Western University
Department of Computer Science
CS 2210B – Data Structures and Algorithms
Course Outline – Winer 2023

Instructor Information

Ahmed Ibrahim
Office: MC 365
Email: aibrah64 at UWO.
Office hours: TBD
Lectures: Mondays, 3:30-5:30pm and Wednesdays, 3:30-4:30pm at NCB-113.

Contact Me

- The best way to get help is via email. Please try not to leave your questions until the last minute. Prefix the subject line with CS2210 for a prompt reply.
- Please follow the **Email Policy** listed below.

TA Consulting Hours (To be posted in OWL)

Course Description

The purpose of this course is to provide the students with solid foundations in the basic concepts of programming: Data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This course is also about showing the correctness of algorithms and studying their computational complexities. This course offers the students a mixture of theoretical knowledge and practical experience.

   The study of data structures and algorithms is carried out within an object-oriented framework. When implementations are considered, the Java programming language is used. Topics covered in this course include:

- Design and analysis of algorithms
- Time complexity and asymptotic notation
- Dictionaries and hash tables
- Trees, binary search trees, AVL trees, multi-way search trees, (2,4)-trees, and B-trees Graphs, graph traversals, and graph algorithms
- Sorting algorithms.

Note – The proposed topics are subject to change according to the progress of the class.

Course Learning Outcomes

- Compute the time and space complexity of an algorithm to predict the amount of time and memory that it will need when executed on a computer
- Compare different data structures and algorithms to select the most appropriate one for a particular application
- Design algorithms that correctly solve a problem
- Use hash tables, trees, and graphs to model and solve computational problems
- Implement algorithms and data structures as Java programs

Contingency Plan for Pivoting to 100% Online Learning

In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, all remaining course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

If the course needs to be moved online, any remaining exams will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

Lecture Notes

All course material will be posted to OWL: (http://owl.uwo.ca). Students are responsible for checking the course OWL site on a regular basis for course material, assignments, news and updates. This is the primary method by which information will be disseminated to all students outside the classroom.

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519- 661-3800 or ext. 83800.

Technical Requirements to Take this Course

- A computer or tablet able to run a recent version of a web browser, Java, and a Java Integrated Development Environment,
- A webcam and microphone in case the course delivery needs to be moved online, and
- Reliable high-speed internet connection

In addition to the technology requirements associated with this course, you should also possess a set of computer skills that include installing software, security, and virus protection on your computer, managing files/folders on your computer, using the internet using a web browser, write, compile, debug, and execute programs in Java.

Prerequisites

- **Either**
  - Either Computer Science 1027A/B, Computer Science 1037A/B, the former Computer Science 2101A/B, Computer Science 2121A/B or Digital Humanities 2221A/B in each case with at least 65%, and 1.0 course with at least 60% in each from: Applied Mathe- matics 1201A/B, Numerical and Mathematical Methods 1411A/B, Numerical and Math- ematical Methods 1412A/B, Calculus 1000A/B, Calculus 1301A/B, Calculus 1500A/B, Calculus 1501A/B, Mathematics 1600A/B, the former Applied Mathematics 1411A/B, the former Applied Mathematics 1412A/B, the former Applied Mathematics 1414A/B, the former Applied Mathematics 1413; or
  - Integrated Science 1001X with at least 60%.

- **Knowledge of Java.** If you do not know Java, you must be aware that you will need to spend extra time learning this language as all programming assignments are in Java.

Students who have been admitted to this course without the normal prerequisite of Computer Science 1027 or 1037 may not have been exposed to the background material expected for this course; it is the responsibility of these students to gain familiarity with this material on their own.

Unless you have either the requisites for this course or written special permission from your dean to enroll in it, you will be removed from this course, and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees if you are dropped from a course for failing to have the necessary prerequisites.

Textbook

– Data Structures and Algorithms in Java, sixth edition. Michael T. Goodrich, Roberto Tamassia, and Michael Goldwasser. John Wiley & Sons Inc., 2014.

– Textbook is **NOT required**, but students are encouraged to try to get a copy as it provides complementary material to that presented in class.

Email policy (Contacting the course instructor through an Email)

- Your email subject should include "**CS2210:**" and start with "**Hello, professor**."
- Last, I check my emails on school days and will reply within **72 hours**. Don't expect any response on weekends or after 7:00 pm on a typical weekday.
- Remember, email is one official means of communication between the students and the course instructor. As with all official University communications, it is the student's responsibility to ensure that time-critical email is accessed, read, and acted upon promptly.
- If a student chooses to forward a university email to another email mailbox, it is that student's responsibility to ensure that the alternate account is viable.

It is a violation for any user of official university email addresses to impersonate a university officer, faculty member, staff, or student body, in line with the University "**Code of Computer User Conduct**" and relevant federal and state legislation.

Student Evaluation – Grades will be based on:

– 2 concept assignments, each worth 10% of the final mark
– 2 programming assignments (10%, 15%)
– A midterm exam, worth 20% of the final mark
– A final exam, worth 35% of the final grade

This course is an important prerequisite for CS 2212a/b and most third year Computer Science courses. The following rules are designed to ensure that students progressing in honors programs, and those planning to take further CS courses, meet certain minimum standards:

- To be eligible to receive an overall passing grade of 50%, a student must receive a weighted average of at least 45% on the midterm and final exams, and a weighted average of at least 55% on the assignments. If these conditions are not met, the maximum mark that you will receive is 48%.

- To be eligible to receive an overall grade of 60% or higher in the course, a student must receive a weighted average of at least 55% on the midterm and final exams, and a weighted average of at least 66% on the assignments. If these conditions are not met, the maximum mark that you will receive is 58%.

If for any reason the assignment schedule given below cannot be adhered to, the assignment marks will be pro-rated. The assignments are worth 45% of the overall mark for the course. If an assignment must be canceled for any reason, the remaining assignment weights will be prorated to add up to 45%. If for any reason the midterm examination must be canceled, the final exam will be worth 55% of the final mark.

Schedule (**Tentative**, some of these dates might change)

All assignments are due through OWL at 6:00 pm on the date indicated.

Assignment 1 (concept) due on Jan 30.

Assignment 2 (programming) due on Feb 13.

Assignment 3 (concept) due on Mar 6.

Assignment 4 (programming) due on Mar 20.

A 1-hour midterm exam on March 1st during lecture time.

A 2-hour final exam will be scheduled by the Registrar's Office.

Midterm Exam

There will be NO MAKEUP Midterm Exam, except for students requesting a Special Midterm Exam for religious reasons. These students must have notified the course instructor and filed documentation with their dean's office at least 2 weeks prior to the Midterm Exam.

If you miss the midterm exam for any other reason, follow the procedure for Academic Accommodation for Medical Illness given below. If accommodation is approved by your dean's office, your final exam mark will be re-weighted to include the weight of the midterm exam.

Concept Assignments

Two concept assignments will be assigned in this course. Each assignment consists of a set of exercises related to the material covered in class. The solutions for the exercises should be neatly written or typed.

All programming assignments must be submitted through OWL. Students are responsible for checking their e-mail and the course's OWL site on a regular basis.

Programming Assignments

The programming assignments require you to write Java programs related to the data structures and algorithms discussed in lectures.

To be eligible for full marks, your programming assignments must run on the departmental computing equipment. You may develop assignments on your home computer, but you must allow for time it will take to get the final programs working on Computer Science's machines.

All programming assignments must be submitted through OWL. Students are responsible for checking their e-mail on a regular basis.

Late Submission Policy

- 24 hours late: 25% reduction (the percentage is calculated from the maximum possible grade).

- 48 hours late: 50% reduction
- Submissions more than 48 hours late will <u>not be accepted</u>

Note:

- **No course work will be accepted after the last day of classes or after any assignment grades are released**.
- If a student misses a course work due to extenuating circumstances, make sure to contact the instructor as soon as possible. Unauthorized missed coursework will receive a grade of ZERO.
- **Any submission for any course component by email will NOT be accepted**.

Accommodation and Accessibility

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at

https://multiculturalcalendar.com/ecal/index.php?s=c-univwo

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic%20Accommodation_disabilities.pdf

By policy, academic considerations for work totaling 10% or more of the final course grade can be granted only by the student's Faculty of Registration (typically by their academic counsellors). In such cases, students should be directed as follows.

For work totaling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical%2015JUN.pdf

The Student Medical Certificate is available at

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/medicalform.pdf."

Academic Policies

The website for Registrarial Services is http://www.registrar.uwo.ca. In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies procedures/section1/mapp113.pdf,

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

No electronic devices will be allowed during the exams.

Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also

wish to contact Student Accessibility Services (SAS) at http://academicsupport.uwo.ca/accessible education/index.html if you have any questions regarding accommodations.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have expe- rienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at

https://www.uwo.ca/health/student support/survivor support/get-help.html.

To connect with a case manager or set up an appointment, please contact support@uwo.ca.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: https://www.uwo.ca/se/digital

Learning-skills counsellors at the Student Development Centre (https://learning.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Indi- vidual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western

http://www.uwo.ca/health

for a complete list of options about how to obtain help. Additional student-run support services are offered by the USC,

http://westernusc.ca/services

Misc. Items

- Do not share!!!, the program/lab assignment submitted must be written on your own or referenced.
- **No lame excuses**. Please, even when they are true, they are still lame.
- **No extra work in the next semester is given to improve your grade**. The given grades are final.

<p align="center">Good Luck!</p>