

COSC 520 - Advanced Algorithms

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UBC Okanagan (Winter Term 1, 2018/2019)
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Textbook Jon Kleinberg and Eva Tardos. *Algorithm Design*. Addison-Wesley, 2006.

Prerequisites COSC 221, COSC 222, and MATH 221.

Meetings Lectures: 11:30am - 12:30pm (Mon, Wed, Fri; ASC 130)
Office Hrs: 12:30pm - 1:30pm (Mon, Wed, Fri; SCI 262)

Objectives This course introduces students to algorithm design and analysis techniques that can potentially be used to develop algorithmic solutions for computationally-hard problems and problems that involve complex, networked, or massive datasets. In addition to a more in-depth discussion on fundamental techniques such as greedy methods and dynamic programming, the course will explore design techniques based on approaches of parameterization, approximation, and randomization. All techniques will be discussed in the context of concrete algorithmic problems. While the course focuses mainly on rigorous design techniques, we may also look at the engineering and empirical aspects of algorithm design. Activities in the course include lectures, class exercises, student lectures, and research projects. In addition to participating in the regular class activities, graduate students are required to give one presentation on a topic assigned by the instructor and complete a research-style project on a research topic selected from the list below. The project can be in the form of a comprehensive survey, algorithm design and analysis, or systematic software implementation.

Evaluations

1. Individual Assignments (10%): Two Problem Sets (5% each)
2. Team Activities (45%)
 - Class Exercises (10%)
 - Mini-Presentation (10%): Topic selected from a suggested list.
 - Research Project (25%): Topic and task selected by students and approved by the instructor. Group of two or three.
3. Midterm Exams(10%): (two in-class exams, 5% each)
4. Final Exam (35%)
5. Submission and late policy. You are required to submit a **hard-copy** of your solution in class on the due date. Late submission is acceptable with the following penalty:
 - 0 to 24 hours late: 20% mark deduction
 - 24 to 48 hours late: 40% mark deduction
 - more than 48 hours: no mark
6. All appeals to marks, except to that of the final exam, must be registered with the instructor before the scheduled date of the final examination.
7. Students who miss a class examination or assignment due to short-term illness or other legitimate reasons should contact the instructor immediately to make an arrangement.

Assignment Expectation

For problems that ask you to prove an assertion, you are expected to give a formal proof using the mathematical skills you have learned from previous courses. For problems that ask you to design an algorithm, you are expected to provide in English the idea of the algorithm, the pseudo-code of the algorithm with required data structures clearly specified, the analysis of its correctness and running time, and an example to illustrate your algorithms.

Collaboration Policy

The assignments are designed to help students solidify their understanding of the course material. Some of problems may be challenging, but not unrealistic. You are encouraged to collaborate with your peers on the assignment problems; Even more desirable is to form your own study group of two to three people. *However, the write-up has to be in your own words. You are also required to identify your collaborators and acknowledge any help from the TA, the instructor, and the Web. You should also be able to explain to the instructor the details of any solution you have submitted.*

Schedule

Weeks	Lecture Topics
W01 - W04	<ul style="list-style-type: none">• Review of Concepts in Algorithm Analysis• Algorithms for Graph Traversal• Greedy Algorithms and Applications in Approximation Algorithms• Research Project
W05 - W08	<ul style="list-style-type: none">• Methods of Dynamic Programming and Divide-and-Conquer• Bounded Search Tree Method in Parameterized Algorithms• Local Search Method, Randomization, and Application in Approximation Algorithms• Research Project
W09 - W12	<ul style="list-style-type: none">• Flow Networks: Theory, Algorithms, and Applications• Theory of Computational Complexity• Research Project

Important Dates

- **Wednesday, 5 September 2018:** first class
 - **Tuesday, 18 September 2018:** last day for changes between credit and audit term 1 courses, or withdrawal from a class without a "W" on record
 - **Monday, 8 October 2018:** Thanksgiving Day. No class.
 - **Friday, 9 November 2018:** Mid-term break. No class and lab.
 - **Monday, 12 November 2018:** Remembrance Day. No class and lab.
 - **Friday, 30 November 2018:** Last day of classes.
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Academic Integrity

The academic enterprise is founded on honesty, civility, and integrity. As members of this enterprise, all students are expected to know, understand, and follow the codes of conduct regarding academic integrity. At the most basic level, this means submitting only original work done by you and acknowledging all sources of information or ideas and attributing them to others as required. This also means you should not cheat, copy, or mislead others about what is your work. Violations of academic integrity (i.e., misconduct) lead to the break down of the academic enterprise, and therefore serious consequences arise and harsh sanctions are imposed. For example, incidences of plagiarism or cheating usually result in a failing grade or mark of zero on the assignment or in the course. Careful records are kept to monitor and prevent recidivism. A more detailed description of academic integrity, including the policies and procedures, may be found at <http://www.calendar.ubc.ca/okanagan/index.cfm?tree=3,54,111,959>. If you have any questions about how academic integrity applies to this course, consult with the instructor.

Disability Services

If you require disability-related accommodations to meet the course objectives, please contact the Diversity Advisor of Disability Resources located in the University Centre, Room 227. For more information about Disability Resources or academic accommodations, please visit the website at : <http://students.ok.ubc.ca/drc/welcome.html>

Examination Hardships and Grading Practices

The final exam period is Dec 5 - Dec 20, 2016. All students who miss or plan to miss the regularly scheduled final examination due to short-term illness or other unexpected reasons should contact the instructor as early as possible to make special arrangements. A brief description of the grading practice of the university can be found at <http://okanagan.students.ubc.ca/calendar/index.cfm?tree=3,41,90,1014>

Equity, Human Rights, Discrimination and Harassment

UBC Okanagan is a place where every student, staff and faculty member should be able to study and work in an environment that is free from human rights based discrimination and harassment. If you require assistance related to an issue of equity, discrimination or harassment, please contact the Equity Office, your administrative head of unit, and/or your unit's equity representative. UBC Okanagan Equity Advisor: ph. 250-807-9291; email equity.ubco@ubc.ca. Web: www.ubc.ca/okanagan/equity