators; algorithms
= ch. 1.7.2 (iterators), 7.1.8 (set), 7.1.9 (map), ch. 3 (linked lists in the STL), ch. 4 (stacks/queues in the STL), ch. 5 (recursion)

Assignment: Word scanner: string class; map container; iterators

Assignment: Sieve of Eratosthenes: algorithm to generate prime numbers; set container

Assignment: Linked lists in the STL

4. Binary Trees: Trees, binary trees, and binary search trees; tree traversals; insertion; deletion; balancing a tree (AVL trees); heaps
= ch. 6

Assignment: Binary tree class: binary trees; C++ class template for binary trees; operations on binary trees and tree traversals

Assignment: Binary search trees and tree sort: building binary search trees by inheritance; sorting values in binary search trees

5. Multiway Trees: B-trees and tries
= ch. 7

6. Sorting: Shell sort; heap sort; quicksort; mergesort; radix sort
= ch. 9

Assignment: Heapsort (or another efficient sorting algorithm)

7. Hashing: Hash functions; collision resolution; deletion
= ch. 10

Assignment: Hash table creation and use

8. Graphs: Graph representation and algorithms
= ch. 8

Assignment: Graph processing