



Faculty of Science

CSCI 3070U: Analysis & Design of Algorithms
Course outline for Fall 2019

1. Course Details & Important Dates*

Term	Course Type	Day	Time
Fall 2019	Undergraduate	Monday	2:10 PM – 3:30 PM
		Wednesday	2:10 PM – 3:30 PM

Location	CRN #	Classes Start	Classes End	Final Exam Period
UA2240	40265	Sept. 5, 2019	Dec. 4, 2019	Dec. 6 - Dec. 15, 2019

* for other important dates go to: www.uoit.ca >Current Students >Important Dates and Deadlines

Important Date	Date
Thanksgiving	Oct. 14, 2019
Study break	Oct. 15 - 20, 2019

2. Instructor Contact Information

Instructor Name	Office	Phone	Email
Heidar (Kourosh) Davoudi	UA 2015	905-721-8668 x 2779	heidar.davoudi@uoit.ca
Office Hours: Monday, 3:30 PM – 4:30 PM, UA 2015 Wednesday, 11:00 AM – 12:00 PM, UA 2015 OR by appointment			

Laboratory/Teaching Assistant Name	Email
Michael Lombardo	Michael.Lombardo@uoit.ca
Ashkan Kiani	Ashkan.Kiani@uoit.ca

3. Course Description

This course exposes students to the fundamental techniques for designing efficient computer algorithms, proving their correctness, and analyzing their complexity. It provides students with the expertise to analyze the cost of solving a specific problem with a given algorithm. Classical algorithms are analyzed in detail and their relative performance (depending on the size of the problem) predicted. Generic efficient techniques such as recursion divide and conquer, greedy strategies and branch and bound are studied and their relative costs identified. Such a toolbox of effective techniques is necessary for the design and analysis of realistic algorithms to solve important problems in all application areas.

4. Learning Outcomes

On the successful completion of the course, students will be able to:

- Design and implement efficient algorithms using a variety of techniques
- Analyze the efficiency of existing algorithms
- Implement and understand algorithms for solving well-known problems
- Implement and understand advanced data structures
- Compare algorithms
- Understand the classes of algorithms and the P vs. NP open question

5. Course Design

Lectures in this course will include both presented material, and interactive elements. The classroom interaction will be designed to solidify concepts and techniques learned in the lectures. In order to achieve success in this course, students must attend all lectures. Regular absences mean that you miss critical information and just are not able to catch up. The instructor will provide the majority of classroom materials on the Blackboard site. The TAs will supervise the tutorials and review main topics designed by the instructor through extra examples. The instructor and the TAs will collaborate on some of the marking.

6. Outline of Topics in the Course (Subject to Change)

1. Theory of computation: complexity classes
2. Design and analysis of algorithms: Complexity and correctness of algorithms (proof by loop invariance) and run-time analysis (worst-case, expected case and amortized analysis of time complexity)
3. Searching and sorting algorithms: comparison based sorting and linear sorting.
4. Performance bounds for searching and sorting algorithms
5. Divide and conquer
6. Recurrences
7. Dynamic programming
8. Greedy algorithms
9. Optimization: optimal coding by Huffman code
10. Branch and bound algorithms
11. Spanning tree algorithms: Kruskal's algorithm, Prim's algorithm
12. Shortest path algorithms: Bellman-Ford algorithm, Dijkstra's algorithm
13. Max Flow algorithms: Ford-Fulkerson algorithm, Edmonds-Karp algorithm
14. Theory of computation: P vs. NP, NP-complete problems, NP-hard problems

7. Required Texts/Readings

Introduction to Algorithms, Third Edition

Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein (ISBN: 978-0-26-203384-8)

8. Evaluation Method

Component	Due Date	Weight
Assignment #1	October 11, 2019 before 11:59pm	15%
Assignment #2	November 22, 2019 before 11:59pm	15%
Midterm	October 28, 2019 (in class)	35%
Final examination	TBA, December 2019	35%

Course Outline - CSCI 3070U - Fall 2019

Final course grades may be adjusted to conform to program or Faculty grade distribution profiles. Further information on grading can be found in Academic Calendar > Academic regulations.

9. Assignments and Tests

Any student who misses an examination without a valid medical reason and documentation will receive zero for that examination. Those with medical documentation will either be given a makeup exam or will have the weight of the examination added to the final exam.

For assignments, a late penalty of 10% per day late will be applied, in the absence of a medical note, to a maximum of 3 days late. After 3 days, the assignment will not be accepted.

10. Accessibility

Students with disabilities may request to be considered for formal academic accommodation in accordance with the Ontario Human Rights Code. Students seeking accommodation must make their requests through Student Accessibility Services. Requests must be made in a timely manner, and students must provide relevant and recent documentation to verify the effect of their disability and to allow the university to determine appropriate accommodations.

Accommodation decisions will be made in accordance with the Ontario Human Rights Code. Accommodations will be consistent with and supportive of the essential requirements of courses and programs, and provided in a way that respects the dignity of students with disabilities and encourages integration and equality of opportunity. Reasonable academic accommodation may require instructors to exercise creativity and flexibility in responding to the needs of students with disabilities while maintaining academic integrity.

11. Academic Integrity

Students and faculty at Ontario Tech share an important responsibility to maintain the integrity of the teaching and learning relationship. This relationship is characterized by honesty, fairness and mutual respect for the aim and principles of the pursuit of education. Academic misconduct impedes the activities of the university community and is punishable by appropriate disciplinary action.

Students are expected to be familiar with Ontario Tech's regulations on Academic Conduct (see Academic regulations in Academic Calendar) which sets out the kinds of actions that constitute academic misconduct, including plagiarism, copying or allowing one's own work to be copied, use of unauthorized aids in examinations and tests, submitting work prepared in collaboration with another student when such collaboration has not been authorized, and other academic offences. The regulations also describe the procedures for dealing with allegations, and the sanctions for any finding of academic misconduct, which can range from a written reprimand to permanent expulsion from the university. A lack of familiarity with Ontario Tech's regulations on academic conduct does not constitute a defense against its application.

Further information about academic misconduct can be found in the Academic Integrity link on your laptop.

In this course, specifically, examples of academic misconduct may include (but are not limited to) sharing work on individual assignments with anyone other than the TAs or the instructor, sharing work on group assignments with anyone outside of your group, sharing information (in person or electronically) with anyone other than the invigilators during a test, and using a tool to automatically generate code, graphs, or other product (unless explicitly permitted by the instructor).

12. Safety

Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact studentlife@uoit.ca for support.

Ontario Tech is committed to the prevention of sexual violence in all its forms. For any Ontario Tech student who has experienced Sexual Violence, **Ontario Tech can help**. Ontario Tech will make accommodations to cater to the diverse backgrounds, cultures, and identities of students when dealing with individual cases.

If you think you have been subjected to or witnessed sexual violence:

- Reach out to a Support Worker, who are specially trained individuals authorized to receive confidential disclosures about incidents of sexual violence. Support Workers can offer help and resolutions options which can include safety plans, accommodations, mental health support, and more. To make an appointment with a Support Worker, call 905.721.3392 or email supportworker@uoit.ca

Learn more about your options at: www.uoit.ca/sexualviolence

13. Midterms and Final Examinations

The final examinations can include the midterm exam. This could include using the skills you've learned in the lectures, tutorials, and assignments to complete the tasks within a specified time limit. The result will be posted to Blackboard for evaluation.

Final examinations are held during the final examination period at the end of the semester and may take place in a different room and on a different day from the regularly scheduled class. Check the published Examination Schedule for a complete list of days and times.

Students are advised to obtain their Student ID Card well in advance of the examination period as they will not be able to write their examinations without it. Student ID cards can be obtained at the Campus ID Services, in G1004 in the Campus Recreation and Wellness Centre.

Students who are unable to write a final examination when scheduled due to religious publications may make arrangements to write a deferred examination. These students are required to submit a Request for Accommodation for Religious Obligations to the Faculty concerned as soon as possible and no later than three weeks prior to the first day of the final examination period.

Further information on final examinations can be found in the Academic Calendar > Academic regulations.

14. Course Evaluations

Student evaluation of teaching is a highly valued and helpful mechanism for monitoring the quality of Ontario Tech's programs and instructional effectiveness. To that end, course evaluations are administered by an external company in an online, anonymous process during the last few weeks of classes. Students are encouraged to participate actively in this process and will be notified of the dates. Notifications about course evaluations will be sent via e-mail, and posted on Blackboard, Weekly News and signage around the campus.