

UNIVERSITY OF WATERLOO

C&O 769: Topics in Continuous Optimization (2022 Winter Term) ¹

Logistical Information

All course information will be maintained and updated on: uWaterloo-LEARN

Instructor: Dr. Walaa Moursi, MC 6024

Contact: Email walaa.moursi@uwaterloo.ca Use “C&O 769” as subject

Lectures: Mondays and Wednesdays 11:30 am–12:50 pm, DWE 1502

Office Hours: Tuesdays and Thursdays 10:00–11:00 a.m. (EST) via zoom (starting January 6, 2022). Students are encouraged to submit their questions for office hours ahead of time, by email to: walaa.moursi@uwaterloo.ca.

Course Outline and Key Dates

An introduction to monotone operator theory in Hilbert space and connection to subdifferentials of convex functions. Characterization of monotonicity via (firm) nonexpansiveness. Projection theorem and the Klee conjecture. Correspondence between firmly nonexpansive operators and maximally monotone operators via the resolvent. Connection to Fixed point theory and algorithmic consequences. Applications to optimization algorithms, e.g., Alternating Direction Methods of Multipliers (ADMM), Douglas–Rachford and Peaceman–Rachford methods, (Fast) Iterative Thresholding Algorithm (F)ISTA, projected (sub)gradient method, and more.

Jan 5 2022: Classes begin.

Apr 5, 2022: Classes end.

Evaluation

Homework: 60%

Personalized Assessment 1: 8%

Personalized Assessment 2: 12%

Final Exam: 20%

Passing Criteria: course grade of $\geq 50\%$

Homework (80%)

Homework must be submitted to CROWDMARK. Homework sent by email WILL NOT be accepted. Assignments are marked for completeness, correctness, and clarity of answers. **LATE ASSIGNMENTS RECEIVE NO MARKS but may receive feedback.**

You are not allowed to communicate with other students or consult any notes other than the notes/resources provided through the course website on LEARN and related resources. Students might be asked to acknowledge an academic integrity pledge prior to completing the homework.

Technology required

In order to engage fully with this course, students are required to have a laptop or desktop computer and a stable Internet connection.

The next sections are valid for all courses taken at University of Waterloo.

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 <http://www.uwaterloo.ca/academicintegrity/> for more information.

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 department’s administrative assistant who will provide further assistance.

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Discipline. A student is expected to know what constitutes academic integrity to avoid committing academic offences and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offence, or who needs help in learning how to avoid offences (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 offences 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>.

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>.

Access Ability Services

University of Waterloo has a long standing commitment to support the participation and access to university programs, services, and facilities by persons with disabilities. Access Ability Services office (AAS) is located in Needles Hall, Room 1401, 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 AccessAbility Services at the beginning of each academic term. <https://uwaterloo.ca/accessability-services/>

Diversity

It is our intent that students from all diverse backgrounds and perspectives be well served by this course, and that students’ learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular:

- We will gladly honour your request to address you by an alternate/preferred name or gender pronoun. Please advise us of this preference early in the semester so we may make appropriate changes to our records.
- We will honour your religious holidays and celebrations. Please inform of us these at the start of the course.
- We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.

Mental Health Support

The Faculty of Math encourages students to seek out mental health support if needed.

- On-campus Resources:
 - Campus Wellness <https://uwaterloo.ca/campus-wellness/>
 - Counselling Services: counselling.services@uwaterloo.ca/ 519-888-4567 ext 32655
 - MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services: mates@uwaterloo.ca
 - Health Services: located across the creek from the Student Life Centre, 519-888-4096.
- Off-campus Resources:
 - Good2Talk (24/7): Free confidential help line for post-secondary students. Phone: 1-866-925-5454
 - Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247
 - OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213