UNIVERSITY OF WATERLOO

Department of Economics
Econ 211
Introduction to Mathematical Economics
Fall 2021

Instructor: Dr. Olivia Mesta
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You are welcome to contact me via e-mail. I check e-mails regularly during the day. I usually respond within a day or two. You should not expect to hear from me evenings, weekends or holidays.

Course Description

The course aims to connect mathematical tools and elementary economics analysis. It is an introduction to mathematical techniques of particular use in economics. Students are expected to learn the mathematical concepts which are required to tackle problems in economic analysis. The objective of this course is to provide the students with all the necessary mathematical tools that are required to follow 300 level courses in economics. The focus is on mathematics, but different concepts will be taught using applications in economics.Topics include functions, continuity, differentiation, partial derivatives, and optimization techniques including constrained optimization. Students are advised to refresh their knowledge on basic arithmetic and algebra, and sets, subsets and functions before proceeding to higher level topics in this course. The goal is to motivate students of economics to study appropriate mathematical tools by demonstrating their power to deal with economic problems.

REQUIRED TEXTBOOK

Mathematics for Economics, 3rd edition, Hoy, Livernois, McKenna, Rees, and Stengos, MIT Press, March 2011, ISBN-10:
0-262-01507-2, ISBN-13: 978-0-262-01507-3
Access to e-book: https://mitpress.ublish.com/book/mathematics-economics#purchase

Student's Solutions Manual, (optional): 3rd edition, Hoy, Livernois, McKenna, Rees, and Stengos, MIT Press, April 2012 ISBN-10:
0-262-51794-9, ISBN-13: 978-0-262-51794-2

Lecture notes from Martin J. Osborne - Department of Economics-University of Toronto:
https://mjo.osborne.economics.utoronto.ca/index.php/tutorial/index/1/toc
(free access)

Support Structures, Practice resources & the Use of Technology

- Instructor: Dr. Olivia Mesta omesta@uwaterlo.ca
- WebEx meetings for Q&A with the prof: Live weekly on WebEx, recorded and posted.
- Tutorials: Live weekly on WebEx, recorded and posted.
- Lecture slides with solutions posted on LEARN
- Supplementary videos posted on LEARN
- Exercises with solutions on Osborne sections under exercises tab:
  https://mjo.osborne.economics.utoronto.ca/index.php/tutorial/index/1/toc
- Examples with solutions on the textbook
- Additional practice questions posted with solutions before exams
- Weekly Quizzes on Mobius

- Homework sets on Crowdmark
- Exams on Mobius
- Student IT support services https://uwaterloo.ca/student-it-services/
- LEARN help e-mail for technical assistance: learnhelp@uaterloo.ca (https://uwaterloo.ca/learn-help/students)
- MOBIUS help line: mobiushelp@uwaterloo.ca

COURSE CONTENT

The coverage consists of two sources, one of which is the textbook *Mathematics for Economics*, 3rd edition, Hoy, Livernois, McKenna, Rees, and Stengos. The other sources is the lecture notes from Martin J. Osborne - Department of Economics-University of Toronto: https://mjo.osborne.economics.utoronto.ca/index.php/tutorial/index/1/toc

Please note that our coverage from the textbook chapters is limited to the concepts covered on the posted lecture slides. We do not cover the entire chapter in most cases. You must download the posted lecture notes and solutions to your computer from LEARN and look at it from slide show; otherwise, you will not be able to see hand written solutions with an electronic pen.

WEEK 1

1. (1.1) from Osborne; Logic, …

2. (1.4) from Osborne; Intervals and functions, intermediate value theorem, …

   Quiz 1 Week 1 September 15 open between 8:00 am – 9:00 pm EST

WEEK 2

3. Chapter 2 from Hoy; functions, convex/concave set, convex/concave functions, …

4. (1.7) from Osborne; Graphical representation of functions, …

   Quiz 2 Week 2 September 22 open between 8:00 am – 9:00 pm EST

WEEK 3

5. Chapter 3 from Hoy; Definition of limit

6. Chapter 4 from Hoy; Continuity of functions and applications, …

   Quiz 3 Week 3 September 29 open between 8:00 am – 9:00 pm EST

WEEK 4

7. Chapter 5 from Hoy; Differentiation, total differential, link to convex/concave functions, …

   Quiz 4 Week 4 October 6 open between 8:00 am – 9:00 pm EST

EXAM 1

READING WEEK

WEEK 5

8. Chapter 6 from Hoy; Optimization in one variable, …

9. (2.1) from Osborne; Introduction to multivariate calculus

   Quiz 5 Week 5 October 20 open between 8:00 am – 9:00 pm EST

10. Chapter 8 from Hoy; Intro to Matrices, …

11. Chapter 9 from Hoy; Determinant, …

    Quiz 6 Week 6 October 27 open between 8:00 am – 9:00 pm EST

12. Chapter 10 from Hoy; Quadratic form, …

13. Chapter 11 from Hoy; Functions of n variables, implicit function theorem, …

    Quiz 7 Week 7 November 3 open between 8:00 am – 9:00 pm EST

14. (2.2) from Osborne; Chain rule – exclude Leibniz's formula, …

15. (2.3) from Osborne; Derivatives of functions defined implicitly, …

    Quiz 8 Week 8 November 10 open between 8:00 am – 9:00 pm EDT

16. (2.5) from Osborne; Homogeneous functions, …

    Quiz 9 Week 9 November 17 open between 8:00 am – 9:00 pm EDT

17. Chapter 12 from Hoy; Optimization in n variables, …

    Quiz 10 Week 10 November 24 open between 8:00 am – 9:00 pm EDT

18. Chapter 13 from Hoy; Optimization with constraints - Lagrange multiplier method, …

    Quiz 11 Week 11 open December 1 between 8:00 am – 9:00 pm EDT

19. December 6, 7: last tutorial, office hour

Please note that the schedule above is tentative. It is subject to change according to the requirements of remote learning.

Evaluation

Quizzes (not cumulative)	11 quizzes (2 are reserved for illnesses)	33%
Homework sets	5 homework sets	10%
Exam 1	Thursday October 7 (Week 4)	17%
Exam 2 (not cumulative)	Thursday November 11 (Week 8)	17%
Final exam (Cumulative)	To be announced by the registrar	23%

Homework sets are due almost every 2 weeks on Fridays by 6:00 pm and will be uploaded to Crowdmark:
HW 1 Week 2 September 24
HW 2 Week 5 October 22
HW 3 Week 7 November 5

HW 4 Week 9 November 19
HW 5 Week 11 December 3
Please note that you are required to answer all questions in every homework set; however, not all questions will be marked. A set of randomly selected questions will be marked from each homework set.

Upload Policy on Exams, Quizzes and HW sets

All due date times are for Toronto. Some questions on quizzes and exams will be multiple choice, multiple select, type your answer using equation editor on Mobius or true/false format. Some other questions might require you to show your work and upload. The uploaded solutions to homework assignments, quizzes, and exams must be hand written, and scanned. Typed solutions will not be accepted for uploads. You will need to write your solutions on paper (do not write the questions), scan and submit it as a single page. To ensure your scanned document is clear, the use of Microsoft Office Lens, which can be installed on your phone or iPad as an app (free of charge), is recommended. Take a picture of the hand written page with Microsoft Office Lens, save it in pdf format to your OneDrive and upload from your OneDrive to Crowdmark for hw sets and to Mobius for quizzes/exams.
It is your responsibility to make sure that your hand-writing is easy to read for marking purposes, no marks will be assigned if the hand writing is not easy to read.
There is a "trial quiz" posted on Mobius. It has upload questions as well as some other types of questions. Please take the trial quiz in order to familiarize yourself with the workings of Mobius. You need to click on "upload" after you select the file.

Policy on Academic Integrity and Honesty

The University of Waterloo subscribes to the strictest interpretation of academic integrity. Faculty members and students bear joint responsibility in assuring that cheating on quizzes or any type of examination is not tolerated. Students who engage in academic dishonesty will be subject to disciplinary action under Policy 71. Course assessments such as questions on quizzes, homework assignments and exams are protected by copyright. Reproduction or dissemination of exams, quizzes or the contents or format of any assessments in any manner (for example posting/e-mailing/texting/sharing the content and questions/answers with other students) is strictly prohibited.
Students who are enrolled in Econ 211 agree to the following academic honesty and integrity statement:
- I confirm that I will keep the content of the quizzes, examinations and other assessments confidential. I will not post questions, solutions or content to third party websites or transfer it to other individuals.
- I confirm that I will not receive any unauthorized assistance in preparing for or writing quizzes/examinations.
- I confirm that I will not access the Internet or any other unauthorized resource in the writing of the assessments such as quizzes and exams.
- I understand that I am responsible for being honest and ethical as per Policy 71
- I understand that there is no group work or cooperation involved in the assessments in this course. The assessments such quizzes and exams will be completed by my own efforts and I will not collaborate with any other person for ideas, questions or answers.

Policy on Quizzes

Quizzes are not cumulative. Each quiz has its own coverage as it is shown on page 2. If a quiz question requires a solution to be uploaded, it must be hand written. Typed solutions will not be accepted. Weekly quizzes will be assigned on Mobius starting week 2 and will be open between 8:00 am and 9:00 pm Toronto time zone. There are 11 quizzes in total. The lowest TWO quiz marks will be dropped at the end of the term to allow for legitimate excuses such as due to illness. The two quizzes are reserved for illnesses or other documented excuses. Missing two quizzes for no documented reasons and then bringing documentation for additional missed quizzes will NOT be accepted. If a student has a medical condition that would cause missing more than 2 quizzes, the student is required to provide verification of illness form for every missed quiz (including the first 2 and the rest) within 3 days of absence in order to qualify for a consideration of shifting the weight for the missed quizzes in excess of 2 to final exam. No shifting of the weight

will be considered if a student misses both midterm exams. The documentation for excuses for each day must be submitted to the instructor within 3 days of absence. There will be no make-up quizzes. Students cannot make arrangements at the end of the term bringing medical notes or excuses to cover all the days missed.

Policy on Missed Exams and Late Homework Assignments

There will be no make-up exams or homework assignments. No additional assignments or work will be assigned to improve the marks. For students who submit the verification of illness form, the weight of the missed exam will be shifted to the final examination. The UW verification of illness form must be obtained at the day of the exam and submitted within 3 days of missed exam date. There are no new exam arrangements by the instructor if you miss the final exam. You will need to apply for a consideration of a deferred exam through the office of Department of Economics. If you have compelling and verifiable evidence that you are unable to write the final exam at the scheduled time, you must follow this procedure to apply for a deferred exam.
Deferred Final Exam Policy found at https://uwaterloo.ca/economics/undergraduate/resources-and-policies/deferred-final-exam-policy

There is no make-up or shifting the weight for missed homework sets. Students are responsible for submitting the homework assignments to Crowdmark before the due date. Late penalty of 1% per hour will apply when the assignment is submitted late for any reason. Homework sets are not accepted after 3 days of the due date. Excuses for extensions or shifting the weight of homework sets are not accepted. Homework marks cannot be shifted to other course components.

- The solutions to homework assignments must be hand written, scanned and uploaded to Crowdmark. Typed solutions will not be accepted.
- The lowest ONE homework score will not count to allow for poor performance and absences due to illness. The policy CANNOT BE ABUSED by missing one hw set for non-documented reasons and then bringing medical notes for the rest of the missed hw sets.
- You must write at least one of the two midterm exams to pass the course.
- No deferred final exam will be provided for students who missed all the exams (including the final exam) in this course.
- Any medical notes submitted after 3 days of a missed deadline or a missed exam will not be accepted. Medical notes brought up at the end of the term to cover missed deadlines will not be accepted.
- I will not be responding to e-mails sent at the end of the term, after or before the final exam requesting an increase in the marks or asking for additional assignments/work to increase the marks.

Notice of recording on video conferencing
There might be live and/or recorded activities using WebEx involving tutorials, practice sessions or Q&A sessions during the term. No marks will be assigned to such activities. Recordings of the activities will be made available so that students who miss these activities will have access. Notice of recording is posted to LEARN under content as well as at the last pages of this course outline. You are not permitted to disclose the link to/URL of an event or an event session recording or copies of recording to anyone, for any reason. Recordings are available only to authorized individuals who have been directly provided the above instructions/link for their use. Recordings for personal use, required to facilitate your learning and preparation of personal course/lecture notes, should not be shared with others without the permission of the instructor.

Course Modification Warning
The instructor and university reserve the right to modify elements of the course during the term. The instructor might need make changes to course components due to the issues with the use of technology and uploading files to LEARN. The university may change the dates and deadlines for any or all courses in extreme circumstances. If either type of modification becomes necessary, reasonable notice and communication with the students will be given

with explanation and the opportunity to comment on changes. <u>It is the responsibility of the student to check his/her UWaterloo email and course website on LEARN daily during the term and to note any changes.</u>

Institutional-required statements for undergraduate course outlines approved by Senate Undergraduate Council.

Economics Department Deferred Final Exam Policy
Deferred Final Exam Policy found at https://uwaterloo.ca/economics/undergraduate/resources-and-policies/deferred-final-exam-policy

Cross-listed course
Please note that a cross-listed course will count in all respective averages no matter under which rubric it has been taken. For example, a PHIL/PSCI cross-list will count in a Philosophy major average, even if the course was taken under the Political Science rubric.

Academic Integrity
In order to maintain a culture of academic integrity, members of the University of Waterloo are expected to promote honesty, trust, fairness, respect and responsibility. See the UWaterloo Academic Integritity webpage and the Arts Academic Integrity webpage for more information.

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. When misconduct has been found to have occurred, disciplinary penalties will be imposed under Policy 71 – Student Discipline. For information on categories of offenses and types of penalties, students should refer to Policy 71 - Student Discipline. For typical penalties check Guidelines for the Assessment of Penalties.

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. When in doubt, please be certain to contact the department's administrative assistant who will provide further assistance.

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.

Accommodation for Students with Disabilities
Note for students with disabilities: The AccessAbility Services office, located on the first floor of the Needles Hall extension (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 the AS office at the beginning of each academic term.

Mental Health Support
All of us need a support system. The faculty and staff in Arts encourage students to seek out mental health supports if they are needed.

On Campus
- Counselling Services: counselling.services@uwaterloo.ca / 519-888-4567 xt 32655
- MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services
- Health Services Emergency service: located across the creek form Student Life Centre

Off campus, 24/7
- Good2Talk: Free confidential help line for post-secondary students. Phone: 1-866-925-5454
- Grand River Hospital: Emergency care for mental health crisis. Phone: 519-749-433 ext. 6880

- [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. Full details can be found online at the Faculty of ARTS [website](#)
Download [UWaterloo and regional mental health resources (PDF)](#)
Download the [WatSafe](#) app to your phone to quickly access mental health support information

Student Notice of Recording: Live and/or recorded video conferencing on WebEx, Microsoft Teams, … etc

Activities for this course might involve recording, in partial fulfillment of the course learning outcomes. You might receive notification of recording via the Learning Management System (LEARN), a message from your course instructor, course syllabus/website, or other means. Some technologies may also provide a recording indicator. Images, audio, text/chat messaging that have been recorded may be used and/or made available by the University to the instructor, Econ 211 students, TAs and tutorial leaders for the purpose of review. Recordings will be managed according to the University records classification scheme, WatClass, and will be securely destroyed when no longer needed by the University. Your personal information is protected in accordance with the [Freedom of Information and Protection of Privacy Act](#), as well as University policies and guidelines and may be subject to disclosure where required by law.

The University will use reasonable means to protect the security and confidentiality of the recorded information, but cannot provide a guarantee of such due to factors beyond the University's control, such as recordings being forwarded, copied, intercepted, circulated, disclosed, or stored without the University's knowledge or permission, or the introduction of malware into computer system which could potentially damage or disrupt the computer, networks, and security settings. The University is not responsible for connectivity/technical difficulties or loss of data associated with your hardware, software or Internet connection.

By engaging in course activities that involve recording, you are consenting to the use of your appearance, image, text/chat messaging, and voice and/or likeness in the manner and under the conditions specified herein. (In the case of a live stream event, if you choose not to have your image or audio recorded, you may [disable the audio](#) [and video functionality](#) (see: *Student privacy during live events*). Instructions to participate using a pseudonym instead of your real name are included where the feature exists; however, you must disclose the pseudonym to your instructor in advance in order to facilitate class participation.) If you choose not to be recorded, this notice serves as confirmation of your understanding that you can watch the recordings later and ask your questions via e-mail.

You are not permitted to disclose the link to/URL of an event or an event session recording or copies of recording to anyone, for any reason. Recordings are available only to authorized individuals who have been directly provided the above instructions/link for their use. Recordings for personal use, required to facilitate your learning and preparation of personal course/lecture notes, should not be shared with others without the permission of the instructor or event coordinator. Review the [University's guidelines for faculty, staff and](#) [students entering relationships with external organizations offering access to course materials](#) for more information on your obligations with respect to keeping copies of course materials. For more information about accessibility, connect with [AccessAbility Services.](#)

Territorial Acknowledgement
We acknowledge that we are living and working on the traditional territory of the Attawandaron (also known as Neutral), Anishinaabe and Haudenosaunee peoples. The University of Waterloo is situated on the Haldimand Tract, the land promised to the Six Nations that includes six miles on each side of the Grand River.

I wish you a productive semester

Dr. Olivia Mesta