Spring 2020

CS 114-004: Introduction to Computer Science II

James Calvin

New Jersey Institute of Technology
A Public Research University

CS 114.002-4-6 Intro. to Computer Science II, Spring 2020

Course Information

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Prerequisite

CS 113.

Course Goals

This course is an introduction to the study of data structures and algorithms, emphasizing implementations in the Java programming language. At the conclusion of the course, students will be able to solve problems using standard data structures and algorithms, and be able to bound the resources used by an algorithm.

Learning Outcomes

- The ability to write computer programs using standard data structures and algorithms.
- The ability to bound the resources used by an algorithm.

Textbooks

Data Structures & Algorithm Analysis in Java, Edition 3.2, by Clifford A. Shaffer, Dover, 2011. ISBN: 0486485811. You can access this book from the author's web page: `https://people.cs.vt.edu/shaffer/Book/JAVA3elatest.pdf`.

You may find the following textbook useful:

Data Structures and Algorithms in Java (fifth edition), by M. Goodrich and R. Tamassia, Wiley, 2010. ISBN 978-0-470-38326-1.

A somewhat more advanced text is

Introduction to Algorithms (second edition), by T. Cormen, C. Leiserston, R. Rivest, and C. Stein, The MIT Press, 2001. ISBN 0-262-03293-7.

Course Materials and Communications

We will be using the Canvas system (http://canvas.njit.edu). All class information will be posted there. You can post questions (and answers) there, and I will post occasional updates. All communications should be through Canvas.

If you have a personal issue that you wish to bring to my attention (for example a grading issue) you should speak to me in person, email, or call me. For other communications, you should use Canvas (for example, questions on homework or what will be on the exam).

Before each lecture I will post the homework assignment for the coming week. I will sometimes post sample programs. Before posting a program, I will verify that it works on an OSL machine. If you encounter trouble running one of these programs on an OSL machine, let me know. If a program does not run on your personal machine, you can post information on Canvas (the details of the software that you are using and the error(s) you see), and perhaps someone in the class will have a suggestion. However, there is no guarantee that anyone will be able to help you with your personal machine.

Grading

Homework will be assigned at the beginning of each lecture, and will be due by the beginning of lecture the following week. Typically, homework assignments will have a programming component and an analysis component. There will be a quiz during the recitation section each week, based on the previous week's work. You must bring your own computer to the recitations.

There will be a final exam, at a time that will be announced by the registrar later in the semester. The course grade will be based on the homework and in-class quizzes (70%) and final exam (30%). The lowest three quiz scores will be dropped. The grading scale (out of 100) is: $83-100$ A, $75-82$ B+, $65-74$ B, $50-64$ C+, $40-49$ C. I reserve the right to modify the scale.

In order to be excused from a component of the course that contributes to the final grade, you must supply documentation explaining your absence to the office of the dean of students, and they will in turn contact me. **Exception:** If you are sick on the day of the class, notify me by email *before* the start of class and you will be excused from the quiz on that day.

Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

`http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf`.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

All work that you submit must be your work only. Any evidence of cheating on a graded course component will result in a grade of zero for that component.

Course Outline

Week Topics

1. Introduction
2. Recursion
3. Math background, common functions

4. Algorithm analysis, asymptotic analysis
5. Lists
6. Stacks, queues
7. Dictionaries
8. Binary trees, search trees
9. Priority queues, heaps
10. Sorting
11. Sorting lower bound, linear-time sorting
12. Selection
13. Graphs
14. Graph algorithms