

2019 Course outline

ECON 3030 Mathematical Economics 2

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Office hours: January 8, 2019 to April 9, 2019

Tuesday and Thursday 11:45 – 13:00, or by appointment. If there are no students in my office 15 minutes before the end of office hours, I may leave. I finish teaching at 4:00 pm, and can often meet students at that time. **No office hours during February break.**

Please feel free to email me to make appointments at other times as needed. I enjoy helping students.

You may also email me questions. Typed answers can be forwarded (with the questioner anonymous) to the class to help clarify a point.

Note: I may need to reschedule, shorten or cancel office hours for meetings. I will send out emails or announcements when this occurs.

Please feel free to email me to make appointments at other times as needed. I enjoy helping students.

You may also email me questions. Typed answers can be forwarded (with the questioner anonymous) to the class to help clarify a point. **Emailed questions are therefore very welcome!**

Note: I will occasionally need to reschedule, shorten or cancel office hours for committee meetings. Also, I do not plan on holding office hours during February break, though I will likely be around for arranged meetings.

Required Textbook:

Course pack including key chapters from: Chiang, Alpha C. and Wainwright, Kevin. 2005. **Fundamental Methods of Mathematical Economics: Fourth Edition.** McGraw-Hill.

Note: The course pack is about half the price of the textbook. It includes Chapters 10 through 17.

ECON 3030 readings are shelved at the end of the economics section with the coursepacks in the bookstore. The "author" is listed as the course number. The isbn is 978-1-4879-2787-9.

Strongly recommended with copies available in bookstore (possibly filed under author)

Dowling, Edward T. 2001. **Introduction to Mathematical Economics: Third Edition**. McGraw-Hill. (good practice questions)

Other useful material:

Martin Osborne's tutorial on mathematical economics:

<http://www.economics.utoronto.ca/osborne/MathTutorial/index.html>

Hoy, Michael, et al. (Livernois, McKenna, Rees and Stengos). 2011. **Mathematics for Economics**. Third Edition. MIT Press.

Wikipedia: for any definition of a mathematical concept – use the internet for questions and answers.

Youtube: Search for videos that cover some of the material in class. I will link a few to our class web page.

Notes for this course are based on all of the sources listed above, but mainly the required text.

Course General Description:

This is the 2nd part of your training in mathematics for Economists. The approach in the course will be mainly functional. We will learn how to apply mathematical tools to economic problems. This course is designed for students who plan to complete their undergraduate degrees or to prepare for their Master's and work as economists. I may include some proofs in the course as this training is needed for graduate theory.

If you hope to someday complete a PhD and pursue economic theory, I strongly advise you to also complete more courses in the Math department that emphasize proofs.

This is an economics course, not a mathematics course. You will be expected to understand and apply economic reasoning to the tools

that you learn. You will also be expected to interpret your answers according to the economics underlying the question. I am providing you with my old exams, but as much as possible, each question on an exam this year will contain a component that asks you to interpret your answer. Please be ready for that.

Course description – More specific:

We will try to learn the material from at least 7 chapters in 12 weeks, all of it advanced material. Therefore, the pace will be fast. Each chapter and many classes will have assignment questions attached to them. As we complete a section of the chapter, you will need to complete questions from the text for the section. We will progress partly according to how well students understand previous sections. There will be a lot of evaluation, mostly in the form of end of class, ten-minute tests and/or assignments.

When learning mathematics, I found the greatest challenge was to comprehend the application of mathematical concepts to economics in a general form. I will try to drill this type of application so that you become comfortable with general equations that have no numbers, and the manipulation of those equations, as well as calculations with numbers. If you find that you need more examples, use the internet. You can find many resources online now. You can expect some questions and assignments to be given in handwritten form, or photocopied and pasted from various sources.

The first day will cover the McLaurin and Taylor series from Chapter 9. Then we will learn exponential functions and their application in Chapter 10.

Chapter 10: First, you will be introduced to a function that is very useful in the rest of the course, the exponential function. The base of the exponential function is the natural number e , and so we will learn the value of e , how it is derived, and its economic interpretation.

You should have learned unconstrained optimization in 2030. We will therefore jump to constrained optimization in Chapter 12; which we will expand to include constrained optimization with inequality constraints. This is the material from Chapter 13. (Note: The start point depends on the material covered in 2030 during term 1).

Once we have completed Chapters 12 and 13, we will start to learn the tools needed to perform economic analysis over *time*, also known as ***dynamic analysis***.

Chapter 14: Next, we learn the major tool for analysis over time, integration. We will spend a week on integration. In this chapter you will learn the rules of integration (memorize them), as well as a basic application to economics. You will be given exercises as well as practice questions on this. Please do as many practice questions as you can find. If you need more questions, pick up a copy of a Schaum's outline on calculus and do questions from it.

Chapter 15 expands dynamic analysis to differential equations. These examine the movement of variables over continuous time. You will learn a few simple methods for solving first order differential equations and how to analyze the movements of variables graphically. The latter is helpful where the equations are non-linear. You will learn how to identify when a solution to an equation can be found and when there is no equilibrium value because the function explodes.

Chapter 16 continues our analysis of continuous time problems. In Chapter 16, we will study 2nd order differential equations as well as systems of differential equations. These will be applied to economic problems, including inflation and unemployment.

Chapter 17 and repeats the analysis of chapters 15 and 16, with the major difference that time is treated as a discrete variable in these chapters.

That is the map of the course. How far we get partly depends on the amount of effort students put into practice questions. It is very possible that we will not get past Chapter 16.

Note the final date for withdrawal is March 20, 2019

Exam behaviour:

I expect students to arrive on time and be prepared for me to arrange seating. Also note, any form of academic dishonesty will not be tolerated. I will immediately send all evidence of academic dishonesty to the Dean's office should any be found. Students will be advised if they have been found to be cheating by the dean's office, not by me. Do not expect leniency. Students should learn the University's policy on plagiarism, cheating, exam personation, ("Personation at Examinations" (Section 5.2.9) and "Plagiarism and Cheating" (Section 8.1)) and duplicate submission by reading

documentation provided on the Arts Student Resources web site at <http://www.umanitoba.ca/faculties/arts/student/index.html>.

Ignorance of the regulations and policies regarding academic integrity is not a valid excuse for violating them. Students may also wish to perform an online search on the concept of academic integrity, and assume that the strictest interpretation of honesty is to be followed on tests and examinations. (On assignments, you are permitted to work together in this class.)

Course Requirements:

All students must submit an email address THAT THEY CHECK to Aurora to ensure that I can email the entire class. I will be constructing a D2L page for this class in the second week of term. Students should check their email regularly for announcements, messages pertaining to class material, etc.

Classroom expectations:

Students are expected to attend lectures, listen attentively, participate in group activities and take notes. Students should arrive on time. Cell phones should be off during class. If a cell phone rings, or the student is caught using a cell phone, the professor can confiscate it until the end of class. Any student who uses a personal communication device in class will either lose 2% of the mark per occurrence or complete an extra assignment per occurrence. No text messaging.

Please bring a calculator and the textbook to all classes. You will be asked to do exercises in class.

Questions are welcome during class. In particular, if a student does not understand a concept or explanation, then I would very much like him or her to ask for further clarification. This helps the entire class.

Course expectations:

Questions are also welcome after class. There is no time limit for student questions. Students are expected to approach me with questions as early in the term as possible.

Students are expected to complete assigned readings from the textbook either before the lecture, or immediately afterward. In this way, any questions can be addressed in a timely manner, and students can keep up with the course. Come to see me if you need help.

Marking:

Assignments: due every week or two	10 %
In class work	5 %
Test 1 February 7	25 %
Test 2 March 19 (cumulative)	25%
Final Exam (All chapters)	35 %

ALL EXAMS ARE CUMULATIVE! Final exam will likely be scheduled during the exam period. Therefore, do not book airline tickets before the end of the exam period. I retain the right to alter the exam weights by 5% up or down, in favour of the students (or not).

Bonus: I retain the right to give students up to 1 % bonus for **class participation and help answering questions during lectures. Feel free to remind me of this at the end of the course if you have been a particularly helpful student.**

Grade Conversion:

< 50 % Fail	66 – 70 % C+	82 – 92 % A
51 – 60 % D	71 – 76 % B	93 – 100 % A+
61 – 65 % C	77 – 82 % B+	

All marks are subject to departmental approval.

Assignments will be marked as follows:

- 0 not handed in on time.
- 1 not completed or not enough effort shown.
- 2 completed on time with effort evident

Students can either hand in the assignment in class, or submit it to UM Learn in the appropriate folder.

Note: It is the student's responsibility to check answers on assignments. The marks are for doing the work, a full mark does not indicate the answer is correct. I will try to put together answer keys based on the best answers students submit. These will be posted on UM Learn, or may be emailed to the class.

A note on in class work.

In-class work will take the form of problems, or examples.

If a student must miss a class, the student should email me ahead of time. I will try to avoid giving a question on that day, or will give them the mark for the day's work. Obviously, no accommodation will be made if requests are frequent.

Exercises are to be completed following each class. Questions from assignments should be brought to the following class. Students should be prepared to answer questions from other students. The schedule is tentative, and so, there may be some changes to the dates that particular assignments are due.

Note: I am fully aware that the final answers to some exercises are at the back of your text. You should use these to check your work. You should show your work on the assignment. Assignments will be due almost daily.

Other notes:

Students with special needs: Students with special learning needs (who require accommodation aids or other supports) should identify themselves to the Student Accessibility Center to make arrangements. You can also inform me of any needs that I can accommodate in the classroom.

Unclaimed term work disposal: Any term work that has not been claimed by students will be held for four (4) months from the end of the final examination period for the term in which the work was assigned. At the conclusion of this time, all unclaimed term work will become property of the Faculty of Arts and be destroyed according to FIPPA guidelines and using confidential measures for disposal.

Minimum penalty for cheating on a test: The minimum penalty for academic dishonesty in a test or final examination is F for the test/examination, and an F---DISC (discipline) in the course plus a suspension from the Faculty of Arts for a period of one year. The F grade and disciplinary notation appears on the student's transcript. For repeat violations, the penalty may include suspension from the Faculty of Arts for a period of up to 5 years.

Seating for midterms and final exam

The midterms will be conducted during class time. Expect to be seated. The final exam will be conducted in the examination room. I will assign seats for each exam.

BRING A CALCULATOR TO ALL EXAMS.

No cellphones in exams, cellphones off during class.

All exams are cumulative.

Academic honesty is expected:

Please refer to the current University Calendar for university policy on plagiarism and cheating (check the web Calendar). Please note that the penalties for cheating are severe, will often include an F in the course, and a note on your transcript. Also note, I send all materials on which cheating is suspected directly to Arts before I inform the student. Don't cheat, especially in my class. It is not worth it.

ACADEMIC HONESTY IMPORTANT:

Any student who speaks or communicates in any way to another student during an exam, including while handing in the exam, will be given a zero and reported to their Faculty.

If the final exam is in a room with dividers between desks, any student who leans back during the final exam will be asked to hand in the exam and given a zero. Leaning back with partitions facilitates cheating, and if you lean back, we will presume you are attempting to cheat. Consider yourself warned. You will receive seat numbers for the final exam. You must sit in your specifically assigned seat.

QUESTIONS ON TESTS AND EXAMINATIONS will be based on lectures and all other course materials including lecture material that is not in notes.

Missing a midterm exam:

All tests and examinations must be written. If any student is unable to take a test on the designated day, because of a clash with a religious holiday or other valid reason, he or she is asked to notify me at least two (2) weeks before the test date. If illness or an emergency prevents the student taking a test he or she is asked to notify me immediately and obtain a medical certificate from a doctor or proof of emergency, which I can confirm. (Students will only be allowed to write a makeup test for **documented** medical or compassionate reasons.) Note: Medical reasons include mental health.

Note: It is NOT FAIR for a student to earn a grade based on how well they can write an exam while ill and have that grade measured alongside the grade of a student who wrote an exam healthy. If you are ill, get a doctor's note. Once an exam is written, its grade stands. If you are crashing psychologically, get a doctor's note.

(The only time I have ever needed longer term leave was for mental health, not physical. This is the norm. It's time we brought it into the light.)

Student accessibility

Students who require extra supports or time to write an exam for physical or psychological reasons should contact [Student Accessibility Services](#). There is a fairly clear process for obtaining supports. If you may need them, contact them as soon as possible!

Appendix: Student supports, health and wellness, copyright, and your rights and responsibilities

A. Student learning support

Writing and Learning Support

The Academic Learning Centre (ALC) offers services that may be helpful to you throughout your academic program. Through the ALC, you can meet with a learning specialist to discuss concerns such as time management, learning strategies, and test-taking strategies. The ALC also offers peer supported study groups called Supplemental Instruction (SI) for certain courses that

students have typically found difficult. In these study groups, students have opportunities to ask questions, compare notes, discuss content, solve practice problems, and develop new study strategies in a group-learning format.

You can also meet one-to-one with a writing tutor who can give you feedback at any stage of the writing process, whether you are just beginning to work on a written assignment or already have a draft. If you are interested in meeting with a writing tutor, reserve your appointment two to three days in advance of the time you would like to meet. Also, plan to meet with a writing tutor a few days before your paper is due so that you have time to work with the tutor's feedback.

These Academic Learning Centre services are free for U of M students. For more information, please visit the Academic Learning Centre website at:

<http://umanitoba.ca/student/academiclearning/>

You can also contact the Academic Learning Centre by calling 204-480-1481 or by visiting 201 Tier Building.

University of Manitoba Libraries (UML)

As the primary contact for all research needs, your liaison librarian can play a vital role when completing academic papers and assignments. Liaisons can answer questions about managing citations, or locating appropriate resources, and will address any other concerns you may have, regarding the research process. Liaisons can be contacted by email or phone, and are also available to meet with you in-person. A complete list of liaison librarians can be found by subject: <http://bit.ly/WcEbA1> or name: <http://bit.ly/1tJ0bB4>. In addition, general library assistance is provided in person at 19 University Libraries, located on both the Fort Garry and Bannatyne campuses, as well as in many Winnipeg hospitals. For a listing of all libraries, please consult the following: <http://bit.ly/1sXe6RA>. When working remotely, students can also receive help online, via the Ask-a-Librarian chat found on the Libraries' homepage: www.umanitoba.ca/libraries.

B. Health and wellness:

For 24/7 mental health support, contact the Mobile Crisis Service at 204-940-1781.

Student Counselling Centre

Contact SCC if you are concerned about any aspect of your mental health, including anxiety, stress, or depression, or for help with relationships or other life concerns. SCC offers crisis services as well as individual, couple, and group counselling.

Student Counselling Centre:

<http://umanitoba.ca/student/counselling/index.html>

474 University Centre or S207 Medical Services
(204) 474-8592

Student Support Case Management

Contact the Student Support Case Management team if you are concerned about yourself or another student and don't know where to turn. SSCM helps connect students with on and off campus resources, provides safety planning, and offers other supports, including consultation, educational workshops, and referral to the STATIS threat assessment team.

Student Support Intake Assistant

<http://umanitoba.ca/student/case-manager/index.html>

520 University Centre
(204) 474-7423

University Health Service

Contact UHS for any medical concerns, including mental health problems. UHS offers a full range of medical services to students, including psychiatric consultation.

University Health Service <http://umanitoba.ca/student/health/>

104 University Centre, Fort Garry Campus
(204) 474-8411 (Business hours or after hours/urgent calls)

Health and Wellness

Contact our Health and Wellness Educator if you are interested in information on a broad range of health topics, including physical and mental health concerns, alcohol and substance use harms, and sexual assault.

Health and Wellness Educator

<http://umanitoba.ca/student/health-wellness/welcome.html>

Katie.Kutryk@umanitoba.ca

469 University Centre (204) 295-9032

Live Well @ UofM

For comprehensive information about the full range of health and wellness resources available on campus, visit the Live Well @ UofM site:

<http://umanitoba.ca/student/livewell/index.html>

C. Copyright

All students are required to respect copyright as per Canada's *Copyright Act*. Staff and students play a key role in the University's copyright compliance as we balance user rights for educational purposes with the rights of content creators from around the world. The Copyright Office provides copyright resources and support for all members of the University of Manitoba community.

Visit <http://umanitoba.ca/copyright> for more information.

D. Your rights and responsibilities

As a student of the University of Manitoba you have rights and responsibilities. It is important for you to know what you can expect from the University as a student and to understand what the University expects from you. Become familiar with the policies and procedures of the University and the regulations that are specific to your faculty, college or school.

The [Academic Calendar](#)

<http://umanitoba.ca/student/records/academiccalendar.html> is one important source of information. View the sections *University Policies and Procedures* and *General Academic Regulations*.

While all of the information contained in these two sections is important, the following information is highlighted.

- If you have questions about your grades, talk to your instructor. There is a process for term work and final **grade appeals**. Note that you have the right to see your final examination scripts. See the Registrar's Office website for more information including appeal deadline dates and the appeal form <http://umanitoba.ca/registrar/>
- You are expected to view the General Academic Regulation

section within the Academic Calendar and specifically read the **Academic Integrity** regulation. Consult the course syllabus or ask your instructor for additional information about demonstrating academic integrity in your academic work. Visit the Academic Integrity Site for tools and support <http://umanitoba.ca/academicintegrity/> View the **Student Academic Misconduct** procedure for more information.

- The University is committed to a respectful work and learning environment. You have the right to be treated with respect and you are expected to conduct yourself in an appropriate respectful manner. Policies governing behavior include the:

Respectful Work and Learning Environment

http://umanitoba.ca/admin/governance/governing_documents/community/230.html

Student Discipline

http://umanitoba.ca/admin/governance/governing_documents/students/student_discipline.html and,

Violent or Threatening Behaviour

http://umanitoba.ca/admin/governance/governing_documents/community/669.html

To clarify. If you feel threatened at the university contact Security Services (555 from any campus phone), and if you feel really threatened, contact the police (911). You should also report any threats.

- If you experience **Sexual Assault** or know a member of the University community who has, it is important to know there is help available in Winnipeg. Information and resources can be found by reviewing the Sexual Assault site <http://umanitoba.ca/student/sexual-assault/>
- The **Sexual Assault** policy, written in legal language, may be found at: http://umanitoba.ca/admin/governance/governing_documents/community/230.html
- For information about rights and responsibilities regarding **Intellectual Property** view the policy <http://umanitoba.ca/admin/governance/media/Intellectual>

[Property Policy - 2013 10 01.pdf](#)

For information on regulations that are specific to your academic program, read the section in the Academic Calendar and on the respective faculty/college/school web site

<http://umanitoba.ca/faculties/>

Contact an **Academic Advisor** within our faculty/college or school for questions about your academic program and regulations <http://umanitoba.ca/academic-advisors/>

Student Advocacy

Contact Student Advocacy if you want to know more about your rights and responsibilities as a student, have questions about policies and procedures, and/or want support in dealing with academic or discipline concerns.

<http://umanitoba.ca/student/advocacy/>

520 University Centre

204 474 7423

student_advocacy@umanitoba.ca

Students caught cheating on a test will want to contact the Student Advocate. They will help you navigate the rules. They will also offer support as you cope with penalties if they apply, which is often the case.