



2. Red-black trees
3. Left-leaning red-black trees
4. 2-3 trees
5. B-trees

### III. Dynamic programming

Dynamic programming is a technique that uses tables to store intermediate results of recursive algorithms for certain divide-and-conquer problems with overlapping subproblems.

### IV. Hashing

Hash maps and other structures that use hashing allow for fast (near constant time) for look-ups while still allowing the structure to grow and shrink easily. They represent a second way to address the searching problem. You have seen one approach to hashmaps in Programming II (specifically what's called "separate chaining"); we here consider other approaches.

- A. The map problem
- B. Separate chaining
- C. Hash functions
- D. Open addressing
- E. Coalesce chaining
- F. Perfect hashing

### V. Graphs

Many problems can be conceptualized as graph problems, and thus many useful algorithms can be built on variations of standard graph algorithms.

- A. Graph concepts
- B. Basic algorithms: Depth-first search and breath-first search
- C. Minimum spanning trees
- D. Shortest paths

### VI. String processing

A lot of data used in modern applications is textual data. String processing plays a crucial role in many of the common uses of computation today.

- A. Tries
- B. Substrings
- C. Compression

See the course website for a schedule.

## *Course procedures*

**HOW WE DO THIS COURSE.** Algorithms and data structures will be presented in class for discussion about their correctness and efficiency and to examine aspects of their implementation. In some cases the students will read about the concepts ahead of time to prepare for class discussion; at other times ideas will be presented first in class. Most of students' work is in projects in which they will implement the things we discuss in class. Occasionally there will be in-class lab

activities, quizzes, and smaller assignments. On tests, students will apply the things we have learned to new problems.

**GRADING.** There will be three tests, currently scheduled for Wed, Feb 25; Wed Apr 1; and Wed, May 6 (at 10:30, our exam block). The tests, including the test given during the exam block, will be “mostly non-cummulative,” meaning that they will be designed specifically to test only the material since the previous test, but may depend incidentally on earlier material.

<i>instrument</i>	<i>weight</i>
Projects	40
Tests	45 (3 15 each)
Other	15

... where *Other* comprises short assignments, in-class activities, quizzes, etc. Some of these may be graded for correctness, others may be marked as done or not.

**PROJECTS.** I estimate 7 projects in this course—one for each heading in the outline plus one for the “Heaps” excursus. See the schedule on the course website for approximate assignment and due dates. The project schedule may be subject to adjustment, and it is possible that some projects will overlap temporally.

### *Policies etc*

**ACADEMIC INTEGRITY.** Collaboration among students in the class is permitted on projects and assignments. Using *code* for projects from any outside resources (print, electronic, or human) is not permitted. Any *ideas* used in project from outside resources must be cited using the same standards as would be used in a research paper. On any assignment given from the textbook, no resources that specifically serve as solutions to exercises from the textbook may be used.

A project or assignment on which a student violates these policies will be rejected. Repeated offenses will be handled through the college’s official disciplinary procedures.

**LATE ASSIGNMENTS.** For *projects*, you are allowed a total of two late days during the course of the semester—either one assignment two days late or two assignments one day late each. Late projects beyond this will not be accepted.

No credit will be given for late homework problems.

**ATTENDANCE.** Students are expected to attend all class periods. It is courtesy to inform the instructor when a class must be missed.

**EXAMINATIONS.** Students are expected to take all tests, quizzes, and exams as scheduled. In the case where a test must be missed because of legitimate travel or other activities, a student should notify the instructor no later than one week ahead of time and request an alternate time to take the test. In the case of illness or other emergency preventing a student from taking a test as scheduled, the student should notify the instructor as soon as possible, and the instructor will make a reasonable accomodation for the student. The instructor is under no obligation to give any credit to students for tests to which they fail to show up without prior arrangement or notification in non-emergency situations. The final exam is Wednesday, May 6, 10:30 am. I do not allow students to take finals early (which is also the college’s policy), so make appropriate travel arrangements.

**GENDER-INCLUSIVE LANGUAGE.** The college requires the following statement to be included on all syllabi: *For academic discourse, spoken and written, the faculty expects students to use gender inclusive language for human beings.*

**SPECIAL NEEDS.** *Institutional statement:* Wheaton College is committed to providing reasonable accommodations for students with disabilities. Any student with a documented disability needing academic adjustments is requested to contact the Academic and Disability Services Office as early in the semester as possible. Please call 630.752.5941 or send an e-mail to [jennifer.nicodem@wheaton.edu](mailto:jennifer.nicodem@wheaton.edu) for further information.

*My own statement:* Whenever possible, classroom activities and testing procedures will be adjusted to respond to requests for accommodation by students with disabilities who have documented their situation with the registrar and who have arranged to have the documentation forwarded to the course instructor. Computer Science students who need special adjustments made to computer hardware or software in order to facilitate their participation must also document their needs with the registrar in advance before any accommodation will be attempted.

**OFFICE HOURS.** I try to keep a balance: Stop by anytime, but prefer my scheduled office hours. Any time my door is closed, it means I'm doing something uninterruptible, such as making an important phone call. Do not bother knocking; instead, come back in a few minutes or send me an email.

**DRESS AND DEPARTMENT.** Please dress in a way that shows you take class seriously—more like a job than a slumber party. (If you need to wear athletic clothes because of activities before or after class, that's ok, but try to make yourself as professional-looking as possible.) If you must eat during class (for schedule or health reasons), please let the instructor know ahead of time; we will talk about how to minimize the distraction.

**ELECTRONIC DEVICES.** Please keep laptops and all electronic devices put away and silenced during class. (That's right, this is a computer science course, but you're not allowed to use a computer during class. Trying out programming concepts on your own during class time (for example) is not productive because it takes you away from class discussion. You cannot multi-task as well as you think you can.) ***Text in class and DIE.***