DATA STRUCTURES, ALGORITHMS AND DISCRETE MATHEMATICS

Instructor: Dr. Sorina Dumitrescu, ITB-A222
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Lectures: Tuesday, Thursday, Friday 8:30-9:20, ITB/137
Tutorials: T01: Friday 9:30-11:20 ABB/271
T02: Tuesday 11:30-13:20 TSH/B106
T03: Tuesday 14:30-16:20 BSB/120

COURSE OBJECTIVES:
To provide a foundation of the concepts of data abstraction, algorithm design and performance estimation. The main topics to be discussed are:

1) Algorithm performance estimation using asymptotic complexity analysis.
2) The use and implementation of elementary data structures such as lists, stacks, queues, trees, binary search trees and hash tables.
3) Efficient algorithms for searching and sorting.

REQUIRED MATERIALS:
2) An i>clicker remote.

ADDITIONAL REFERENCES - NOT REQUIRED:
1) M. T. Goodrich, R. Tamassia, *Data structures & Algorithms in Java*
2) A. V. Aho, J. E. Hopcroft, J. D. Ullman, *Data structures and algorithms*, Addison-Wesley,
4) Any good references on program design and on the Java programming language.

OUTLINE: ◇ REVIEW:
Java programming language review, brief math review.

◇ ALGORITHM COMPLEXITY ANALYSIS:
Space and time complexity, asymptotic notation, examples.

◇ RECURSION
Recursive algorithms, their space and time complexity analysis, divide and conquer method.

◇ LISTS:
Basic operations, array-based implementation, linked lists.
Stacks and Queues:
Operations, array and linked-list implementations, applications.

Trees:
Operations, pointer-based and array-based implementations.

Searching and Hashing:
Linear search, binary search, binary search trees, hash tables.

Sorting Algorithms:
Insertion sort, bubble sort, merge sort, quicksort, heaps, heap sort.

(Time permitting) Graphs. Algorithms on Graphs:
Representation of graphs, paths, spanning trees, Dijkstra’s Algorithm, Prim’s Algorithm.

Course Web Page:
This course will be administered via Avenue to Learn. To access the course’s Avenue to Learn page go to http://avenue.mcmaster.ca/

Please DO NOT send emails to the instructor or TAs via Avenue, but only using your and their McMaster email addresses.

Assessment:
Assignments – 15% (3 individual programming assignments)
Midterm Test – 25%
Class Participation – 5%
Quizzes – 5%
Final Exam – 50%.

The midterm test is two hours long. The final exam is three hours long. When computing the final course grade, the midterm mark will be replaced by the final exam mark if the latter is higher.

The mark for class participation is for participation in lecture sessions. This will be assessed using i>clickers. Students will have a participation mark assigned to each lecture based on the number of questions answered using the i>clicker. The overall participation mark will be the average of the best 85% marks for individual lectures. No excuses are accepted for missed lectures, i>clicker malfunction, forgetting to bring the i>clicker to class, lost i>clicker, etc. The instructor reserves the right to assign a participation mark of zero for the entire lecture to any student who is caught performing other activities instead of paying attention to the lecture (for instance playing computer games, texting, reading, working on assignments for other courses, etc.).
Quizzes will be administered during lectures using i>clickers, one quiz every week, starting the second week. The overall quizzes mark will be the average of the best 85% of the individual quiz marks. No excuses are accepted for missed quizzes, i>clicker malfunction, forgetting to bring the i>clicker in class, lost i>clicker, etc.

Attention! Using another student’s i>clicker to answer on his/her behalf, or lending your i>clicker to another student for him/her to answer on your behalf, represent instances of academic dishonesty. Any student caught doing so at least once will receive a ”class participation” mark of zero for the whole course and, additionally, a ”quizzes” mark of zero for the whole course if the incident happens during a quiz session. Additionally, the incident will be reported to the Office of Academic Integrity.

Important:
The instructor reserves the right to choose the format (i.e. written or oral) of any deferred or missed work, midterms, or exams in this course.

Assignment/Test Assessment:
If you believe there is an error in grading your assignment/test, provide a written explanation of the error and resubmit.

Calculators:
The use of calculators or other electronic devices will not be permitted during tests and examinations.

Clickers:
This course will be using the i>clicker system, and all students taking this course are required to use i>clicker remotes. Each student must have his/her own i>clicker. The same i>clicker can be used for all courses. Students who do not already have one, may purchase it from McMaster bookstore. Students are expected to do the following:
1. Register the i>clicker at http://www.iclicker.com/registration/ prior to the second lecture. You must use your MacID where the ”Student ID” is requested. DO NOT use your student number.
2. Bring the i>clicker to all lectures.
3. Maintain the i>clicker in working condition throughout the course.
4. Attach a label to your i>clicker with your name so that you will not confuse your i>clicker with someone else’s.
5. Record the serial number of your i>clicker in case it is rubbed off.

Attention! Using another student’s i>clicker to answer on his/her behalf, or lending your i>clicker to another student for him/her to answer on your behalf, represent instances of academic dishonesty.
ACADEMIC DISHONESTY: Academic dishonesty will be taken very seriously. Any copying of assignments etc. will be reported to the Office of Academic Integrity. Both the copyee and the copyor will be reported. On the first offence, the standard penalty is a zero on the work in question. Subsequent offences are much more serious: the student is typically assigned an F in the course, with a transcript notation indicating the F is for academic dishonesty. The University Senate Resolutions on Academic Dishonesty states:

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means. In an academic setting this may take any number of forms such as copying or use of unauthorized aids in tests, assignments, examinations, lab reports, term papers, or cases; plagiarism; talking during in-class examinations; submission of work that is not your own without citation; submission of work generated for another course without prior clearance by the instructor of both courses; submission of work generated by another person; aiding and abetting another student's dishonesty; and giving false information for the purpose of gaining admission or credits; and forging or falsifying McMaster University documents. No excuses for violation of this policy, including ignorance of the policy, are accepted. For more information, please visit:

http://www.mcmaster.ca/policy/ac_ethics.htm
http://www.mcmaster.ca/academicintegrity/students.cfm

ANNOUNCEMENTS: Please note that announcements concerning any type of graded material may be in any format (e.g. announcements may be made only in class). Students are responsible for completing the graded material regardless of whether they received the announcement or not.

What this means is that if you skip a class and an announcement for a quiz, lab, test, etc. is made in that class, then you are still responsible for that material. If you miss it, then you get a zero.

FACULTY OF ENGINEERING POLICY REMINDERS:

The Faculty of Engineering is concerned with ensuring an environment that is free of all adverse discrimination. If there is a problem, that cannot be resolved by discussion among the persons concerned, individuals are reminded that they should contact the Department Chair, the Sexual Harassment Officer or the Human Rights Consultant, as soon as possible.

Students are reminded that they should read and comply with the Statement on Academic Ethics and the Senate Resolutions on Academic Dishonesty as found in the Senate Policy Statements distributed at registration and available in the Senate Office.

Academic dishonesty consists of misrepresentation by deception or by other fraudulent means and can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of
F assigned for academic dishonesty”), and/or suspension or expulsion from the university. It is your responsibility to understand what constitutes academic dishonesty. For information on the various kinds of academic dishonesty please refer to the Academic Integrity Policy, specifically Appendix 3, located at

http://www.mcmaster.ca/senate/academic/ac_integrity.htm

The following illustrates only three forms of academic dishonesty:

1. Plagiarism, e.g. the submission of work that is not one’s own or for which other credit has been obtained.

2. Improper collaboration in group work.

3. Copying or using unauthorized aids in tests and examinations.