

# CS 2121B and DH 2221B: Data Structures and Algorithms 2019–20 Course Outline

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## *General Course Information*

### *Course Description*

The purpose of this course is to provide students with foundations in the basic concepts of data structures and algorithms. The main objective of the course is to teach students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. Students will be exposed to a variety of data structures, their advantages and disadvantages, and will learn when different data structures are useful. This course is also about ensuring that students understand basic algorithms for manipulating these data structures and using them in varying informatics and analytics domains.

### *List of Prerequisites*

Computer Science 2120A/B, Digital Humanities 2220A/B, or Integrated Science 1001X with at least 60%.

**Beware of the following Dean’s rule:** Unless you have either the prerequisites 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 in the event that you are dropped from a course for failing to have the necessary prerequisites.

### *Antirequisites*

Computer Science 1027A/B, Computer Science 1037A/B, Digital Humanities 2221A/B.

# Lecture and Instructor Information

Section	Time	Room	Instructor	Office	Office Hour	Email
001	Tu: 11:30–1:30 pm Wed: 3:30–4:30 pm	NCB-114	Dr. Ali Safari Khatouni	MC 369	Tu: 10:15–11:15	<a href="mailto:asafarik@uwo.ca">asafarik@uwo.ca</a>

If you are contacting your instructor, please use your Western email address.

## Labs

Section	Time	Room	TA
002	Wed: 4:30-5:30 pm	HSB-14	Will be announced
003	Wed: 5:30-6:30 pm	NCB-105	Will be announced

## TA Consulting Schedule

Teaching Assistants and their consulting hours for CS 2121B and DH 2221B will be posted on the course website and announced during the second or third week of the term once information is available to the instructors.

## Course Materials

- How to Think Like a Computer Scientist (it's free):  
<http://openbookproject.net/thinkcs/python/english3e/>
- Data Structures and Algorithms Using Python (also free):  
<http://home.ustc.edu.cn/~huang83/ds/Data Structures and Algorithms Using Python.pdf>

## Tools

- Download and install the (free) Anaconda Python 3 distribution:  
<https://www.anaconda.com/download/>

## Lecture Topics

- Objects
- Stacks
- Queues
- Recursion
- Algorithm analysis
- Trees
- Graphs
- Dictionaries and Hash tables
- Searching and Sorting

Course lecture notes will be made available in PDF format on the course website (OWL) on a regular basis. They are provided as a courtesy by the course instructor. Possessing (and even reading) these notes is not a suitable substitute for attending lectures.

## Course Website

The CS 2121B and DH 2221B website is accessible through OWL: <https://owl.uwo.ca/portal>. Announcements, assignments, lecture notes, and other course-related information will be posted on this website. It is the responsibility of the student to check this website often.

## Evaluation (approximate due dates)

The overall course grade, out of 100, will be calculated as listed below.

Component	Notes	Value
Labs	Weekly throughout the term; Labs start week of January 19	8%
Assignment 1	Due 27 <sup>th</sup> January 2020	8%
Assignment 2	Due 12 <sup>th</sup> February 2020	9%
Assignment 3	Due 11 <sup>th</sup> March 2020	10%
Assignment 4	Due 29 <sup>th</sup> March 2020	10%
Midterm Exam	Sunday 1 <sup>st</sup> March 2020 Time: 10:00 AM (2 hours) Location: HSB 236	15%
Final Exam	3 hours Date: Will be announced Location: Will be announced	40%

If for any reason the assignment schedule given cannot be adhered to, the assignment marks will be prorated. (The assignments are worth 37% 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 37%.)

***IMPORTANT NOTE: To be eligible to receive a passing grade in the course, your mark on the final exam must be at least 50% and your weighted average on the assignments, labs, and midterm exam must be at least 50%.***

## Labs

The purpose of the weekly labs is to give students guided, hands-on experience with Python programming. It is expected that students will come prepared to the labs by reading the lab instruction.

- Labs begin the week of January 19th, 2020.
- Labs are mandatory. Each completed lab is worth 1% of your final grade (to a maximum of 8%).

- There will be 9 labs; your lab mark will be based on your best 8 lab performances.
- You must attend the lab session for which you are registered.
- There are no make-up and students who are absent for a lab do not have the option of attending another lab; however, students who encounter serious health or other personal difficulties are encouraged to contact their Dean's office.

## *Assignments*

- Assignments will contain conceptual programming parts.
- The solutions for the exercises **must** be typed.
- All assignments will be made available on OWL.
- The availability of assignments will be announced in class and/or via email.
- Students are responsible for checking their email on a regular basis.
- 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 the software, but you must allow for time it will take to get the final product working on Computer Science's machines.
- Instructions for the submission of assignments will be posted on the course website. It is each student's responsibility to read and follow the instructions. Failure to follow the submission instructions may result in the assignment receiving a mark of zero.
- You will be required to submit each programming assignment electronically. Details will be given in the assignment descriptions. We reserve the right to use similarity detection software to detect possible cheating cases.
- Assignments are marked by the Teaching Assistants, who follow marking schemes provided by instructors.
- It is each student's responsibility to keep up-to-date backups of assignment disk files in case of system crashes or inadvertently erased files. Students must keep disk copies of all material submitted, as well as the actual graded assignment, to guard against the possibility of errors in recording marks. It is not safe to discard these materials until you are satisfied that your final mark for the course has been computed properly.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at this website: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

## *Appeal of Assignment Marks*

A request for adjustment in an assignment mark **must be made within 2 weeks** of the date on which it was first available after marking. (**Beyond that date, regrading will not be considered**, regardless of whether you retrieved your assignment.)

Such a request must be submitted to the course instructor in writing and must include specific reasons why you believe you deserve more marks. The request must be accompanied by all materials that were

originally handed in, as well as the original marker's grade summary sheet. The instructor will inform you by email when the re-evaluation process is complete.

## *Late Assignment Policy*

**No submissions will be taken after the due date; there are no late submissions.** All submissions after the due date will result in a mark of zero and will not be evaluated. Unless, students use Self-Reporting-Absence tool. Self-reporting may not be used for assessments (e.g. midterm exams, tests, reports, presentations, or essays) worth more than 30% of any given course. Students must be in touch with their instructors no later than 24 hours after the end of the period covered by the Self-Reported Absence form, to clarify how they will be expected to fulfil the academic expectations they may have missed during the absence.

If you have serious medical or compassionate grounds for an extension, you should take supporting documentation to the Academic Counseling office of your faculty, who will contact the instructor.

## *Midterm & Final Exams*

- There are a midterm exam and a final exam. Exams are closed-book. No reference materials, calculators or other electronic devices are allowed
- Students must bring their UWO identification to the exams.
- There will be no makeup midterm exam, except for students requesting a special midterm exam for University recognized 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 there are other serious medical or compassionate grounds for missing the midterm exam, please take supporting documentation to the office of the Dean of your faculty, who will contact the instructor. In such cases, the weight of your midterm exam will be shifted to the final exam, which would then be worth 55% of your final overall grade.
- The final exam is scheduled by the Office of the Registrar during the final exam period. Students are advised not to make travel plans until they have consulted the final exam schedule.
- Computer-marked multiple-choice exams may be screened for similarity by software that checks for unusual coincidences in answer patterns that may indicate cheating.

## *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.

## *Academic Policies*

The website for the Registrar's Services is <http://www.registrar.uwo.ca>.

## *Course, Department, University Policies on 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: [https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf).

- Plagiarism: Students must write their assignments (or essays) 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 (see the *Scholastic Offence Policy* in the *Western Academic Calendar*).
- plagiarism-checking software: All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).
- Your assignments must be your own individual work, not the products of group effort. You may discuss approaches to problems with other students, but the work you submit (programming code, answers to concept questions, etc.) must be an individual effort.
- With each assignment, you are required to confirm that you did the material you have submitted is exclusively your own work and that you understand the course policies concerning plagiarism and individual effort. You are responsible for reading and respecting the departmental policies on [Scholastic Offences](#) and [Rules of Ethical Conduct](#). The University of Western Ontario uses software for plagiarism checking.
- The standard departmental policy for assignments that are judged to be the product of academic dishonesty is, for the student's first offence, a mark of zero for the assignment, with an additional penalty equal to the weight of the assignment also being applied to the overall grade.
- The role of tutoring is to help students understand course material. Tutors should not write assignments or take-home tests for the students who hire them. Submitting an assignment that contains material written by a tutor is an academic offence. Having employed the same tutor as another student is not a legitimate defense against an accusation of collusion, should two students' hand in assignments judged similar beyond the possibility of coincidence.

## *Academic Accommodation and Accessibility*

### *Accommodation*

If you are unable to meet a course requirement due to illness or other serious circumstances, you must seek approval for the absence as soon as possible. Approval can be granted either through a self-reporting of absence or via the Dean's Office/Academic Counselling unit of your Home Faculty. If you are

a Science student, the Academic Counselling Office of the Faculty of Science is located in NCB 280, and can be contacted at [scibmsac@uwo.ca](mailto:scibmsac@uwo.ca).

For further information, please consult the university's policy on academic consideration for student absences:

[https://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/Academic\\_Consideration\\_for\\_absences.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Consideration_for_absences.pdf).

Students unable to submit assignments as per course requirements with valid excuses will be able to submit the assignment within two days of the designated due date without penalty. If the student is unable to submit within the two-day time period, marks for the assignment will be redistributed.

Accommodations less than 10% in weight will be managed by the professor. 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 makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see [https://registrar.uwo.ca/academics/examinations/exam\\_conflicts.html](https://registrar.uwo.ca/academics/examinations/exam_conflicts.html))

## *Academic Consideration for a Medical Absence*

Students seeking academic consideration for a medical absence not covered by existing Student Accessibility Services (SAS) accommodation, will be required to provide documentation in person in the form of a completed, signed Student Medical Certificate (SMC) where the conditions for a Self-Reported Absence have not been met, including where the student has exceeded the maximum number of permissible Self-Reported Absences. The following conditions are in place for students seeking academic consideration for a medical absence:

- Students must submit their documentation along with a request for academic consideration specifying the nature of the relief being requested. This documentation, in the form of a Student Medical Certificate (SMC), shall be submitted to the Academic Counselling or Undergraduate Office of the student's Faculty of registration indicating the period of illness, severity, and when the student should be able to resume academic responsibilities. Forms must be submitted no later than two business days after the date specified for resuming responsibilities.
- Students who require academic consideration must, where possible, seek medical attention in advance of due dates, examinations, etc.
- If the Academic Counselling/Dean's Office determines that academic consideration is warranted, the period of academic consideration will normally be that specified on the medical documentation. Once the request for academic consideration and supporting documents have been received and approved, the student's instructors will be notified of this by the Academic Counselling or Undergraduate Office in the student's home faculty.
- Academic consideration shall be granted only where the documentation indicates that the onset, duration and severity of the illness are such that the student could not reasonably be expected to complete their academic responsibilities, and only when the licensed practitioner providing the documentation is able to make a reasonable assessment of the student's physical or mental state during the period for which relief is sought. The expectation is that the practitioner's assessment of the student's condition will be made in person.

- The duration of the excused absence will terminate prior to the end of the period indicated on the SMC should the student undertake significant academic responsibilities (write a test, submit a paper) during that time.
- Students must communicate with their instructors no later than 24 hours after the end of the period covered by the SMC, to clarify how they will be expected to fulfil the academic expectations they may have missed during the absence.
- In cases where a student may be experiencing long-term or recurring absences, students should consult their Academic Counsellors for advice about which of the options available to them (academic consideration, pursuing Academic Accommodation, withdrawal from the course) are most appropriate.

## *Using the Self-Reported Absence Form*

Students who experience an unexpected illness or injury or an extenuating circumstance (48 hours or less) that is sufficiently severe to temporarily render them unable to meet academic requirements (e.g., attending lectures or labs, writing tests or midterm exams, completing and submitting assignments, participating in presentations) should self-declare using the online Self-Reported Absence portal. This option should be used in situations where the student expects to resume academic responsibilities within 48 hours or less. The following conditions are in place for self-reporting of medical or extenuating circumstances:

- Students will be allowed a maximum of two self-reported absences between September and April and one self-reported absence between May and August;
- Any absences in excess of the number designated in clause a above, regardless of duration, will require students to present a Student Medical Certificate (SMC), signed by a licensed medical or mental health practitioner, detailing the duration and severity of illness, or appropriate documentation supporting extenuating circumstances to the Academic Counselling unit in their Faculty of registration no later than two business days after the date specified for resuming responsibilities. Please see section 4 below for more details.
- The duration of the excused absence will be for a maximum of 48 hours from the time the Self-Reported Absence form is completed through the online portal, or from 8:30 am the following morning if the form is submitted after 4:30 pm;
- The duration of the excused absence will terminate prior to the end of the 48-hour period should the student undertake significant academic responsibilities (write a test, submit a paper) during that time;
- The duration of an excused absence will terminate at 8:30 am on the day following the last day of classes each semester regardless of how many days of absence have elapsed;
- Self-reported absences will not be allowed for scheduled final examinations; for midterm examinations scheduled during the December examination period; or for final lab examinations scheduled during the final week of term;
- Self-reporting may not be used for assessments (e.g. midterm exams, tests, reports, presentations, or essays) worth more than 30% of any given course. Students must be in touch with their instructors no later than 24 hours after the end of the period covered by the Self-Reported Absence form, to clarify how they will be expected to fulfil the academic expectations they may have missed during the absence.

# *Support Services*

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 661-2147 if you have any questions regarding accommodations.

The policy on Accommodation for Students with Disabilities can be found here:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_disabilities.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_disabilities.pdf).

The policy on Accommodation for Religious Holidays can be found here:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_religious.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf).

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.health.uwo.ca/mental\\_health](http://www.health.uwo.ca/mental_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>.

This course is supported by the Science Student Donation Fund. If you are a BSc or BMSc student registered in the Faculty of Science or Schulich School of Medicine and Dentistry, you pay the Science Student Donation Fee. This fee contributes to the Science Student Donation Fund, which is administered by the Science Students' Council (SSC). One or more grants from the Fund have allowed for the purchase of equipment integral to teaching this course. You may opt out of the Fee by the end of September of each academic year by completing the online form linked from the Faculty of Science's Academic Counselling site. For further information on the process of awarding grants from the Fund or how these grants have benefitted undergraduate education in this course, consult the chair of the department or email the Science Students' Council at [ssc@uwo.ca](mailto:ssc@uwo.ca).