Computer Science E-22
Data Structures
Harvard Extension School, Fall 2017

Syllabus

Overview
A survey of fundamental data structures for information processing, including lists, stacks, queues, trees, and graphs. The course explores the implementation of these data structures (both array-based and linked representations) and examines classic algorithms that use these structures for tasks such as sorting, searching, and text compression. The Java programming language will be used to demonstrate the concepts discussed in lecture, and programming problems must be completed in Java. Key notions of object-oriented programming, including encapsulation and abstract data types, are emphasized.

Prerequisites
A good working knowledge of Java (at least a grade of B in CSCI E-10b or the equivalent). If your background is in another language, you will need to quickly come up to speed with Java, and you may want to consider first taking Computer Science E-10b. You should also consider taking E-10b if you have had little or no prior experience with object-oriented programming, array manipulation, or recursion.

Instructor
David G. Sullivan, Ph.D. (sullivan@post.harvard.edu)
Senior Lecturer on Computer Science, Boston University
office hours: after lecture, and by appointment

Teaching Assistants (see the course website for office hours)
Alex Breen (abreen@bu.edu)
Cody Doucette (doucette@bu.edu)
Kylie Moses (kylietmo@bu.edu)
Eli Saracino (esaracin@bu.edu)

Meeting Times and Places
lectures: Wednesdays, 7:40-9:40 p.m., Maxwell Dworkin G125
sections: weekly one-hour meetings; times and locations TBA
Distance-education students: The lectures will be streamed live online; in addition, recorded videos of the lecture will be available within 24-48 hours of the original lecture. The sections will also be available online. All of the other aspects of the course are “live.” This means that you are responsible for homework, exams, and all other work according to the posted dates. See the exam policy below for more information about exams.
Requirements
1. Problem sets: five assignments including a combination of written exercises and programming problems. All programming problems must be completed in Java, and they must compile and run in order to be eligible for full credit. Grad-credit students will complete additional work on most assignments.
2. Midterm exam
3. Final exam

Important note: The problem sets tend to be fairly time-consuming. Don’t wait until the last minute to begin them! You should plan on devoting approximately 10-20 hours of work per week. If you have other major time commitments, you should reconsider whether to take this course.

Graduate-credit students: Students taking the course for graduate credit must complete additional homework. On most problem sets, the problems required of all students will be worth a total of 100 points; grad-credit students will complete one or two additional problems worth a total of 10 points. These grad-credit problems are typically more challenging than the other problems, and thus grad-credit students should plan to spend approximately 20% more time on the homework.

Grading Policies
Late penalties: Homework is due prior to the start of lecture. If it is submitted more than 10 minutes after the start of lecture, it will be considered a full day late. There will be a 10% deduction for homework that is up to four days late, and a 20% deduction for homework that is 5-7 days late. We will not accept any homework that is more than 7 days late. Plan your time carefully, and don't wait until the last minute to begin an assignment. Starting early will give you ample time to ask questions and obtain assistance.

Determining the final grade: homework 50%, midterm 17%, final exam 33%
The exams will count for larger percentages if doing so improves your final grade. In addition, your final exam grade will replace your lowest assignment grade if doing so improves your final grade.

The final grades are not curved. The performance of the class as a whole is taken into account when assigning letter grades, but this can only improve your grade, not harm it.

Extensions and makeups will only be given in documented cases of serious illness or other emergencies. You cannot redo or complete extra work to improve your grade.

An EXT (extension) grade will be granted only in extreme circumstances (e.g., illness), and only when appropriate documentation has been provided. Please bring any such circumstances to Dr. Sullivan's attention as soon as possible.
Exam Policy for the Distance Education Program
If you are not able to come to campus to sit for the midterm or final exam, you must find a qualified proctor near your home to administer the exam in absentia in a proctored setting. Proctored exams must be taken within a 24-hour window that begins with the start time of the on-campus exam (i.e., sometime between 7:40 pm Wednesday and 7:40 pm Thursday, Eastern time). Information about your proctor must be submitted through online services no later than a week before the exam. More information can be found here: https://www.extension.harvard.edu/resources-policies/exams-grades-transcripts/exams-online-courses. Students should contact Academic Services, 617-495-0977, if they have any questions about this policy.

Academic Conduct
Unless otherwise stated, all work submitted as part of this course is expected to be your own. You may discuss the main ideas of a given problem with other students (provided that you acknowledge doing so in your solution), but you must write the actual solution by yourself. This includes both programming assignments and other types of problems that we may assign.

Prohibited behaviors include:

- copying all or part of another person's work, even if you subsequently modify it
- viewing all or part of another student's work
- showing all or part of your work to another student
- consulting solutions from past semesters, or those found in books or on the Web.

You are also responsible for understanding Harvard Extension School policies on academic integrity:
www.extension.harvard.edu/resources-policies/student-conduct/academic-integrity

Not knowing the rules, misunderstanding the rules, running out of time, submitting "the wrong version", or being overwhelmed with multiple demands are not acceptable excuses. There are no excuses for failure to uphold academic integrity.

If we believe that a student is guilty of academic dishonesty, we will refer the matter to the Administrative Board of the Extension School, who could require withdrawal from the course and suspension from all future work at the School.

Other Extension School Policies
We also expect you to know and adhere to the general policies and procedures of the Extension School. You can find more information here:
http://www.extension.harvard.edu/resources-policies

Accessibility Services
The Extension School is committed to providing an accessible academic community. The Accessibility Services Office offers a variety of accommodations and services to students with documented accessibility issues. For more information, please visit:
www.extension.harvard.edu/resources-policies/resources/disability-services-accessibility
Textbooks

- Computer Science E-22 coursepack. This will be available for download from the course website. More information will be given during the first lecture.
- Optional readings will be also given from the following book:
  This book is not required, but you may find it useful to purchase it. It will be available for purchase at the Harvard Coop, and it will also be on reserve in Grossman Library.

Schedule

<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Lecture topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>August 30</td>
<td>Introduction. Abstract data types and object-oriented programming</td>
</tr>
<tr>
<td>2</td>
<td>September 6</td>
<td>Recursion and backtracking</td>
</tr>
<tr>
<td>3</td>
<td>September 13</td>
<td>Sorting and algorithm analysis I</td>
</tr>
<tr>
<td>4</td>
<td>September 20</td>
<td>Sorting and algorithm analysis II Problem Set 1 due</td>
</tr>
<tr>
<td>5</td>
<td>September 27</td>
<td>Linked lists</td>
</tr>
<tr>
<td>6</td>
<td>October 4</td>
<td>Lists, stacks, and queues I Problem Set 2 due</td>
</tr>
<tr>
<td>7</td>
<td>October 11</td>
<td>Lists, stacks, and queues II</td>
</tr>
<tr>
<td>8</td>
<td>October 18</td>
<td>Midterm exam (first hour) State-space search (second hour)</td>
</tr>
<tr>
<td>9</td>
<td>October 25</td>
<td>Binary trees and Huffman encoding Binary search trees Problem Set 3 due</td>
</tr>
<tr>
<td>10</td>
<td>November 1</td>
<td>Balanced search trees (2-3 and B-trees) Heaps and priority queues</td>
</tr>
<tr>
<td>11</td>
<td>November 8</td>
<td>Heaps and priority queues (cont.) Hash tables</td>
</tr>
<tr>
<td>12</td>
<td>November 15</td>
<td>Graphs I Problem Set 4 due</td>
</tr>
<tr>
<td>13</td>
<td>November 22</td>
<td>Thanksgiving break. No class.</td>
</tr>
<tr>
<td>14</td>
<td>November 29</td>
<td>Graphs II</td>
</tr>
<tr>
<td>15</td>
<td>December 6</td>
<td>Wrap-up and review Problem Set 5 due</td>
</tr>
<tr>
<td>16</td>
<td>December 13</td>
<td>Final exam</td>
</tr>
</tbody>
</table>

Other important dates:
August 27: regular registration ends
September 5: late registration ends; course drop deadline for full-tuition refund
November 24: Last day to withdraw for a grade of WD (no refund)