THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

Course Number - ACS-2947/3-001
Course Name - Data Structures and Algorithms

1 Instructor Information

Instructor:	Alex Brodsky	**Office:**	3D17
E-mail:	acs2947@acs.uwinnipeg.ca	**Office Hours:**	TBA
Class Meeting Time:	Tuesday and Thursday, 10:00-11:15	**Room No:**	4C84
Course Group:	Email acs2947@acs.uwinnipeg.ca to receive an invite.		
Course Homepage:	www.soyuz.acs.uwinnipeg.ca/~abrodsky/2947		

2 Important Dates

1. Midterm Exam: October 21, 2008
2. Final Exam: December 15, 2008, 9:00 - 12:00
3. Final Withdrawal Date w/o academic penalty: October 24, 2008
4. Assignment deadlines: due at 5pm on September 25, October 13, November 6, and November 27.

3 Course Objectives and Learning Outcomes

This course provides an introduction to the theory and application of data structures and algorithm design. Students will be introduced to basic abstract data types such as stacks, queues, sequences, dictionaries, and graphs. Students will learn how these data types can be implemented using elementary data structures such as arrays, linked lists, trees, heaps, skip lists, hash tables, and adjacency lists. Students will also learn the algorithms used to manipulate these data structures and how to analyze the complexity of these algorithms. The course will also introduce the students to general techniques for designing algorithms such as iterative methods, recursion, divide and conquer, and dynamic programming.

4 Evaluation Criteria

1. Four Assignments (30%)
   - Assignment 1, due September 25
   - Assignment 2, due October 16
   - Assignment 3, due November 6
   - Assignment 4, due November 27

   Information about assignments
   - **Late assignments will not be accepted.**
   - Assignments need to be submitted both in paper and by email.
   - All assignments are in English.

2. Midterm Exam (20% or 0%)
    - The midterm is optional.
    - If you choose not to write the midterm or do better on the final exam then your midterm will be worth 0% and your final will be worth 70%.
3. Final Exam (50% or 70%)

Note: The instructor reserves the right to adjust a student's evaluation criteria, with the student's consent, if the instructor deems than an adjustment is warranted.

5 Exam Requirements

- Photo ID is required.
- No dictionaries, notes, calculators, talking slide rulers, or other electronic aids allowed.

6 Required Text

Goodrich & Tamassia, "Data Structures and Algorithms in Java, 4th ed.", 2006, John Wiley & Sons Inc., ISBN 0-471-73884-0. The 2nd or 3rd edition of this book is also acceptable, but may not have all the material covered in the 4th edition.

7 Prerequisite Information

A grade of at least C in ACS-1904/3 or ACS-1905/3. Note: MATH-1401/3 is a corequisite of ACS-2947/3.

Make sure that you have the necessary prerequisites to take this course. If you have not successfully completed the above listed courses, it is in your interest to go to the student registration office and officially drop the course. Otherwise, the registration office will do it on your behalf.

8 Misuse of Computer Facilities, Plagiarism, and Cheating

Academic dishonesty is a very serious offense and will be dealt with in accordance with the University's discipline bylaw. Be sure you have read and understood Chapter 7, section 7a in the 2008/2009 UW General Calendar.

Students caught cheating on an assignment or an exam will be assigned a mark of **0** for that assignment. Furthermore, the case will be forwarded to the department chair for further prosecution resulting in a possible suspension or expulsion from the university.

Do not cheat or plagiarize!

To avoid the possibility of plagiarism here are some rules of thumb that you should follow.

1. Put away pens, pencils, and keyboards when discussing the problem with others.
2. Acknowledge all help that you received on the assignment in an acknowledgments section at the end of your write-up.
3. Look at other code all you want, but do not copy it.
4. If you are unsure about something ask the instructor!

9 Tentative List of Topics to be Covered

1. Simple Data Structures and Recursion
   - arrays, linked lists, and doubly linked lists
   - recursion
2. Analytic Tools
   - algorithmic complexity
   - asymptotic analysis
   - big-O notation
3. Simple Abstract Data Types
   - Stacks
   - Queues
   - Deques
4. Trees
   - general trees
   - traversals
   - binary trees
   - binary search trees
5. Dictionaries
   - list-based dictionaries
   - hash tables
   - skip lists
6. Priority Queues
   - list-based priority queues
   - heaps
7. Graphs
   - representing graphs
   - traversing graphs
   - directed and weighed graphs
   - shortest path algorithms
   - minimum spanning trees
8. Searching and Sorting
   - sorting lists
   - sorting arrays
   - radix sort
   - union-find