Computer Science E-22
Data Structures

Harvard Extension School, Fall 2022

Syllabus
DRAFT – SUBJECT TO CHANGE

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 recursion. For a sense of the level of proficiency that is required, we encourage you to review the sample problems that are found here: https://cscie22.sites.fas.harvard.edu/problem_sets/sample.html

Instructor (see the course website for office hours)
David G. Sullivan, Ph.D. (dgs@bu.edu)
Master Lecturer on Computer Science, Boston University

Teaching Assistants: TBA

Key Dates
first day of class: Wednesday, August 31, 2022
final exam: Wednesday, December 14, 2022
See the detailed schedule at the end of this document for more information.

Meeting Times and Places
lectures: Wednesdays, 8-10 pm Eastern time, 1 Story Street 304.
sections: optional weekly one-hour meetings; times and locations TBA.
Students can attend in person on campus, participate live online at the time the class meets via web conference, or watch recorded video on demand. Recorded sessions are typically available within a few hours of the end of class and no later than the following business day.
COVID-19 Policies
Students who attend this course in person must comply with the Harvard Extension School mandatory COVID-19 immunization documentation policy. Please see the COVID-19 updates page for details. If you will not be coming to campus, documentation is not required.

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 (October 19; see below)
3. Final exam (December 14; see below)

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: problem sets 35%, midterm 25%, final exam 40%
Your final-exam grade will replace your lowest problem-set grade if doing so improves your final grade. A letter grade will be given in accordance with the Extension School's grading policy. 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.

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
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 8 pm Wednesday and 8 pm Thursday, Eastern time). Information about your proctor must be submitted through online services no later than a week before the exam. Students should contact Academic Services (academicservices@extension.harvard.edu) if they have any questions about this policy.

Academic Integrity
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 online.
- posting your work where others can view it (e.g., online)
- receiving assistance from others or collaborating with others during an exam, or consulting materials except those that are explicitly allowed.

You are also responsible for understanding Harvard Extension School policies on academic integrity and how to use sources responsibly. Violations of academic integrity are taken very seriously. Please review important information on academic integrity and student responsibilities here: https://extension.harvard.edu/for-students/student-policies-conduct/academic-integrity

Accessibility Services
The Extension School is committed to providing an accessible academic community. The Accessibility Services Office (ASO) is responsible for providing accommodations to students with disabilities. Students must request accommodations or adjustments through the ASO. Instructors cannot grant accommodation requests without prior ASO approval. It is imperative to be in touch with the ASO as soon as possible to avoid delays in the provision of accommodation.

The Extension School takes student privacy seriously. Any medical documentation should be provided directly to the ASO if a substantial accommodation is required. If you miss class due to a short-term illness, notify your instructor and/or TA but do not include a doctor's note. Course staff will not request, accept, or review doctor's notes or other medical documentation. For more information, please visit: https://www.extension.harvard.edu/resources-policies/accessibility-services-office-aso or contact accessibility@extension.harvard.edu.
Publishing or Distributing Course Materials
Students may not post, publish, sell, or otherwise publicly distribute course materials without the written permission of the course instructor. Such materials include, but are not limited to, the following: lecture notes, lecture slides, video, or audio recordings, assignments, problem sets, examinations, other students’ work, and answer keys. Students who sell, post, publish, or distribute course materials without written permission, whether for the purposes of soliciting answers or otherwise, may be subject to disciplinary action, up to and including requirement to withdraw from the Summer School. Further, students may not make video or audio recordings of class sessions for their own use without written permission of the instructor.

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 given from *Data Structures & Algorithms in Java, 2nd edition* by Robert Lafore (ISBN 9780672324536). This book is **not** required.

Schedule

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<tr>
<th></th>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>August 31</td>
<td>Introduction. Abstract data types and object-oriented programming</td>
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<td>2</td>
<td>September 7</td>
<td>Recursion and backtracking</td>
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<td>3</td>
<td>September 14</td>
<td>Sorting and algorithm analysis I</td>
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<td>4</td>
<td>September 21</td>
<td>Sorting and algorithm analysis II</td>
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<td><em>Problem set 1 due</em></td>
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<td>5</td>
<td>September 28</td>
<td>Linked lists</td>
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<td>6</td>
<td>October 5</td>
<td>Lists, stacks, and queues I</td>
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<td><em>Problem set 2 due</em></td>
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<td>7</td>
<td>October 12</td>
<td>Lists, stacks, and queues II</td>
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<td>8</td>
<td>October 19</td>
<td><strong>Midterm exam</strong></td>
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<td>9</td>
<td>October 26</td>
<td>Binary trees and Huffman encoding</td>
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<td>Binary search trees</td>
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<td><em>Problem set 3 due</em></td>
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<td>10</td>
<td>November 2</td>
<td>Balanced search trees (2-3 and B-trees)</td>
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<td>Heaps and priority queues</td>
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<td>11</td>
<td>November 9</td>
<td>Heaps and priority queues (cont.)</td>
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<td>Hash tables</td>
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<td>12</td>
<td>November 16</td>
<td>Graphs I</td>
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<td><em>Problem set 4 due</em></td>
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<td>13</td>
<td>November 23</td>
<td><strong>Thanksgiving break. No class.</strong></td>
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<td>14</td>
<td>November 30</td>
<td>Graphs II</td>
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<td>15</td>
<td>December 7</td>
<td>Wrap-up and review</td>
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<td><em>Problem set 5 due</em></td>
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<td>16</td>
<td>December 14</td>
<td><strong>Final exam</strong></td>
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Other important dates:
August 25: registration ends
September 6: course change period ends (last day to drop for 100% refund)
September 13: last day to drop for 50% refund
November 18: last day to withdraw for a grade of WD (no refund)