



THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

Course Number: GACS-7101-001
Course Name: Advanced Data Structure and Algorithms
Course Webpage: Nexus (<https://nexus.uwinnipeg.ca/d2l/home/30612>)

Instructor Information

Instructor: Dr. Mary Adedayo
E-mail: m.adedayo@uwinnipeg.ca
Office Hours: Wednesdays 11:30 – 1:00 pm via Zoom
Class meeting time: Tuesdays/Thursdays 1:00 – 2:15 pm via Zoom/Online

Important Dates

1. First Class: Tuesday, September 8, 2020
2. Reading Week (no classes): October 11-17, 2020
3. Midterm Test: Tuesday, October 27, 2020
4. Final Withdrawal Date w/o academic penalty*: Tuesday, November 17, 2020
5. Last Class: Thursday, December 3, 2020
6. Final Exam (Comprehensive): *TBD*
7. University closures: Thanksgiving Monday, October 12, 2020
Remembrance Day Wednesday, November 11, 2020

*A minimum of 20% of the work on which the final grade is based will be evaluated and available to the student before the voluntary withdrawal date.

Course Objectives / Learning Outcomes

In this course, students will study methods for designing efficient data structures and algorithms such as binary search trees, red-black trees, priority queues, minimum spanning trees, strongly connected components, maximum flows, string matching and tree matching, as well as bipartite graphs. Through the study of these data structures and algorithms, students will develop skills to solve hard problems in specialized databases such as Web and Document, DNA and Deductive Databases.

Remote Learning

Lectures will be a combination of both live and pre-recorded lectures. Days on which there will be no live lectures will be announced and the pre-recording will be available on Nexus. Students must be available via Zoom during class times.

All course material including lecture notes/slides and videos, sample code and assignment details will be available on Nexus. Class times are reserved for lectures, discussions, Q&A, and for office hours, as necessary.

For all Zoom interactions:

- Students must display their real/full name.
- Use of Video is optional (except for midterm and the final exams).
- Participants must be muted when not speaking.
- Students may interact via chat, voice or gestures.

Students can find answers to frequently asked questions related to remote learning here: <https://www.uwinnipeg.ca/covid-19/remote-learning-faq.html>.

Evaluation Criteria

1. Assignments (20%)
 - 3 assignments (equally weighted). Due dates will be posted on Nexus.
 - All programming work should be done in JAVA and written work must be in PDF format.
 - Assignments will be submitted electronically via Nexus. Further details about each assignment will be stated in the assignment document.
 - Assignments will be accepted up to 1 day late with a 25% penalty.

Students are responsible for backing up and protecting their work.

2. In class participation and discussions (10%)
 - Some lectures will be designed as a discussion of algorithmic problems. Student contributions in these discussions, and participation in the class will be graded. More information about discussions will be provided in the lectures.
 - Students may be asked to write a report of discussions on specific algorithmic problems. More information about the report and the problems will be provided in the lectures.
3. Midterm Test (25%)
 - During the regular class times on October 27.
4. Final Exam (45%)
 - Cumulative

Students should contact the instructor as soon as possible if extenuating circumstances require missing a lab, assignment, test, or examination. A medical certificate from a practicing physician may be required before any adjustments are considered.

Test / Exam Requirements

- Photo ID is required for the midterm and final exams.
- Midterm and final exams will be delivered via Nexus. Students must have video capability and be prepared to present their student ID.
- Midterm and final exams are open book.
 - Students are permitted to view only the following authorized course material:
 - Class notes, slides, recordings, sample code, assignment descriptions and solutions posted by the instructor.
 - Course textbook.
 - Student’s own course notes and assignment submissions.
 - Students may use an external tool such as an IDE or text editor to answer questions before entering them into the exam.
 - Students may contact the instructor to ask questions.
 - External resources (or any material not listed above) are NOT PERMITTED.
 - Communication with others (except the instructor) is NOT PERMITTED.
 - All work must be entirely the students’ own. Collaboration or sharing of work is NOT PERMITTED.

Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams (e.g., private space) or during lectures/laboratories (e.g., note-takers) are encouraged to contact Accessibility Services (AS) at 204-786-9771 or accessibilityservices@uwinnipeg.ca to discuss appropriate options. All information about a student’s disability or medical condition remains confidential.

<https://www.uwinnipeg.ca/accessibility-services>.

Students may choose not to attend classes or write examinations on holy days of their religion, but they must notify their instructors at least two weeks in advance. Instructors will then provide opportunity for students to make up work examinations without penalty. A list of religious holidays can be found in the 2019-20 Undergraduate Academic Calendar online at

<http://uwinnipeg.ca/academics/calendar/docs/important-notes.pdf>

Final Letter Grade Assignment

Historically, numerical percentages have been converted to letter grades using the following scale. However, instructors can deviate from these values based on pedagogical nuances of a particular class, and final grades are subject to approval by the Department Review Committee.

A+	90 – 100%	B+	75 – 79%	C	60 – 64%
A	85 – 89 %	B	70 – 74%	D	50 – 59%
A-	80 – 84%	C+	65 – 69%	F	below 50%

Required Textbook / Reading List

- Cormen, Leiserson, Rivest and Stein, *Introduction to algorithms, 3rd Edition*, The MIT Press, 2009.
- Class notes/slides will be available on Nexus.

Besides the information contained in the main text, the instructor may also distribute papers, and discuss appropriate material and examples from other sources. Students are responsible for all material covered in the class.

Optional Textbook

- Jeffrey D. Ullman, Alfred V. Aho, and John E. Hopcroft, *The Design and Analysis of Computer Algorithms*, Addison-Wesley Publishing Com., London, 1969

Prerequisite Information

- Consent of Department Graduate Program Committee Chair or Instructor.

Regulations, Policies, and Academic Integrity

Academic dishonesty is a very serious offense and will be dealt in accordance with the University's policies.

Avoiding Academic Misconduct: Students are encouraged to familiarize themselves with the Academic Regulations and Policies found in the University Academic Calendar at:

<https://uwinnipeg.ca/academics/calendar/docs/regulationsandpolicies.pdf>

Particular attention should be given to subsections 8 (Student Discipline), 9 (Senate Appeals) and 10 (Grade Appeals). Please note, in particular, the subsection of Student Discipline pertaining to plagiarism and other forms of cheating.

Detailed information can be found at the following:

- Academic Misconduct Policy and Procedures: <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-policy.pdf> and <https://www.uwinnipeg.ca/institutional-analysis/docs/policies/academic-misconduct-procedures.pdf>
- UW Library video tutorial "Avoiding Plagiarism"
<https://www.youtube.com/watch?v=UvFdxRU9a8g>

Uploading essays and other assignments to essay vendor or trader sites (filesharing sites that are known providers of essays for use by others who submit them to instructors as their own work) involves "aiding and abetting" plagiarism. Students who do this can be charged with Academic Misconduct.

Non-academic misconduct: Students are expected to conduct themselves in a respectful manner on campus and in the learning environment irrespective of platform being used. Behaviour, communication, or acts that are inconsistent with a number of UW policies could be considered “non-academic” misconduct. More detailed information can be found here:

- Respectful Working and Learning Environment Policy
<https://www.uwinnipeg.ca/respect/respect-policy.html>,
- Acceptable Use of Information Technology Policy
<https://www.uwinnipeg.ca/institutional-analysis/docs/policies/acceptable-use-of-information-technology-policy.pdf>
- Non-Academic Misconduct Policy and Procedures: <https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-policy.pdf> and <https://www.uwinnipeg.ca/institutional-analysis/docs/student-non-academic-misconduct-procedures.pdf>.

Copyright and Intellectual Property: Course materials are the property of the instructor who developed them. Examples of such materials are course outlines, assignment descriptions, lecture notes, test questions, and presentation slides—irrespective of format. Students who upload these materials to filesharing sites, or in any other way share these materials with others outside the class without prior permission of the instructor/presenter, are in violation of copyright law and University policy. Students must also seek prior permission of the instructor/presenter before, for example, photographing, recording, or taking screenshots of slides, presentations, lectures, and notes on the board. Students found to be in violation of an instructor’s intellectual property rights could face serious consequences pursuant to the Academic Misconduct or Non-Academic Misconduct Policy; such consequences could possibly involve legal sanction under the Copyright Policy

https://copyright.uwinnipeg.ca/docs/copyright_policy_2017.pdf

Privacy

Students have rights in relation of the collecting of personal data the University of Winnipeg:
<https://www.uwinnipeg.ca/privacy/admissions-privacy-notice.html>.

More information:

- Zoom and Privacy: <https://www.uwinnipeg.ca/privacy/zoom-privacy-notice.html>
- Testing/Proctoring: <https://www.uwinnipeg.ca/privacy/zoom-test-and-exam-proctoring.html>.

Email Communication

Emails from accounts at uwinnipeg.ca are usually not filtered by the UofW email filter. Thereby it is strongly recommended that electronic communication is done using your UofW email account to minimize the risk of filtering.

When emailing the instructor, you must include your full name, your student number, and the course number (with section) in the subject line or body of your email. You are to use the UofW Webmail system, i.e. *webmail.uwinnipeg.ca* to communicate with the instructor. **Do not** use the Nexus email system, i.e. *mail.nexus.uwinnipeg.ca*, Nexus mailbox are not monitored on a regular basis.

Class Cancellation, Correspondence with Students and Withdrawing from Course

When it is necessary to cancel a class due to exceptional circumstances, the course instructor will make every effort to inform students via uwinnipeg email and Nexus.

Students are reminded that they have a responsibility to regularly check their uwinnipeg e-mail addresses to ensure timely receipt of correspondence from the University and/or the course instructor.

Please let course instructor know if you plan on withdrawing from the course. Note that withdrawing before the VW date does not necessarily result in a fee refund.

Topics to be covered (tentative)

1. Algorithm basics
2. Divide and conquer
3. Sorting algorithms
4. Basic data structures and Hash tables
5. Binary search tree and Red-black trees
6. Dynamic programming
7. Greedy algorithms
8. B-Trees
9. Graph algorithms
10. Elementary Graph algorithms and Minimum spanning trees
11. Single source shortest paths and All-pairs shortest paths
12. Maximum flow
13. String matching