

Western University
Department of Computer Science
CS 2210B - Data Structures and Algorithms
Course Outline - Winter 2020

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:

- analysis of algorithms;
- dictionaries, hash tables;
- trees, binary search trees, AVL trees, multi-way search trees, (2,4)-trees, B-trees;
- graphs, graph traversals, graph algorithms;
- sorting.

Prerequisites

1. Computer Science 1027A/B or 2101A/B with a grade of at least 65%, or Computer Science 1037A/B with a grade of at least 60%;
2. One full-course from the following, with at least 60% in each: Applied Mathematics 1201 or the former Calculus 1201A/B, Applied Mathematics 1413, Calculus 1000A/B, 1100A/B, 1301A/B, 1500A/B, 1501A/B, Mathematics 1600A/B or the former Linear Algebra 1600A/B;
3. **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;

4. Students who have been admitted to this course without the normal prerequisite of Computer Science 1027A/B or 1037A/B may not have been exposed to some of 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 enrol 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.

Instructor

Da Zhi

Office: WIRB 4th floor

Email: dzhi@uwo.ca

Lectures: Monday 3:30pm - 5:30pm, Wednesday 4:30pm - 5:30pm, NCB-113

Office hours: TBD

TA consulting hours

To be announced

Textbook

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

Supplementary texts

Data Structures

- *Data Structures and Algorithms with Object Oriented Design Patterns in Java*, Bruno R. Preiss, Wiley.
- *Data Structures, Algorithms, and Applications in Java*, Sahni, McGraw Hill.
- *Data Structures and Algorithm Analysis in Java*, Weiss, Addison Wesley.
- *A Practical Introduction to Data Structures and Algorithm Analysis (Java Edition)*, Shaffer, Prentice Hall.

Java

- *The Java Programming Language*, Arnold and Gosling, Addison-Wesley
- *Java, an Object Oriented Approach*, Arnow and Weiss, Addison-Wesley.
- *Java how to Program*, Deitel and Deitel, Prentice Hall.
- *The Java Tutorials*: <http://docs.oracle.com/javase/tutorial>.

Course website

TBD

Lecture notes

Lecture notes will be available either on the course website or on OWL.

Student evaluation

Grades will be based on:

- 1 or 2 concept assignment(s), each worth 6% or 3% of the final mark
- 3 programming assignments, each worth 10% of the final mark
- a midterm exam, worth 29% of the final mark
- a final exam, worth 35% 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 pass the course, 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.
- 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 for any reason the assignment schedules 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 cancelled 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 cancelled, the final exam will be worth 64% of the final mark.

Every effort will be made to have assignments marked and handed back within 2 weeks of the hand in date. Midterm exam marks will be available within 2 weeks of the exam.

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

Concept assignments are due in class on the date indicated. Programming assignments are due at 11:59pm on the date indicated.

- Assignment 1 (concept) due on January 24.
- Assignment 2 (programming) due on February 14.
- Assignment 3 (concept) due on February 29.

- Assignment 4 (programming) due on March 14.
- Assignment 5 (programming) due on April 3.
- An in class midterm exam will take place on Monday, February 24.
- A 3-hour final exam will be scheduled by the Registrar.

Electronic devices will not be allowed during examinations.

It is Faculty of Science policy that a student who chooses to write a test or exam deems themselves fit enough to do so, and the student must accept the mark obtained. Claims of medical, physical, or emotional distress after the fact will not be considered.

There will be no make-up 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 assignments will be made available on the course web site and OWL. The availability of assignments will be announced in class, on the website, and on OWL. Students are responsible for checking the website and OWL 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 using an alternative version of Java, but you must allow for the amount of time it will take to get the final product working on Computer Science's machines.
- All programming assignments must be handed in using electronic submission procedures, to be described in class.
- All assignments will be made available on the course web site and OWL. The availability of assignments will be announced in class, on the course website, and on OWL. Students are responsible for checking the course website and OWL on a regular basis.

Appeals of Assignment Marks

- Appeals of assignment marks should be addressed to the T.A. first. If you and the T.A. cannot agree, then please discuss the situation with the lecturer.
- 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.

Late Policy

For each assignment it is indicated above when it is due, and for each assignment we will give details on how to hand in the work.

- Concept assignments must be handed in on the due date. **No late concept assignments will be accepted.**
- The late penalty for programming assignments is:

$$[2.5^i]$$

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.
- For computing the late penalty, Saturday and Sunday count as one day.

Extensions will be granted only by the course instructor. If you have serious medical or compassionate grounds for an extension, you should take supporting documentation to the office of the Dean of your faculty, who will contact the instructor.

Academic Accommodation for Medical Illness and Absences

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to your Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately.

If you are a Science student, the Academic Counselling Office of the Faculty of Science is located in WSC 140, and can be contacted at 519-661-3040 or scibmsac@uwo.ca. Their website is:

<https://www.uwo.ca/sci/undergraduate/academiccounselling/index.html>.

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Record's Release

Form (located in the Dean's Office) for visits to Student Health Services. For further information, please consult the university's medical illness policy at

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

and accommodation consideration for absences at

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

If you miss the Final Exam, please contact your faculty's Academic Counselling Office as soon as you are able to do so. They will assess your eligibility to write the Special Exam (the name given by the university to a make-up Final Exam). You may also be eligible to write the Special Exam if you are in a Multiple Exam Situation. See:

<http://www.registrar.uwo.ca/examinations/examschedule.html>

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 [here](#).

Students must write their assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence.

All assignments are individual assignments. You may discuss approaches to problems among yourselves; however, the actual details of the work (assignment coding, answers to concept questions, etc.) must be an individual effort. Assignments that are judged to be the result of academic dishonesty will, for the student's first offence, be given a mark of zero with an additional penalty equal to the weight of the assignment also being applied. You are responsible for reading and respecting the Computer Science Department's policy on Scholastic Offences at [here](#), and Rules of Ethical Conduct at [here](#).

We use plagiarism detection software (MOSS) to examine your code against everyone else in the class and report any incidents of copying. Students may be required to submit their written work and programs in electronic form for plagiarism checking. For computer-marked multiple-choice tests and/or exams, use may be made of software to check for unusual coincidences in answer patterns that may indicate cheating.

Email Contact and OWL

Students should check OWL (<http://owl.uwo.ca>) and the course's website on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. Students are responsible for checking OWL and the course's website on a regular basis.

Email messages will be sent to the UWO email address assigned to students by Information Technology Services (ITS), 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 ITS website for directions on forwarding email.

However, you should note that email at ITS (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.

If you send email to instructors from a commercial account, send a carbon copy (cc) to your UWO email address. The instructors will respond to your UWO address.

Computing Facilities

Each student will be given an account on the Computer Science Department senior undergraduate computing facility, GAUL. In accepting the GAUL account, a student agrees to abide by the department's Rules of Ethical Conduct:

http://www.csd.uwo.ca/current_students/undergraduate_students/rules_of_ethical_conduct.html

Note: After-hours access to certain Computer Science lab rooms is by student card. If a student card is lost, a replacement card will no longer open these lab rooms and the student must bring the new card to a member of the Systems Group in Middlesex College Room 346.

Accessibility Statement

Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

Support Services

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.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 (<http://www.uwo.ca/uwocom/mentalhealth>) for a complete list of options about how to obtain help.

Please consult the Web site for Registrarial Services (<http://www.registrar.uwo.ca>), and for USC (<http://westernusc.ca/services>) for a list of student support services and programs.