CPSC 270: Algorithms
Spring 2010

Instructor: Dr. Jane Ingram  
Office Hours: Monday/Wednesday: 2:15 - 3:30 pm  
Tuesday/Thursday: 1:30 - 2:30 pm

Office: 365-A Trexler  
Phone: 375-2446  
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Office Hours: Also by appointment.  
Drop ins welcome!

Course Web Site: http://cs.roanoke.edu/Spring2010/CPSC270A


Course Objectives: This course is an introduction to advanced data structures and the design and analysis of algorithms. The course also provides an introduction to C++ (assuming a programming background in Java).

Intended Learning Outcomes: At the end of the course the successful student should be able to:

1. explain the design of standard algorithms studied in the course that use a variety of techniques including brute force, divide-and-conquer, decrease-and-conquer, transform-and-conquer, dynamic programming, and greedy approaches;
2. design algorithms using the various design techniques listed above;
3. perform a complete mathematical analysis of the computational complexity of algorithms;
4. analyze and implement (in C++) various algorithms studied in the course;
5. understand, and provide arguments for, the limitation of algorithms,
6. understand and be able to implement some strategies for coping with limitations of algorithms such as backtracking and branch-and-bound.

Prerequisites: CPSC 220; Familiarity with Java and Unix is assumed.

Attendance Policy: Class attendance is a very important aspect of a student's success in this course. The student is expected to attend every class and is accountable for any missed classes. Attendance at two Department of Mathematics, Computer Science, and Physics Conversation Series lectures is required (there will be several options).
**Grading Policy:** The course grade will be based on 3 tests, regular homework and lab activities, programming projects, the co-curricular requirement, and a comprehensive final examination with weights as follows:

<table>
<thead>
<tr>
<th>Grade Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests (3)</td>
<td>42%</td>
</tr>
<tr>
<td>Homework Assignments, Labs, &amp; Programming Projects</td>
<td>35%</td>
</tr>
<tr>
<td>Co-curricular</td>
<td>3%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Test Dates:**

- Test #1: Friday, February 5
- Test #2: Friday, March 12
- Test #3: Friday, April 9

*Final Exam: Friday, April 23 (8:30 - 11:30 am)*

**Grading Scale:**

- 93-100 A
- 83-86 B
- 73-76 C
- 63-66 D
- 90-92 A-
- 80-82 B-
- 70-72 C-
- 60-62 D-
- 87-89 B+
- 77-79 C+
- 67-69 D+
- below 60 F

**Make-up Policy:** Everyone is expected to take tests and the exam at the scheduled time. Make-ups will be given only for legitimate, documented absences and, if given, may be oral.

**Special Needs:** If you are on record with the College's Special Services as having special academic or physical needs requiring accommodations, please meet with me as soon as possible. We need to discuss your accommodations before they can be implemented. Also, please note that arrangements for extended time on exams and testing in a semi-private setting must be made at least one week before the exams. If you believe you
are eligible for accommodations but have not yet formally contacted Special Services, please call 375-2248 or drop by the Office of Academic Services in the Library.

Assignments: There will be several assignments including daily homework, both in-class and out-of-class labs and programming activities, and larger programming projects. These will vary in difficulty, amount of time required, and credit. Daily homework problems will be turned in the next class period after assigned unless otherwise specified. For daily work you will receive one grade based on effort (did you make a reasonable attempt at the problems) rather than correctness. However, a few of the problems (between 0 and 3) will be graded for correctness. On some (but not all - this policy is mainly for proofs) of these graded problems you will be given two tries. If a "two-try" problem is not perfect (logically correct and well-written) on the first try, it may be turned in again the next class (after being returned to you) to be re-graded. Such a problem will not be given a grade on the first try; there will only be comments.

Late Policy for Assignments, Labs, and Programming Projects: Unless otherwise specified, work is to be turned in at the beginning of class on the day it is due. Late homework and lab assignments will not be accepted. For programming projects, ten percent per calendar day (24 hours) will be deducted for late work; work will not be accepted if it is handed in more than 5 days late OR after the graded assignment or lab has been returned (whichever comes first).

Co-Curricular Requirement: The Department of Mathematics, Computer Science, and Physics is offering a series of lectures designed to engage the campus community in discussions of ongoing research, novel applications, and other issues that face these disciplines. You are invited to attend all of the events but participating in at least two is mandatory. Within one week of attending an event you must submit to Blackboard a one page, single-spaced, paper reflecting on the discussion. If you do not turn the paper in within the one week time frame you may not count that event as one you attended.

Academic Integrity: Students are expected to adhere to the policies in the "Academic Integrity at Roanoke College" Handbook. In particular, all tests, exams, quizzes, programming and computer assignments, and papers are to be the work of the individual student. You are encouraged to get help from the instructor if you need help with an assignment. The work you turn in must be your own. Using someone else's work or ideas as your own is plagiarism and an academic integrity offense. Examples of academic integrity violations include: copying a program or part of a program (even one line) from someone else, writing code for someone else, telling someone else how to solve a problem (such as telling someone the formula needed in a program or a spreadsheet) or having someone tell you how to solve a problem. Discussion among students should be limited to general concepts, not specific aspects of how to complete the assignment.

Electronic Devices and Academic Integrity: All cell phones and other electronic devices (including iPods and laptops) must be turned off prior to entering the classroom or lab. Any use of such a device during a test will be considered a breach of academic integrity. Handheld calculators may be used only with the permission of the instructor, and when permitted, may not be shared by students (each student must have his/her own).

Computer Use Policies: All students must abide by the Computer Use policies of the Roanoke College.
Failure to do so will result in involuntary withdrawal from the course.
Math 388 Topics in Mathematics: Computational Number Theory

Spring 2010

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Course Objectives: The primary objective is to further develop each student's mathematical thinking skills: the ability to recognize patterns, form hypotheses, test hypotheses through analysis and experimentation, verify hypotheses through proof. In the process of meeting the primary objective students will learn basic concepts of number theory, increase their ability to use Mathematica to explore and verify ideas and hypotheses in number theory, to write clear and correct proofs, increase their understanding of the role of number theory in cryptography and modern computer and network security.

Intended Learning Outcomes: At the end of the course the successful student will be able to:

1. generate a representative set of data to test a hypothesis about numbers (both by hand and using Mathematica) and draw a conclusion about the hypothesis from the data;
2. find patterns in sets and sequences of numbers and express the pattern in appropriate terminology or symbolic form;
3. write clear, logically correct proofs of theorems about numbers;
4. be able to apply fundamental number theory concepts in proofs, explorations, and applications (cryptography in particular).


Attendance Policy: Class attendance is a very important aspect of a student's success in this course. The student is expected to attend every class and is accountable for any missed classes.

Grading Policy: The grade in this course will be based on 2 in-class tests (with take-home components), homework assignments, attendance at 3 co-curricular lectures, and a comprehensive final examination. The weight given to each of these in determining the final grade is as follows:
<table>
<thead>
<tr>
<th>Grade Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests (2)</td>
<td>40%</td>
</tr>
<tr>
<td>Assignments</td>
<td>32%</td>
</tr>
<tr>
<td>Co-curricular</td>
<td>3%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>25%</td>
</tr>
</tbody>
</table>

**Test Dates:**

- Test #1: Wednesday, February 10
- Test #2: Friday, March 26
- Final Exam: Friday, April 23 (2:00 - 5:00 pm)

**Grading Scale:**

- 93-100 A
- 83-86 B
- 73-76 C
- 63-66 D
- 90-92 A-
- 80-82 B-
- 70-72 C-
- 60-62 D-
- 87-89 B+
- 77-79 C+
- 67-69 D+
- below 60 F

**Assignments:** Assignments in this course will include daily homework problems and additional longer-term assignments. In addition to routine problems designed to help you understand concepts there will be explorations (some on paper, some using Mathematica) and proofs. Daily homework problems will be turned in the next class period after assigned unless otherwise specified. For daily work you will receive one grade (up to 5 points) based on effort (did you make a reasonable attempt at the problems) rather than correctness. However a few of the problems (between zero and three) will be graded for correctness (each will receive up to 5 points). On some (but not all - this policy is mainly for proofs) of these graded problems you will be given two tries. If a "two-try" problem is not perfect (logically correct and well-written) on the first try, it may be turned in again in the next class (after being returned to you) to be re-graded. Such a problem will not be given a grade on the first try; there will only be comments. You may be required to type the second try.

**Late daily homework will not be accepted.** Re-writes (the 2nd try) will be accepted up until 5 p.m. on the due date but not after that. Students may be called on to present some non-handin problems in class.

**Co-Curricular Requirement:** The Department of Mathematics, Computer Science, and Physics is offering a series of lectures designed to engage the campus community in discussions of ongoing research, novel applications, and other issues that face these disciplines. You are invited to attend all of the events but participating in at least three is mandatory. Within one week of attending an event you must submit (to Blackboard) a one page, single spaced, paper reflecting on the discussion. If you do not turn the paper in within the one week time frame you may not count that event as one you attended.
**Make-up Policy:** Everyone is expected to take tests and the exam at the scheduled time. Make-up tests will be given only for legitimate, documented absences and, if given, may be oral.

**Academic Integrity:** Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be strictly the work of the student unless otherwise specified by the instructor. The polices as outlined in the Academic Integrity handbook will be strictly enforced in this course.