Mathematics for Economists II

The Ap/Econ 1540 Section M & U Outline: What you need to know to succeed

- **Motivation**
  Mathematics is the language of choice for economists.

The language of math is understood world-wide.

The purpose of economics as a field is to help us understand and navigate the world of (economic) human behavior. To do that, economists need a way, a language to describe the world and human behavior, human choices. The most convenient language for that is the language of mathematics:

- Using numbers, economists can count, e.g., number of firms, inventory hold, pieces of information shared, etc.
- Using functions, we can express relationships, such as between income, education level, and life expectance or between foreign investments, domestic infrastructure, and GDP.
- With optimization methods we can more precisely describe the choices made by consumers, firms, and governments.
- Comparative statics help us predict how those optimal choices change as the environment and the context changes.
- Finally, vectors and matrices are an extremely convenient short-hand notation to organize and manipulate data, e.g., the number of people employed in various sectors of the economy over time.

- **Why**
  you will benefit from Econ 1540

Strengthening your mathematical skills has three benefits: (1) It increases your proficiency in the language of mathematics. As a result, you will be a better student of economics and, eventually, a producer of better economic arguments. (2) It strengthens your abstraction skills. Building on these skills, it will be easier for you to acquire other (highly valuable) technical skills such as programming or data analysis skills. (3) It helps you further develop a sophisticated understanding of reality. As a result, you will be better able to detect patterns, discern risks, and make better decisions in your personal and professional life.

- **How**
  you will achieve those benefits.

One learns math only by doing it. You develop your mastery of mathematical tools by solving practice problems. It is much more valuable for students to solve problems instead of watching the instructor solve problems. This course will offer plenty opportunities for student-centered problem solving inside and outside of class.

- **What**
  we will cover in this course.

In this second part of mathematics for economists, we master functions of more than one variable and expand derivatives and optimization methods to such functions. Finally, we introduce vectors and matrices as convenient short-hand notation and learn how to manipulate and interpret them.

Learning Objectives,

As a successful student, at the end of this course you will

Foundational Knowledge	• Have developed a thorough mastery of the mathematical tools covered. • Be able to execute manipulation of formal expression and to reliably solve mathematical and formal economic problems.
Integration and Application	• Be able to connect mathematical notation to real-world observations. • Be able to use mathematical tools to capture essential aspects of real-world observations and critically assess their limitations.
Professional Development	• Have developed confidence and proficiency in using mathematical language to express relationships, observations, etc. • Be able to translate between mathematical language and plain English.

Course Structure,

The course consists of an introduction and four modules, with the following content:

0. Introduction week 1	• Get to know your classmates and your instructor. • Understand the syllabus, course components and expectations.
I. Functions of two or more variables week 1-2	• Understand and interpret functions of multiple variables. • Calculate partial derivatives, partial elasticities. Apply Young's Theorem.
II. Characterizing functions of week 3-4	• Work with functions of multiple variables. • Calculate total derivatives, elasticity of substitution. • Identify and characterize homogenous and homothetic functions. • Find and apply linear approximations.
III. Optimization week 5-6	• Solve unconstrained and constrained optimization problems. • Apply the Lagrangian Multiplier method. • Apply and interpret comparative static and envelope theorem.
IV. Vectors and Matrices week 7-9	• Understand and interpret vectors and matrices as short-hand notation of data, geometric objects, short-hand notation for systems of equations. • Execute and apply: Addition. Inner Product. Scalar multiplication. Transpose. Symmetry. Parallel and orthogonal vectors.
V. Syst of Equations, Determinants week 10-12	• Identify and set-up linear systems of equations (LSE). Matrix notation. • Solve LSE using substitution, Gaussian elimination, inverse matrices. • Calculate determinants of matrices of order 2 and higher. • Interpret determinants in different contexts.

and Course Components

You can earn 100 points or marks in this course. In each module, you can earn 20 points: 8 for participation and 12 for demonstrating mastery. You can also earn 2 bonus marks in each module by submitting a comprehensive info-graphic 2 days before the respective first test day.

Participation
40 points
8 per module

Participation is important in this course: It supports your learning progress and makes you part of our learning community.

- Each week you are asked to contribute to a group discussion forum, e.g.,
  - By explaining some terminology,
  - By demonstrating the solution of a practice problem,
  - By discussing an application of a mathematical concept.
- At the end of each module, your contributions to your group discussions will be evaluated. You will earn:
  - 4 points for completing all participation-activities in each module.
  - 2 points for demonstrating effort and engagement in each activity.
  - 2 points for engaging in discussions with other students through thoughtful comments and responses.
- Please make sure to read the activity instructions carefully and fulfill all aspects of the activity. For example, if the activity asks you to post a picture and comment on it, it is not enough to just post an image.

Mastery
60 points
12 per module

Demonstrate:
- *comprehension* of mathematical terminology
- *ability to apply* concepts,
- *capability to manipulate* formal expressions and *to reliably solve* mathematical and formal economic problems.

- For each module, demonstrate mastery by completing an online term test or a writing assignment.
- Online tests include multiple choice, short-answer, and numeric questions. Online tests are open book. Calculators are allowed.
- There are three writing assignments. You can use the writing assignment WA 1-2 instead of module 1 or module 2 online test. You can complete the writing assignment WA 3 instead of the online test for module 3. You can complete WA 4-5 instead of module 4 or module 5.
- Each writing assignment has three deadlines. Submitting after the first deadline, you are not getting feedback, though no penalty. For the third deadline, grading is on pass (7 of 12 pts)/ fail (0 pts) basis only.
- Deadlines are as follows

		Term Test (on Moodle)	Writing Assignment Deadline 1 (grading, feedback)	Deadline 2 (grading, no feedback)	Deadline 3 (Pass/Fail, no feedback)	complete
Part 1	Module 1 Module 2 WA1-2	30-Jan 13-Feb	20-Feb	27-Feb	6-Mar	2 of 3
Part 2	Module 3 WA 3	6-Mar	13-Mar	20-Mar	27-Mar	1 of 2
Part 3	Module 4 Module 5 WA4-5	27-Mar Final Exam Period	21-Apr	26-Apr	1-May	2 of 3

Course Format

Asynchronous.

Each student learns the material according to their own schedule and availability.

This course runs completely asynchronously. Students can access the course material and complete the assignments on their own schedule. Except for weekly office hours, there are no synchronous activities.

Same-paced.

Students progress through the course together, completing the same assignments each week.

We start and finish each module together. Within each module there is some flexibility to work ahead or catch up, though generally all students complete the same activities each week.

Module-based.

Our course is structured around modules.

Our course consists of five modules. Each module in turn has three phases: learning the terminology, understanding the concepts, and practising the concepts. Within each module, students complete activities across a range of modalities: reading, writing, explaining, computing, explaining, listening, and reflecting. This range of activities strengthens the neural networks that form the basis of your learning.

Course Policies.

! You do not need to submit documentation. It is your choice how you demonstrate mastery.

Missed Term Tests.

If you miss an online term test, you must submit the corresponding writing assignment to earn a grade.

If you miss both term tests for part 1 or part 3 or if you fail to submit the writing assignment by the due date, you will automatically receive a mark of zero.

Missed Participation.

No make-up credit will be given for any reason for missed participation.

Email Policy and Etiquette.

Email is not an effective way to discuss economics or mathematics.

Instead, attend digital office hours or post on the "Questions? Answers!" section in our Moodle course. If you have a concern, others will share your concern. I am checking questions posted in the "Questions? Answers!" section frequently and typically answer questions posted there before responding to emails. The "Questions? Answers!" section is our course repository of clarifications, tips, strategies, and answers.

Please reserve email communication for brief personal questions and concerns. When you email, please

- follow the guidelines for emailing your instructor posted on Moodle.
- do include Econ1540 in the subject line.
- be as specific as possible.
- do not send attachments unless requested.

I strive to reply to e-mail within 48 hours, except on weekends. Emails between instructors and students constitute professional communication; please treat them as such. If you are not sure what constitutes professional communication, please refer to the "Guideline on emailing an instructor" posted on Moodle.

Rounding Policy.

To arrive at your final mark, I will round your final score to the nearest integer, e.g., an overall score of 69.4 is a final mark of 69. No exceptions.

Appealing a Grade

You must submit any appeals within two weeks of the grade having been posted

Students can appeal test grades and grades for the midterm by submitting an electronically fillable Test Remark Request form available through the Moodle website. Please note that following an appeal, your test score can increase, decrease, or stay constant.

Academic Integrity.

- **Why**

Upholding high standards of Academic Integrity is essential for successful academic discourse, and to the pursuit of learning and scholarship. Respecting and enforcing these standards at our University also ensures that the degree you earn from York University is a strong signal your learning and academic achievement.

- **How**

You uphold high standards of Academic Integrity by:

- doing and submitting only your own work
- not permitting others to use your answers
- giving credit to others for their ideas and works
- quoting your sources, correctly paraphrasing and summarizing

- **More Information**

If you have questions or concerns about what constitutes appropriate academic behaviour, please consult with me or seek additional resources.

- **Enforcement**

York University takes its responsibility to uphold high academic standards very seriously. The Senate Policy outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences. Sanctions in cases of cheating can include temporary and permanent records on your transcript, suspension from the course, up to suspension from the University.

- **Not up the instructor**

If I observe behaviour that might involve academic dishonesty, I am required to report it. It is not up to me to judge whether the behavior was unintended, a minor infraction, a first-time infraction, etc. I am professionally bound to report any suspicious behavior.

- **Turn-it-in**

To promote academic integrity in this course, students who opt into a writing assignment are required to submit their written assignments to Turnitin (via the course Moodle) for a review of textual similarity and the detection of possible plagiarism. In so doing, students allow their material to be included as source documents in the Turnitin.com reference database, where they will be used only for the purpose of detecting plagiarism. The terms that apply to the University's use of the Turnitin service are described on the Turnitin.com website.

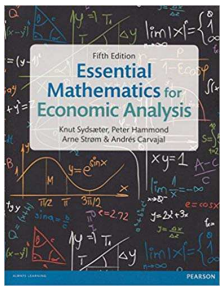
You Need ….

Required

Pen and Paper. Pencil and Eraser.

Handwriting is demonstrably more effective in helping you learn than typing notes. Even when reading an e-book, practicing with ALEKS, or watching a video online, it will be helpful for you to take handwritten notes in your own words.

Required



Knut Sydsaeter, Peter Hammond, Andrés Carvajal:
Essential Mathematics for Economic Analysis

We will closely follow chapter 1-9. Each module, there will be assigned reading from the textbook. Each week, we will engage with the textbook in another activity. You are especially encouraged to work through the practice questions worked out in the book. Many quiz and midterm are similar to those practice questions.

Required

8 hours of time. Every week.

Full time student = full time work. So: 5 courses = 40 hours each week.
As the instructor I thus design the course such that the average student can perform satisfactorily (= C) by spending 8h each week.

I am aware that many of you take six courses, work part- or full-time, are involved in clubs, and/or have family obligations. Please be aware of your opportunity cost and work effectively with the time you have.

Required

Reliable internet access

You need to be able to regularly stream videos from our Moodle eclass site, participate in Zoom office hours, and complete online quizzes.

Also useful

Patience and a Sense of humor
Learning mathematics is a process that takes time. Transitioning to online learning and into the role of a college student is a process that takes time. Be patient and kind with yourself.

Technical Requirements.

Several platforms will be used in this course (e.g., Moodle, Zoom, etc.) through which students will interact with the course materials, the course director/TA, as well as with one another.

To successfully participate in this course, you will need:

Hardware

- a laptop or desktop in good working order. You will not be able to complete course assessments with just a tablet or smartphone.
- a webcam with microphone or smartphone for our Zoom meetings.
- a camera with which to take pictures of your work to upload to our Moodle website.
- a reliable internet connection.

Software

- Moodle. This is our course website. It is provided by York University.
- Zoom. Zoom is available to all York students for free. https://yorku.zoom.us/
- MS Word. For two of the four modules you will have a choice to demonstrate your mastery through an online test or through a writing assignment. To complete the writing assignments, you will need MS Word. It is available to all York students at https://uit.yorku.ca/student-services/software/.

Note

Please review the technology requirements and FAQs for Moodle.

Students shall note the following:

- Zoom is hosted on servers in the U.S. This includes recordings done through Zoom. If you have privacy concerns about your data, provide only your first name when you join a session.
- The system is configured in a way that all participants are automatically notified when a session is being recorded. In other words, a session cannot be recorded without you knowing about it.

Course Summary

Instructor

Karen Bernhardt-Walther, Assistant Professor of Economics (teaching stream)

Contact

Email: bkaren@yorku.ca

Time and Location

This course runs asynchronously on Moodle and ALEKS. The course-week starts on Thursday. Most assignments are posted on Thursday and are due the next Wednesday.

Office hours: tba on Zoom.
Meeting ID: tba, Passcode: tba

I enjoy discussing economics/ life/ college … with you and look forward to seeing you in office hours!

Course Structure

Part 0:	Introduction
Mod I:	Functions of two or more variables.
Mod II:	Characterization.
Mod III:	Optimization.
Mod IV:	Vectors and Matrices
Mod V:	LSE. Determinants.

Class Format

The class runs asynchronously. Weekly activities support your learning through reading, writing, reflecting, watching videos, solving practice problems and debating material with your classmates.

Our learning community engages in respectful, friendly, constructive, and supportive exchanges.

Make sure to schedule time to work on this course on at least 3-4 days each week.

Marking Scheme

Participation:	5 x 8	40
Mastery:	5 x 12	60
Bonus (week 1, infographics)	6 x 2	12
Total:		100

Course Website: Moodle

On Moodle you will find group discussions, practice tests, assignments, guidelines, etc. Check the Moodle website regularly and read announcements carefully.

Key Dates

Jan 11th	Start of first course-week
Jan 25th	Last day to add course
Mar 12th	Last day to drop course
Apr 12th	Last day to withdraw
Apr 14-28th	Final Exam Period