Faculty of Liberal Arts & Professional Studies

Department of Economics

September, 2021

Course: AP/ECON 1530 J – Introductory Mathematical Economics I

Course Webpage: https://eclass.yorku.ca/eclass/course/view.php?id=57120
Please check this regularly for updates and announcements.

Term: Fall Term of Academic Year 2021-2022

Prerequisite / Co-requisite:

1. Grade 12U Advanced Functions or equivalent.
2**.** AP/ECON 1000 3.00 or AP/ECON 1010 3.00, or equivalent. Strongly recommended completion:
high-school calculus or equivalent.

Course Credit Exclusions:

SC/MATH 1000 3.00, SC/MATH 1013 3.00, SC/MATH 1300 3.00, SC/MATH 1505 6.00,
SC/MATH 1513 6.00, SC/MATH 1530 3.00, SC/MATH 1550 6.00, GL/MATH/MODR 1930 3.00.
Note: Acceptable course substitutes are available in the Calendar.

Course Instructor Contact Information

Name: Barry Smith
Office: 1078 Vari Hall (This course is REMOTE/ONLINE and I will not be available in my
                 office.)
Office Hours: Will be combined with regular review and problem solving sessions.
Email: maecsta@yorku.ca

Time and Location

Lectures: M 2:30-4:30 PM, W 2:30-3:30 PM (All times are EST)
               Course lectures will be presented via Zoom. Zoom access is as follows:
               Meeting ID: 779 755 3860
               Passcode: 13571113

Course Description

Overview: This course introduces and develops topics in differential calculus, integral calculus,
and their applications in economics. Topics will include a review of algebra, linear and some
nonlinear equations, quadratics, general functions of one variable (including quadratic
functions), continuity, limits and derivatives of single-variable functions, series, inverse
functions, exponential and logarithmic functions, single-variable optimization and integration.
Applications to topics in economics will include (but not be limited to) supply and demand
functions, maximization of revenue and profits and elasticity of demand and supply.

Details: Economists are interested in microeconomic models of the behavior of agents (demanders and suppliers) in individual markets. Economists are also interested in macroeconomic models of aggregated markets and total consumption, investment and government spending as well as interest rates, exchange rates and money supply. This interest manifests itself at both a theoretical and empirical level. In all cases it is important that economists describe their areas of interest, their models and their results in a precise manner. The natural way to do this is to write models and study their properties using a language or languages that are rich and precise and which are used by most economists in the profession. These languages are mathematics and statistics. Our goal in this course is to review and develop the mathematics needed for you to be able to both understand the statement of economic models and for you to analyze and derive properties of economic models.

Learning Process: You are expected to attend lectures and to solve the problems that are assigned each week. Your understanding of the course material will become deeper and broader the more you practise. You can't simply read mathematics and expect to understand or retain ideas or solve problems. Each week there will be a 2 hour review and problem solving session. This extra class will run from 3:30-5:30 PM on those Wednesdays where we do not have a test. If there is a test on a Wednesday, the review session will take place two days earlier on the Monday from 4:30-6:30 PM. These review sessions will be recorded and distributed to you. I strongly recommend that you attend these sessions.

Course Text

> Knut Sydsaeter and Peter Hammond, Essential Mathematics for Economic Analysis, Fifth Edition (ISBN 9781292074719), Pearson.
> See the end of this outline for more details for getting electronic access for this text. Both hard copies and electronic versions are available.

Course Modules

This course will be presented in 3 modules. Each module will be separate and at the end of a module there will be a test. Material from previous modules will not be tested directly but, as your skills and knowledge develop, you will use them in subsequent modules. For example, Module 2 contains material on limits and differentiation. Module 3 uses derivatives for optimization and integration but won't directly test derivatives material presented in Module 2. Similarly, Module 2 may test derivatives of functions you studied in Module 1.

Components of the Modules

Module 1.

Please review Chapter 1 on your own. The topics that will be covered in class are as follows:

0. *Review of Algebra, Chapter 2.*
   - Real Numbers, Section 2.1
   - Integer Powers, Section 2.2
   - Rules of Algebra, Section 2.3
   - Fractions, Section 2.4

- Fractional Powers, Section 2.5
- Single and Double Inequalities, Section 2.6
- Intervals and Absolute Values, Section 2.7

1. *Equations, Chapter 3.*
    - How to Solve Simple Equations, Section 3.1
    - Equations with Parameters, Section 3.2
    - Quadratic Equations, Section 3.3
    - Linear Equations in Two Unknowns, Section 3.6
    - Nonlinear Equations, Section 3.4

2. *Functions of One Variable, Chapter 4.*
    - Introduction, Section 4.1
    - Basic Definitions, Section 4.2
    - Graphs and Functions, Sections 4.3
    - Linear Functions, Sections 4.4
    - Linear Models, Section 4.5
    - Quadratic Functions, Section 4.6
    - Power Functions and Polynomials, Sections 4.7-4.8

Module 2.

3. *Differentiation, Chapter 6.*
    - Slopes of Curves, Section 6.1
    - Tangents and Derivatives, Section 6.2
    - Increasing and Decreasing Functions, Section 6.3
    - Rates of Change, Section 6.4
    - A Dash of Limits, Section 6.5
    - Simple Rules for Differentiation, Section 6.6
    - Sums, Products, and Quotients, Section 6.7
    - Chain Rule, Section 6.8 & Chapter 5, Section 5.2 pp. 134--135
    - Higher-Order Derivatives, Section 6.9

4. *Derivatives in Use, Chapter 7.*
    - Implicit Differentiation, Section 7.1
    - Economic Examples, Section 7.2
    - Differentiating the Inverse, Section 7.3 & Chapter 5 , Section 5.3
    - The Differential of a Function and Approximation Section 7.4 pp. 217--220
    - Why Economists Use Elasticities, Section 7.7

5. *Limits, Continuity, Series and L'Hopital*
    - Continuity Chapter 7, Section 7.8
    - More on Limits Chapter 7, Section 9
    - Infinite Sequences and Geometric Series Chapter 7, Section 9, Chapter 10, S4
    - Present Value, Chapter 10, Section 10.3
    - L'Hopital's Rule Chapter 7, Section 1

Module 3.

6. *Single-Variable Optimization*, Chapter 8.

- More on Inverse Functions
- Logarithmic Functions, Section 6.11 & Chapter 4, Section 4.1
- Exponential Functions, Section 6.10 & Chapter 4, Section 4.9
- Introduction to Optimization, Section 8.1
- Simple Tests for Extreme Points, Section 8.2
- Economic Example, Section 8.3
- The Extreme Value Theorem Section 8.4
- Further Economic Examples, Section 8.5
- Local Extreme Points, Section 8.6
- Inflection Points Convexity and Concavity, Section 8.7

7. *Integration, Chapter 9*
- Indefinite Integrals, Section 9.1
- Area and Definite Integrals, Section 9.2
- Properties of Definite Integrals, Section 9.3
- Economic Applications, Section 9.4
- Integration by Parts, Section 9.5
- Integration by Substitution, Section 9.6
- Integration over Infinite Intervals 9.7

Weighting of Course Components

At the end of each Module there will be a test. Each test is worth 1/3 of your final grade. Tests for Modules 1 and 2 will take place during the term in class time on Wednesdays. The test for Module 3 will take place during the Final Exam Period and will be scheduled by the Registrar. York rules prohibit me from having a test in the last week of class that is worth more than 20% of your grade. I have no control over when the final test will be scheduled so please do not schedule travel etc. before the final exam schedule is published by the Registrar.

It is difficult for me to judge exactly when Modules will be completed and it may be necessary for me to shuffle material between modules. The dates for tests 1 and 2 are fixed. It is important for you to keep up with the material. Here are the test dates that I know about now:

Module 1 Test :   Wednesday October 6, 2021 (during class time) 33%
Module 2 Test :   Wednesday November 10, 2021 (during class time) 33%
Module 3 Test :   As scheduled by the Registrar during Fall Examination period 33%

Additional Information

There are no currently scheduled deferred tests and no currently scheduled makeup tests. In January 2022 there will be a time set aside for deferred tests for those who receive permission.

The grading scheme for the course conforms to the 9-point grading system used in undergraduate programs at York (e.g., A+ = 9, A = 8, B+ = 7, C+ = 5, etc.). Test grades will be numeric. They can be transformed to a letter grade using the following scale: A+ = 90 to 100, A = 80 to 89, B+ = 75 to 79, etc.

Important Course Information

1. Important Dates:
- September 8, 2021 Courses start
- September 21, 2021 Last day to enroll without permission of instructor
- October 5, 2021 Last day to enroll with permission of instructor
- October 9-15, 2021 Fall Reading Week (No classes, University is open)
- November 12, 2021 Last day to drop course without a grade
- November 13 - December 7, 2021 Course Withdrawal Period (grade of W on transcript)
- December 7, 2021 Fall classes end
- December 8, 2021 Study day
- December 9-23, 2021 Fall exam period. Exams dates are set by the Registrar. Special exam dates cannot be set by the instructor. If you pre-book travel at a time that turns out to conflict with the final exam time and date, you are taking a gamble.

2. Other Important Information

The Senate Committee on Curriculum & Academic Standards (CCAS) provides a Student Information Sheet that includes:

- *York's Academic Honesty Policy and Procedures / Academic Integrity Web site*
- *Access/Disability*
- *Religious Observance Accommodation*
- *Student Code of Conduct*

Additional information:

- *Academic Accommodation for Students with Disabilities*
- *Alternate Exam and Test Scheduling*
- *Grading Scheme and Feedback Policy*
  The Senate Grading Scheme and Feedback Policy stipulates that (a) the grading scheme (i.e. kinds and weights of assignments, essays, exams, etc.) be announced, and be available in writing, within the first two weeks of class, and that, (b) under normal circumstances, graded feedback worth at least 15% of the final grade for Fall, Winter or Summer Term, and 30% for 'full year' courses offered in the Fall/Winter Term be received by students in all courses prior to the final withdrawal date from a course without receiving a grade.

- *"20% Rule"*
  No examinations or tests collectively worth more than 20% of the final grade in a course will be given during the final 14 calendar days of classes in a term. The

exceptions to the rule are classes which regularly meet Friday evenings or on Saturday and/or Sunday at any time, and courses offered in the compressed summer terms.

- *Final course grades may be adjusted to conform to Program or Faculty grade distribution profiles.*

Course Text (Further Details Communicated by York Bookstore)

The York U Bookstore has been working towards enhancing our digital delivery of e-books. We have seen student preference shift considerably in the last year towards digital. For the summer semester more than half of the course materials provided by the bookstore were in digital format and we are now a leader in Canada in digital delivery.

We strive to make many more titles available in electronic format. Our most student friendly method of digital delivery is through eClass or Moodle via the Willo Reader, and we expect to have about 400 courses with e-books delivered in this format for the fall semester. These unique eClass eBooks allow us help students to access their e-book through the course shell in the learning management system.

We would like to ask your permission to allow us to add the e-book link to your course shell in eClass for the following title(s)/course(s) for the coming semester.

Course	**Title**
AP-ECON/ECON1530/A	SYDSAETER / ESSENTIAL MATHEMATICS FOR ECONOMIC ANALYSIS 5TH

With your approval, we will do the work on our end to add the link(s) to your course shell(s), which includes details on how students can get access to support if needed (all managed by us).

While there are many benefits for both students and faculty (listed below), the one that resonates the most is that as an instructor you receive free access to the content for the duration of the course and students receive free access for the first 7 days. This immediate accessibility to the title ensures that students have the materials they need to be successful from day one. Also, with student affordability being more important than ever, students save the most possible with digital books.

The process for students is very simple. Everything is accessed in eClass. They click on a button to receive free access to the e-book which takes them directly to the title in the e-reader. When they access the e-book each time, it shows them the number of days of free access that remain and gives them a purchase option. When they click to purchase, they are taken to the bookstore website, and once they complete the transaction, access to the title continues within eClass.

The solution is fully approved by York University including privacy and security and been in operation at York U since the summer of 2020. The Willo Reader is also used by hundreds of post-secondary institutions across North America.