

# THE UNIVERSITY OF WESTERN ONTARIO

DEPARTMENT OF COMPUTER SCIENCE  
LONDON CANADA

## Computer Science 3340b Analysis of Algorithms I Course Outline – January 2023

### Course Information

#### Course Information

Course Name: Computer Science 3340b  
Class Meetings: Tuesday 2:30-3:30pm, Thursday 2:30-4:30pm  
Location: NCB-101

#### Prerequisites

Computer Science 2210, 2211, Computer Science 2214 or Mathematics 2155.

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 in the event that you are dropped from a course for failing to have the necessary prerequisites.

### Instructor Information

#### Instructor

Dr. Kaizhong Zhang  
372 Middlesex College  
Tel: 661-3826, ext. 83826  
Course Email: cs3340<at>uwo.ca  
Office Hours: TBA  
Office Hours format: Zoom: by appointment only (arranged at least one day prior)

### Course Description

Algorithms are precisely stated, general problem solving methods suitable for computer implementation. Data Structures are methods of organizing data involved in computation.

Algorithms and data structures are central objects of study in computer science. Once appropriate algorithms and data structures are chosen, all that remains in most computer programs is routine coding. Moreover, algorithms and data structures go hand in hand: neither can be studied fruitfully without knowledge of the other.

The course studies techniques for designing and analyzing algorithms and data structures. The course concentrates on the logical process that leads to the creation of the algorithm, rather than the algorithm itself, and the techniques for evaluating the performance of algorithms. The central idea is that Computer Science is more than just recipes; it is about computational thinking.

## Topics

The topics are drawn from the following lists:

- algorithm design basics: algorithm design with mathematical induction, asymptotic notation, and solving recurrence relations.
- algorithm design techniques: divide and conquer, dynamic programming, greedy algorithms, and backtracking.
- searching, sorting, and union-find.
- trees and red-black trees.
- string matching, sequence comparison, and Huffman codes.
- graph algorithms.
- NP-completeness.

## Delivery Mode

Lectures will be delivered in person.

## Key Sessional Dates

Class Begin: Monday, January 9, 2023  
Fall Reading Week: February 18 – February 26, 2023  
Class End: Monday, April 10, 2023  
Exam Period: April 13 – 30, 2023

## Contingency Plan for an In-Person Class 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, affected 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.

## Course Materials

### Required Textbook

T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, *Introduction to Algorithms* (fourth edition), The MIT Press, 2022.

## **Suggested Textbook**

M.T. Goodrich and R. Tamassia, *Algorithm Design and Application*, John Wiley & Son, Inc., 2014.

## **Course Website**

The CS3340b website is accessible through OWL: <http://owl.uwo.ca>. Lecture notes, assignments, and class information will be posted on this website. You are responsible for reading this information frequently.

Students are responsible for checking the course OWL site (<http://owl.uwo.ca>) 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.

All course material will be posted to OWL: <http://owl.uwo.ca>.

If students need assistance with the course OWL site, 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.

## **Lecture Notes**

Most of the course notes will be available online through the course OWL web site. Students are cautioned, however, that getting course notes is not a sufficient substitute for attending lectures.

## **Technical Requirements**

Completion of this course will require you to have a reliable internet connection and a device that meets the system requirements for Zoom. Information about the system requirements are available at the following link: <https://support.zoom.us/hc/en-us>.

## **Teaching Assistant Consulting:**

Questions regarding assignments or lecture materials can be directed to a Teaching Assistant (TA) or through the Assignment Discussions in the OWL Forums section on OWL. Questions requiring further information can be dealt with by contacting the course instructor through his office hour appointments or send to the course email. A list of teaching assistants and their contact information will be posted to OWL once available.

## **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.

## **Email Contact**

Emails related to the course should be directed to the course email account at [cs3340@uwo.ca](mailto:cs3340@uwo.ca) which will be attended by the designated TAs and the instructor. Students could ask questions via email, however if there are any large, somewhat complicated issues, it is recommended to discuss them during office hours. Moreover, students must use their UWO (@uwo.ca) email account in order to write to the course email account.

## Online Conduct:

All of the remote learning sessions for this course may be recorded. The data captured during these recordings may include your image, voice recordings, chat logs and personal identifiers (name displayed on the screen). The recordings will be used for educational purposes related to this course, including evaluations. The recordings may be disclosed to other individuals participating in the course for their private or group study purposes. Please contact the instructor if you have any concerns related to session recordings.

All Zoom contact will require that your video is turned on and that you can be seen by the instructor. Not only is this a simple courtesy and the standard of Zoom classes, but it allows for a positive interaction.

## Methods of Evaluation

There are two components that will be used for the evaluation.

- Assignments, worth 30%
- Exams, worth 70%

To obtain a passing mark in the course, the weighted average of the Midterm and Final exam marks must be at least 40%, and weighted average on the assignment marks must be at least 40%.

By the end of the term, no accommodation will be granted for either of the following cases:

- Missed more than one assignment for any reason.
- Missed all the exams for any reason.

## Examinations

There will be a Midterm exam and a Final exam. Midterm weights **30%** and final weights about **40%**.

The Midterm exam will be (**tentative**) on Thursday March 16 at 2:30-4:20PM. The Final exam will be in April (date and time: TBA).

Both exams are closed book; however, students will be allowed to bring in one 8.5 x 11 sheet of notes. No electronic devices of any kind are allowed.

- There will be no makeup Midterm exam. If you miss the Midterm Exam for any reason, follow the procedure for Academic Considerations given in [this website](#). If accommodation is approved by your Dean's office, your Final Exam mark will be reweighed to include the weight of the Midterm Exam. You must notify the course instructor within a week of the missed Midterm exam, and documentation must be received by your Dean's office within 2 weeks of the missed exam.
- Every effort will be made to have midterm exam marked within two weeks of the exam date, preferably sooner.

- If you missed final exam, please check university policy at "Student Absences" section.

## Assignments

There will be three assignments in this course. Assignments will be graded by their correctness, preciseness, clarity, and efficiency. In addition, programming questions are also evaluated by coding styles, comments, etc.

All assignment are individual assignments. Students may discuss approaches to assignment problems. However, actual work (answering assignment questions, coding assignment questions, etc.) must be the student's individual effort.

The assignments have to be typed. **We do not accept handwritten assignment.** However, you can include handwritten figures, but not text and formula, in your assignment.

One can use Microsoft Word, LaTeX, and possibly Vim and then convert to pdf format. By far, the best language for scientific writing is LaTeX. While LaTeX is not required, it is a useful and very-easy-to-learn tool. It is freely available for all platforms. A very short and useful introduction to LaTeX can be found [in this document](#). A not so short, more complete, introduction to LaTeX can be found [in this document](#). While unbeatable for all your academic writings, it is a bonus for your CV as well!

Programming parts of the assignments have to be able to run on [compute.gaul.csd.uwo.ca](http://compute.gaul.csd.uwo.ca). This is the only platform we will test your programs.

Students must write their essays and 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.

The standard departmental penalty for assignments that are judged to be the result of academic dishonesty is described [in this website](#).

You are also responsible for reading and respecting the Computer Science Department's policy on [Scholastic Offences](#) and Rules of [Ethical Conduct](#).

The approximate assignment (**tentative**) due dates, and mark distribution are given below:

- Assignment 1 – Thursday, February 2, **10%**
- Assignment 2 – Tuesday, February 28, **10%**
- Assignment 3 – Tuesday, April 4, **10%**

## Assignment Submission Policies

All assignments are submitted electronically through owl course website. 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.

All assignments are due by 11:55PM of the due date. Late assignments will be accepted for up to three days after the due date, with weekends (Saturday and Sunday) counting as one

single day. After that the late work is no longer accepted regardless if the OWL assignment submission is open or not. The late penalty in percentage of the total mark of the assignment is 5% for one day late, 25% for two days late and 45% for three days late. Lateness is based on the time the assignment is **received through OWL**, not on the time it was created on student's own computer or his/her gaul account.

If you have submitted an academic consideration for an assignment, we acknowledge the university policy and extension will be given according to the number of days approved by academic counsellors. The arrangement of the course is that you must provide documentation in the **CS3340 Assignment Academic Consideration Form** when you submit your assignment for penalty reduction. You do not need to contact the instructor and we will not reply any such inquiry.

The documentation will be either the document or email from student services allowing the extension. The teaching assistant grading the assignment will then apply the supplied extension to the grade.

If the extension is within five days, you do not need to contact the instructor and we will not reply any such inquiry.

If the extension is more than five days, contact the instructor through his office hours to arrange an appropriate deferred due date.

Programming parts of the assignments must be able to run on Computer Science Department senior undergraduate computing facility, GAUL, In particular, programming parts of the assignments must be able to run on [compute.gaul.csd.uwo.ca](http://compute.gaul.csd.uwo.ca).

By submitting an assignment, you declare that:

- You have read and understood the Departmental policies on Scholastic Offences.
- The assignment is exclusively your own work
- You have complied with the Departmental Rules of Ethical Conduct.
- You have taken all reasonable precautions to ensure that your work has not been copied by other students, including the protection of your files from access by other students.

### **Assignment Marking**

Assignments will be marked by the Teaching Assistants who follow marking schemes provided by the instructor.

Every effort will be made to have assignments marked within two weeks of the submission date, preferably sooner.

You should direct any questions regarding assignment marks or marking in the first instance to your TA. If you and the TA cannot agree, then the TA will discuss the situation with the instructor.

Such request for an adjustment of an assignment mark must be made within 2 weeks from the day in which it was first available to students. **After 2 weeks, all assignment marks are considered to be final.**

Requests for mark adjustments will only be considered when they are for adjustments of **5 marks or greater**.

## **Student Absences**

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

**Assessments worth less than 10% of the overall course grade:**

**Assessments worth 10% or more of the overall course grade:**

For work totalling 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 [this website](#). The Student Medical Certificate is available at [this website](#).

### **Absences from Final Examinations**

If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (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" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour 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. The maximum course load for that term will be reduced by the credit of the course(s) for which the final examination has been deferred. See the Academic Calendar for details (under Special Examinations).

## **Accommodation and Accessibility**

### **Religious Accommodation**

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 [this website](#).

### **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: [this website](#).

## **Academic Policies**

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

In accordance with policy, see [this website](#), 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.

**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 website: [see this link](#).

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>).

Tests and examinations in this course may 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>.

## 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/>.

Students who are in emotional/mental distress should refer to Mental Health@Western ([at this website](#)) for a complete list of options about how to obtain help.

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 [this website](#).

To connect with a case manager or set up an appointment, please contact [support@uwo.ca](mailto:support@uwo.ca).

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 Accessible Education at [this website](#) if you have any questions regarding accommodations.

Learning-skills counsellors at the [Student Development Centre](#) 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.



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.

Additional student-run support services are offered by the USC, [see this website](#).