Data Structures and Algorithms – (COMP SCI 2C03)
Winter 2021
Course Outline

January 11, 2021

Instructor: Dr. Neerja Mhaskar
Email: pophlin[at]mcmaster[dot]ca
Office Hours: Thurs., 1:30 – 2:30pm (starts on Jan 14th, 2021)
Course URL: http://avenue.mcmaster.ca/

Lectures and Tutorials:

Lectures on Ms Team:
Wed., 3:30pm – 5:20pm (1 hour 50 minutes)
Fri., 3:30pm – 4:20pm (50 minutes)

Tutorials on Ms Team:
T01, T02: Mon., 11:30am - 12:20pm, headed by TBA
T03: Mon., 1:30am – 2:20pm, headed by TBA

Teaching Assistants:

[-] Morteza Alipour Langouri: alipoum@mcmaster.ca
[-] TBA
[-] Victor Chen: chenv5@mcmaster.ca
[-] Tianyi Zhang: zhangt73@mcmaster.ca

Calendar Description:

Basic data structures: stacks, queues, hash tables, and binary trees; searching and sorting; graph representations and algorithms, including minimum spanning trees, traversals, shortest paths; introduction to algorithmic design strategies; correctness and performance analysis.

Prerequisites: COMPSCI 1DM3 or 2DM3; COMPSCI 1XC3 or 1XD3 or 1MD3. In addition to these prerequisites students should have basic knowledge of discrete mathematics and basic programming skills.

Antirequisites: SFWRENG 2C03

Learning Objectives: Students should know and understand

- Worst case analysis of algorithms
- Basic searching algorithms (elementary sorts, quicksort, mergesort, heapsort)
- Basic sorting algorithms (binary search, search trees, hashing)
- Elementary data structures (stacks, queues, priority queues, search trees, heaps, hash tables, tries, graph representations)
- Graph algorithms (topological sort, breadth/depth-first-search, strongly connected components, minimum spanning trees, shortest paths)
- Basic string algorithms
- FSA's and Regular expressions

Students should be able to:

- Analyze the running time of algorithms
- Identify the time/space trade-offs in designing data structures and algorithms
- Given a problem such as searching, sorting, graph and string problems, select from a range of possible algorithms, provide justification for that selection

- Understand implementation issues for the algorithms studied
- Reduce a given application to (or decompose it into) problems already studied

Textbook:

- R. Sedgewick, K. Wayne, Algorithms, 4th Ed., Addison-Wesley 2011.

Other texts that might be useful:

- T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein, Introduction to Algorithms, 3rd Ed., McGraw Hill, 2001 – this is an encyclopedia of algorithms, preferred reference book,
- J. Kleinberg, E. Tardos, Algorithm design, Addison-Wesley 2005 – more devoted to algorithms, assume knowledge of basic data structures,
- M. Soltys, An Introduction to the Analysis of Algorithms, 2nd Ed., World Scientific – excellent compact book that concentrates on the analysis of algorithms.

The course may not always follow the text-book closely.

Marking Scheme:

- Mid-terms: 40% (2 mid-terms worth 20% each)
- Assignments: 30% (3 assignments worth 10% each)
- Final Exam: 30%

Announcements:

All announcements and course related communications will be posted on the course website. It is your responsibility to check the course website (in particular the Announcements section) on a regular basis.

Tutorials:

Tutorials are on Mondays every week. TAs will lead the tutorials.

Assignments:

Assignments are 30% of your grade. You will have three assignments worth 10% each of your grade. Assignments may be done individually or in groups of two. However, if you choose to do in a group of two, the groups will be decided at the beginning of your term and cannot change later during the term. You may choose your own partner.

No late assignments are accepted.

You may discuss the general ideas and concepts of the course material with your classmates However, your assignments/labs must be your individual effort. You may consult other sources, such as textbooks, but all such sources must be documented. Failure to do so will result in academic dishonesty charges.

Exams:

Mid-term constitutes 40% of your grade. You will have two mid-terms worth 20% each of your grade. The mid-terms will be 60 minutes exams each. The final exam constitutes 30% of your grade, and will be for 2 hours. Since, the term is conducted in an on-line format, extra time will be given for all exams.

Important:

- Missed work will be given a mark of zero, unless an MSAF is provided.
- If you MSAF an assignment, its weight will be moved towards your final exam. If you MSAF Mid-term I, its weight will be moved to Mid-term 2. If you MSAF mid-term II, its weight will be moved to the final exam. If you MSAF both the mid-terms their weight will be moved to the final exam.
- Any issues with your marks/grade for labs/assignments/mid-term/final exam must be reported and discussed within one week of the distribu-

tion of marks. Any re-grading request after this period will not be considered.

Please note:

The instructor and university reserve the right to modify elements of the course during the term. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given with explanation and the opportunity to comment on changes. It is the responsibility of the student to check their McMaster email and course websites weekly during the term and to note any changes. All students are expected to adhere to McMaster University's academic integrity policies.

Policy Reminder:

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity. It is your responsibility to understand what constitutes academic dishonesty.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour 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. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at https://secretariat.mcmaster.ca/university-policies-procedures-guidelines/.

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.

AUTHENTICITY/PLAGIARISM DETECTION

Some courses may use a web-based service (Turnitin.com) to reveal authenticity and ownership of student submitted work. For courses using such software, students will be expected to submit their work electronically either directly to Turnitin.com or via an online learning platform (e.g. A2L, etc.) using plagiarism detection (a service supported by Turnitin.com) so it can be checked for academic dishonesty.

Students who do not wish their work to be submitted through the plagiarism detection software must inform the Instructor before the assignment is due. No penalty will be assigned to a student who does not submit work to the plagiarism detection software. All submitted work is subject to normal verification that standards of academic integrity have been upheld (e.g., on-line search, other software, etc.). For more details about McMaster's use of Turnitin.com please go to www.mcmaster.ca/academicintegrity.

COURSES WITH AN ON-LINE ELEMENT

Some courses may use on-line elements (e.g. e-mail, Avenue to Learn (A2L), LearnLink, web pages, capa, Moodle, ThinkingCap, etc.). Students should be aware that, when they access the electronic components of a course using these elements, private information such as first and last names, user names for the McMaster e-mail accounts, and program affiliation may become apparent to all other students in the same course. The available information is dependent on the technology used. Continuation in a course that uses on-line elements will be deemed consent to this disclosure. If you have any questions or concerns about such disclosure please discuss this with the course instructor.

ONLINE PROCTORING

Some courses may use online proctoring software for tests and exams. This software may require students to turn on their video camera, present identification, monitor and record their computer activities, and/or lock/restrict their browser or other applications/ software during tests or exams. This software may be required to be installed before the test/exam begins.

CONDUCT EXPECTATIONS

As a McMaster student, you have the right to experience, and the responsibility to demonstrate, respectful and dignified interactions within all of our living, learning and working communities. These expectations are described

in the Code of Student Rights & Responsibilities (the "Code"). All students share the responsibility of maintaining a positive environment for the academic and personal growth of all McMaster community members, whether in person or online.

It is essential that students be mindful of their interactions online, as the Code remains in effect in virtual learning environments. The Code applies to any interactions that adversely affect, disrupt, or interfere with reasonable participation in University activities. Student disruptions or behaviours that interfere with university functions on online platforms (e.g. use of Avenue 2 Learn, WebEx or Zoom for delivery), will be taken very seriously and will be investigated. Outcomes may include restriction or removal of the involved students' access to these platforms.

ACADEMIC ACCOMMODATION OF STUDENTS WITH DISABILITIES

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS)at sas@mcmaster.ca or 905-525-9140 ext. 28652 to make arrangements with a Program Coordinator. For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

REQUESTS FOR RELIEF FOR MISSED ACADEMIC TERM WORK

McMaster Student Absence Form (MSAF): In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

ACADEMIC ACCOMMODATION FOR RELIGIOUS, INDIGENOUS OR SPIRITUAL OBSERVANCES (RISO)

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students should submit their request to their Faculty Office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations. Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

COPYRIGHT AND RECORDING

Students are advised that lectures, demonstrations, performances, and any

other course material provided by an instructor include copyright protected works. The Copyright Act and copyright law protect every original literary, dramatic, musical and artistic work, including lectures by University instructors. The recording of lectures, tutorials, or other methods of instruction may occur during a course. Recording may be done by either the instructor for the purpose of authorized distribution, or by a student for the purpose of personal study. Students should be aware that their voice and/or image may be recorded by others during the class. Please speak with the instructor if this is a concern for you.

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.