THE UNIVERSITY OF WESTERN ONTARIO

DEPARTMENT OF COMPUTER SCIENCE
LONDON   CANADA

Computer Science 3340b

Analysis of Algorithms

Course Outline – January 2019

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 mere recipes; it is about computational thinking.

Topics

The topics are drawn from the following lists:

- mathematical induction, big O nation, recurrence relations,

- algorithm design techniques: divide and conquer, dynamic programming, greedy algorithms, backtracking,

- searching and sorting, union-find,

- trees, red-black trees,

- string matching and sequence comparison, Huffman codes,

- graph algorithms,

- NP-completeness.

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

Dr. Kaizhong Zhang,
372 Middlesex College,
Tel: 661-3826, ext. 83826,
kzhang<at>uwo.ca
Office Hours: Tuesday 2:30-4:20pm

Class Meetings

Monday 9:30-11:30am, SEB 1059; Wednesday 2:30-3:30pm, MC 110.

TA Consulting Hours: TBA

Required Textbook

T.H. Cormen, C.E. Leiserson, R.L. Rivest, and C. Stein, *Introduction to Algorithms* (third edition), The MIT Press and McGraw-Hill Book Company, 2009.

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/portal**. Lecture notes, assignments and class information will be posted on this website. You are responsible for reading this information frequently.

Lecture Notes

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

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

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, you must use your UWO account in order to write to the instructor. (Emails from non-academic accounts will be automatically ignored.) In addition, you must include "CS3340" in the subject line.

Student Evaluation

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

- Exams, worth 70%

- Assignments, worth 30%

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 assignments must be at least 40%.

To achieve a final mark higher than 60% in the course, the weighted average of the Midterm and Final exam marks must be at least 50%, and weighted average on the assignments must be at least 50%.

Examinations

There will be a Midterm exam and a Final exam. Midterm weights **25%** and final weights about **45%**.

The Midterm exam will be (**tentative**) on Monday March 4 at 9:30-11:30AM, (location: TBA). 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 is allowed.

- There will be no makeup Midterm exam. If you miss the Midterm Exam for any reason, follow the procedure for Academic Accommodation given below. If accommodation is approved by your Dean's office, your Final Exam mark will be reweighted 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.

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. 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 not so short introduction to LaTeX can be found at **https://tobi.oetiker.ch/lshort/lshort.pdf**. While unbeatable for all your academic writings, it is a bonus for your CV as well!

The standard departmental penalty for assignments that are judged to be the result 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. You are 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 – Tuesday, January 29, **10%**

- Assignment 2 – Tuesday, February 26, **10%**

- Assignment 3 – Tuesday, April 2, **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. The late penalty is $2^{(n+1)}\%$, where n is the number of days late. Lateness is based on the time the assignment is received, not the time it was created.

Programming parts of the assignments must be able to run on Computer Science Department senior undergraduate computing facility, GAUL.

Assignment Marking

Assignments will be marked by the Teaching Assistant's 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 T.A. If you and the T.A. cannot agree, then the T.A. will discuss the situation with the instructor. Such request for an adjustment of an assignment mark must be made within 2 weeks following the day in which it was first available to students. After 2 weeks, all assignment marks are considered to be final.

Accommodation and Accessibility

If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counselling Office of your home faculty as soon as possible. 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.

For further information, please consult the university's medical illness policy **http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.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 makeup 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/exam_schedule.html**).

Academic Policies

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

In accordance with policy, **http://www.uwo.ca/its/identity/activatenonstudent.html,** 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 site: **http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.** You are also responsible for reading and respecting the Computer Science Department's policy on Scholastic Offenses **(http://www.csd.uwo.ca/current_students/undergraduate_students /scholastic_offences.html)** and Rules of Ethical Conduct **(http://www.csd.uwo.ca/current_students /undergraduate_students/rules_of_ethical_conduct.html).**

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.

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