

# UNIVERSITY OF WATERLOO

## C&O 463/663: Convex Optimization and Analysis (2023 Winter Term)<sup>1</sup>

### 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](mailto:walaa.moursi@uwaterloo.ca) Use “C&O 463/663” as subject

**Lectures:** Tuesdays and Thursdays 2:30-3:50 pm, QNC 1507

**Office Hours:** Mondays 9:00–10:00 am and Wednesdays 5:00–6:00 p.m. (EST) via zoom (starting January 10, 2023).

Students are encouraged to submit their questions for office hours ahead of time, by email to: [walaa.moursi@uwaterloo.ca](mailto:walaa.moursi@uwaterloo.ca).

**Lecture notes:** Notes are posted on LEARN.

### Course Outline and Key Dates

An introduction to the modern theory of convex optimization, its extensions and applications. Convex sets: structure, separation and support, topological properties and best approximation properties. Convex functions: differentiability and subgradient calculus for convex functions, Fenchel conjugacy and duality, Lagrange multipliers. Proximal minimization, algorithms and connection to fixed point theory.

**Jan 9, 2023:** Classes begin.

**Apr 6, 2023:** Classes end.

### Evaluation

**Homework:** 50%

**Midterm Exam:** 20%

**Final Exam:** 30%

### Homework (50%)

**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.

### Alternate arrangements in case of cancellation of classes and/or exams

Please note that the following arrangements are tentative and subject to change if needed.

- Short-term (e.g., one-week) cancellation of in-person classes, whether for the particular course or University-wide: Classes will be delivered as recorded lectures and recordings will be posted on LEARN.
- longer-term cancellation of in-person classes, whether for the particular course or University-wide: Classes will be delivered as recorded lectures and recordings will be posted on LEARN.
- Cancellation of in-person (midterm or final) examinations: Exams will be delivered via crowdmark. Further proctoring arrangements will be posted in this case.

### 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.

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## 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.

**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>.

## AccessAbility 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. AccessAbility 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 accommodate 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 accommodate 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.

## Student Covid-19 and flu cases

- Students should not to come to class or other in-person activities if they are experiencing COVID-19 symptoms or are required to self-isolate.
- In the event of absence due to influenza-like illness or required self-isolation, students shall submit an Illness Self-declaration. Students can self-declare their illness in Quest (graduate or undergraduate students).
- Students can find the Illness Self-declaration form in the Personal Information section of Quest. Students should contact the COVID-19 Support and Advice line to report their illness.

## 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/](mailto: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](mailto: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