

Western University
Department of Computer Science
CS 2210A – Data Structures and Algorithms

Instructors Information

Section 1

Dr. Roberto Solis-Oba

██████████

Email: solis@csd.uwo.ca

Office hours: Monday 4:00 pm - 5:30 pm, Friday 4:30 pm - 5:30 pm

Lectures: Tuesday 3:30 pm - 5:30 pm and Thursday 3:30 pm - 4:30 pm ██████████

Section 2

Dr. Apurva Narayan

██████████

Email: apurva.narayan@uwo.ca

Office hours: TBD

Lectures: Wednesday 11:30 am - 12:30 pm and Friday 10:30 am - 12:30 pm ██████████

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.

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

Prerequisites

1. • 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 Mathematics 1201A/B, Numerical and Mathematical Methods 1411A/B, Numerical and Mathematical Methods 1412A/B, Numerical and Mathematical Methods 1414A/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.
2. **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's Designate (Department/Program Counsellors and Science Academic Advisors) 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 in the event that you are dropped from a course for failing to have the necessary prerequisites.

Course Materials

All course material will be posted to OWL: <https://westernu.brightspace.com>. Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

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

Textbook (Recommended)

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

ZyBook version of the book: TBD.

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

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 to attend office hours, 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.

TA Consulting Hours (TBD)

Methods of Evaluation

Grades will be based on:

- 2 concept assignments, each worth 3% of the final mark
- 3 programming assignments, each worth 10% of the final mark
- a midterm exam, worth 24% of the final mark
- a final exam, worth 40% of the final mark

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 honours 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 45% 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 55% 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 36% of the overall mark for the course. If an assignment has to be canceled for any reason, the remaining assignment weights will be prorated to add up to 36%. If for any reason the midterm examination has to be canceled, the final exam will be worth 64% of the final mark.

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

All assignments are due at 11:55pm on the date indicated.

- Assignment 1 (concept) due on September 26.
- Assignment 2 (programming) due on October 14.
- Assignment 3 (concept) due on October 21.
- Assignment 4 (programming) due on November 14.
- Assignment 5 (programming) due on December 5.
- A 2-hour midterm exam on October 25 (date tentative).
- A 3-hour final exam will be scheduled by the Registrar's Office.

No electronic devices are allowed on the exams.

There will be **no makeup** Midterm Exam. If you miss the midterm exam and receive an accommodation 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.

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 Gradescope**.

Use of Generative AI Tools

Unless otherwise stated, the use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is not permitted in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, tests, and final examinations.

Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a scholastic offence.

If the use of generative AI is permitted for a particular assessment, the conditions of use will be specified by the instructor in advance. If no such permission is granted, students must assume that use is prohibited. It is your responsibility to seek clarification before using any AI tools in academic work.

Late Policy

Concept assignments must be handed in by the due dates. **No late concept assignments will be accepted**, as solutions will be posted the day after the due date.

The late penalty for programming assignments is $[2.5^i]$ (2.5 to the i -th power, rounded to the nearest integer), where $i > 0$ is the number of days you are late. So if you hand in your assignment 1 day late, you will be penalized 3%, a delay of 2 days will decrease your grade by 6%, 3 days is penalized 16% and 4 days takes 39% off your grade. You cannot be more than 4 days late.

General Information about Missed Coursework

Students must familiarize themselves with the University Policy on Academic Consideration – Undergraduate Students in First Entry Programs posted on the Academic Calendar:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf.

This policy does not apply to requests for Academic Consideration submitted **for attempted or completed work**, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education:

https://academicsupport.uwo.ca/accessible_education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make one Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this, and therefore always require formal supporting documentation:

- Midterm exam
- Final exam

When a student mistakenly submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above, the request cannot be recalled and reapplied. This privilege is forfeited.

Evaluation Scheme for Missed Assessments

If a student receives academic consideration for a programming assignment, if the request is for less than 48 hours, the deadline for the assignment will be extended by the amount of time specified in the academic consideration. If the academic consideration is for more than 48 hours, the weight of the missed assignment will be transferred to the final exam.

If a student receives academic consideration for a concept assignment, the weight of the missed assignment will be transferred to the final exam.

If a student receives academic consideration for the midterm exam, the weight of the midterm exam will be transferred to the final exam.

When a student misses the Final Exam and their academic consideration has been granted, they will be allowed to write the Special Examination (the name given by the University to a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

If a student fails to write a scheduled Special Examination, the date of the next Special Examination (if granted) normally will be the scheduled date for the final exam the next time this course is offered.

Appeals of Assignment Marks

Appeals of assignment marks **must be addressed first to the T.A.** who marked your work. If you and the T.A. cannot agree, then please discuss the situation with the instructor.

Appeals **must occur within 1 week** from the first day that the marked assignments were made available to students. After that 1 week period has gone by, no more appeals will be considered.

Ethical Conduct

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf

All assignments are individual assignments. Students must write their assignments on **their own** and are not allowed to copy or share any part of their work. Collaborative group work is prohibited, and students cannot use code or solutions for concept assignments that were not designed by themselves. Students are not permitted to use ChatGPT or any other AI chatbots.

Assignments that are judged to be the result of academic dishonesty will be penalized and the Department of Computer Science and the Dean's office will be informed of this offence. Notice that the Department or the Dean's office might impose additional penalties. You are responsible for reading and respecting the Computer Science Department's policy on Scholastic Offences and Rules of Ethical Conduct

https://www.csd.uwo.ca/undergraduate/current/policies/ethical_conduct.html

We will use the plagiarism checking software called MOSS to compare student program submissions.

Computer-marked multiple-choice tests and/or exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

Email Contact and OWL

Students should check the course's OWL site on a regular basis for news and updates. Email messages will be sent to the UWO email address assigned to students by Western Technology Services (WTS), i.e. your email address @uwo.ca. It is each student's responsibility to read this email on a frequent and regular basis, or to have it forwarded to an alternative email address if

preferred. See the WTS website for directions on forwarding email. However, you should note that email at WTS (your UWO account) and other email providers such as hotmail.com or yahoo.com may have quotas or limits on the amount of space they can use. If you let your email accumulate there, your mailbox may fill up and you may lose important email from your instructors. Losing email that you have forwarded to an alternative email address is not an excuse for not knowing about the information that was sent.

Students must use their Western (@uwo.ca) email addresses when contacting the instructor. If you send email to the instructor from a commercial account, send a carbon copy (cc) to your UWO email address. The instructors will respond to your UWO address.

Religious Accommodation

When conflicts arise with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing to the Academic Advising office of their Faculty of Registration. This notice should be made as early as possible but not later than two weeks prior to the writing or the examination (or one week prior to the writing of the test).

Please visit the Diversity Calendars posted on our university's EDID website for the recognized religious holidays: <https://www.edi.uwo.ca>.

Academic Accommodation Policies

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_Accommodation_disabilities.pdf.

General Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

Use of @uwo.ca email: In accordance with policy,

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

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.

Requests for Relief (formally known as "appeals")

Policy on Request for Relief from Academic Decision:

https://uwo.ca/univsec//pdf/academic_policies/appeals/requests_for_relief_from_academic_decisions.pdf

Procedures on Request for Relief from Academic Decision (Undergraduate):

https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_requests_for_relief_procedure.pdf

Scholastic Offences

Policy on Scholastic Offences:

https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

Use of Electronic Devices During Assessments

In courses offered by the Faculty of Science, the possession of unauthorized electronic devices during any in-person assessment (such as tests, midterms, and final examinations) is strictly prohibited. This includes, but is not limited to: mobile phones, smart watches, smart glasses, and wireless earbuds or headphones.

Unless explicitly stated otherwise in advance by the instructor, the presence of any such device at your desk, on your person, or within reach during an assessment will be treated as a scholastic offence, even if the device is not in use.

Only devices expressly permitted by the instructor (e.g., non-programmable calculators) may be brought into the assessment room. It is your responsibility to review and comply with these expectations.

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>

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 experienced 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.

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. Individual 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 (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

<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>.