CS 466/666: Design and Analysis of Algorithms
Fall 2017 Course Outline

Last revised: September 14, 2017
Course website: `cs.uwaterloo.ca/~eblais/CS466/`
Piazza page: `piazza.com/uwaterloo.ca/fall2017/cs466666`

Please note that any term-specific content of this document is decided tentatively at the beginning of the term, and is subject to change. See the course website for current, up-to-date information.

CS 466/666 Description

Algorithmic approaches and methods of assessment that reflect a broad spectrum of criteria, including randomized algorithms, amortized analysis, lower bounds, approximation algorithms, and on-line algorithms. Particular examples will be chosen from different areas of active research and application.

The lectures will be delivered on the blackboard. All other communications for the course will be made on the course website (for assignment postings) and on the Piazza page for the course (for all other notices and for discussions and questions about the assignments and all other aspects of the course).

Recommended text

There is no required textbook for this course. The following two textbooks are highly recommended and cover some, but not all, of the material that we will see in the course.

- Michael Mitzenmacher and Eli Upfal. *Probability and Computing.* Cambridge University Press, 2005.

- Thomas Cormen, Charles Leiserson, Ronald Rivest, and Clifford Stein. *Introduction to Algorithms*, 3rd edition. MIT Press, 2009.

The following textbooks and lecture notes are also recommended as supplementary reading material:

- Noga Alon and Joel Spencer. *The Probabilistic Method*, 4th edition. Wiley, 2016.

- David P. Williamson and David B. Schmoys. *The Design of Approximation Algorithms.* Cambridge University Press, 2016. `www.designofapproxalgs.com/book.pdf`

- Amit Chakrabarti. *Data Stream Algorithms.* lecture notes, 1995. `http://www.cs.dartmouth.edu/ ac/Teac`

- Tim Roughgarden. *Communication complexity (for algorithm designers).* lecture notes, 2015. `https://arxiv.org/abs/1509.06257`

Fall 2017 Schedule and Contact Information

Lecture Schedule

Days	Times	Location	
MW	1:00–2:20pm	MC 2054	Eric Blais

Office Hours

Days	Times	Location	
Tu	2:30-3:30pm	DC 2305	V. Abhinav Bommireddi Nathan Harms
Th	12:00-1:00pm	DC 3122	Eric Blais

Course Staff Contact Information

Eric Blais (Instructor)

Office:	DC 3122
E-mail:	`eric.blais@uwaterloo.ca`
Office hours:	See above.

V. Abhinav Bommireddi (Teaching Assistant)

Office:	DC 3136
E-mail:	`vabommireddi@uwaterloo.ca`
Office hours:	See above.

Nathan Harms (Teaching Assistant)

Office:	DC 2118
E-mail:	`nharms@uwaterloo.ca`
Office hours:	See above.

Fall 2017 Weekly Calendar

The tentative schedule for the lectures in this course is as follows.

Sep. 11, 13, 18 Introduction and randomized algorithms.

Sep. 20, 25, 27 Approximation algorithms

Oct. 2, 4, 13, 16, 18, 25 Sketching algorithms.

Oct. 30, Nov. 1, 6, 8 Constraint satisfaction problems.

Nov. 13, 15, 20 Amortized analysis.

Nov. 22, 27, 29 Limits of efficient algorithms.

Dec. 4 Conclusion.

There will be six assignments in the course expected back according to the following schedule.

- Problem set 1. Due on **September 20.**

- Problem set 2. Due on **October 4.**

- Problem set 3. Due on **October 18.**

- Problem set 4. Due on **November 1.**

- Problem set 5. Due on **November 15.**

- Problem set 6. Due on **November 29.**

The midterm will be held in class on **Monday, October 23**.

For details concerning final examinations (`http://www.registrar.uwaterloo.ca/exams/finalexams.html`), various course drop deadlines (`http://quest.uwaterloo.ca/undergraduate/dates.html`), etc., see the appropriate UWaterloo webpages.

Grade calculation

For students enrolled in CS 466, the final grades for the class will be determined by the scores on the assignments, the midterm, and the final exam, according to the following percentages:

- 40%: Assignments

- 20%: Midterm

- 40%: Final exam

There will be **6** assignments during the term. They are all weighed equally in the Assignments portion of the final grade. Additional bonus problem sets may also be distributed outside of the regular assignments. All assignments and bonus problem sets will be available on the class web page.

For students enrolled in CS 666, the final grades for the class will be determined by the assignments, midterm, final exam, and a research project according to the following percentages:

- 35%: Assignments

- 15%: Midterm

- 30%: Final exam

- 20%: Project

The assignments, midterm, and final exam will be the same as for CS 466.

Viewing Current Marks

The current marks will be available to the students throughout the term online via the course's LEARN course site.

Course Work Policies

Assignment Submission

All assignments in this class require written (mathematical) solutions. Students are strongly encourage to typeset their solutions in LaTeX, but *clearly legible* handwritten solutions sets will also be accepted.

Missed or Late Work

Assignments are due at the beginning of class on their due date. *No late assignments will be accepted.* Special accommodations will be considered in exceptional cases only with appropriate written documentation, such as Verification of Illness Forms (VIF).

Obtaining Marked Work

Marked assignments and midterm will be returned to the students in class.

Collaboration

Collaboration with classmates when completing the assignments is encouraged in this class, but must follow these guidelines.

- **Try on your own first.** You should try to solve each problem on your own before you discuss it with any classmate. The process of trying to solve the problems on the assignments is an important step for understanding the material in the class, especially since we will be covering the topics at an accelerated pace. Remember, you will not have help from your classmates in the midterm or exam.

- **True collaborations only.** A one-sided collaboration where only one student is guiding another one through the solution or where students are trading solutions to the problems are not helpful or acceptable. Once again: you will be on your own in the midterm and exam.

- **Acknowledge collaborators.** You must clearly indicate on each of the assignments (i) who you collaborated with for each problem, and (ii) the nature of this collaboration. Marks will be deducted if you fail to do this.

- **Submit your own write-up.** You must prepare the write-up of your solutions to each assignment on your own. While collaborating with other students to come up with the solutions to the problems is acceptable, **copying someone else's solutions is plagiarism**. In particular, *never* share your write-up (or its draft) with other students in the class. Plagiarism will be penalized severely, as described below in the Academic Integrity section.

External sources

Do not search for the solutions to the assignment problems in external sources. As described above: the point of the assignments is to learn the material, and you will be penalizing yourself if you try to shortcut this process.

However, you are allowed to look at sources outside of the official course material in order to understand the material better. In many situations, reading different presentations of the same material can be very helpful in understanding it better. Occasionally, you may find the solution to an assignment problem while reading one of these external sources. When that happens, just be honest: give a proper citation for the source of the solution in your acknowledgments and write the solution on your own (using your own words and, obviously, without the found solution in front of you). You will not be penalized for a solution found in another source that is cited properly and written by yourself, but failure to cite the source properly is plagiarism.

Other Important Information

Academic Integrity. In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. Check the Office of Academic Integrity's website, `www.uwaterloo.ca/academicintegrity/`, for more information.

All members of the UW community are expected to hold to the highest standard of academic integrity in their studies, teaching, and research. This site explains why academic integrity is important and how students can avoid academic misconduct. It also identifies resources available on campus for students and faculty to help achieve academic integrity in – and out – of the classroom.

Grievance. A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4, `http://www.adm.uwaterloo.ca/infosec/Policies/policy70.htm`. When in doubt please be certain to contact the departments administrative assistant who will provide further assistance.

Discipline. A student is expected to know what constitutes academic integrity, to avoid committing academic offenses, and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about rules for group work/collaboration should seek guidance from the course professor, academic advisor, or the Undergraduate Associate Dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline, `http://www.adm.uwaterloo.ca/infosec/Policies/policy71.htm`. For typical penalties check Guidelines for the Assessment of Penalties, `http://www.adm.uwaterloo.ca/infosec/guidelines/penaltyguidelines.htm`.

Avoiding Academic Offenses. Most students are unaware of the line between acceptable and unacceptable academic behaviour, especially when discussing assignments with classmates and using the work of other students. For information on commonly misunderstood academic offenses and how to avoid them, students should refer to the Faculty of Mathematics Cheating and Student Academic Discipline Policy, `http://www.math.uwaterloo.ca/navigation/Current/cheating_policy.shtml`.

Appeals.   A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals, `http://www.adm.uwaterloo.ca/infosec/Policies/policy72.htm`.

Note for students with disabilities.   The Office for Persons with Disabilities (OPD), located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the OPD at the beginning of each academic term.

See `http://www.studentservices.uwaterloo.ca/disabilities` for more information.