

ESSENTIAL MATHEMATICS FOR ECONOMICS (ECON 1357)

Semester: Summer 2025

Time: Monday, Tuesday, Wednesday, Thursday 1:00 PM- 2:55 PM

Location: St. Marys G40

Professor: Hoang Nguyen

COURSE DESCRIPTION

This course covers mathematical concepts that will be used in economics courses at the intermediate and advanced levels. In this course, the concepts are applied to economic questions, and in-class problem-solving is emphasized. The course begins with a review of functions in economics (e.g., demand and supply). We then turn to calculus, with a focus on optimization (e.g., choosing the amount of output to maximize your profit). We next consider optimization of functions of two variables (e.g., choosing the quantities of two inputs to maximize your profit). We subsequently study optimization subject to one or more constraints. An example occurs when you maximize your well-being (i.e., utility) while facing a budget constraint. The course concludes with an introduction to linear algebra, which studies linear equations with several variables.

The prerequisites for the course are ECON 1001, 1002, or 1003 (or the equivalent). Students who have taken Intermediate Microeconomics (ECON 2101) may not take ECON 1357 for credit. Students who have taken or are taking Calculus II (MATH 1360), Linear Algebra (MATH 2250) or Multivariable Calculus (MATH 2370) may not take ECON 1357 for credit. Students contemplating a MATH major or minor should consider taking a MATH course instead of ECON 1357.

COURSE LEARNING OBJECTIVES

By the end of this course, you should be able to:

1. Determine optimal decisions for economic agents (e.g., consumers and producers).
2. Employ mathematical techniques that are used in intermediate and advanced economic courses.
3. Interpret solutions to mathematical problems in an economic context.
4. Develop strategies for learning mathematical concepts.

COURSE ASSIGNMENTS AND GRADING CRITERIA

Graded Assignments

There will be six assignments, two midterm exams, and a final exam.

If you miss an assignment or exam without being excused, you will receive a grade of zero. (In case of a medical or family emergency, you should contact your dean or academic counselor to document the issue.) If the University closes on the day of a midterm exam, the exam will be given during the next class period.

It is your responsibility to ensure that all answers to assignments have been successfully uploaded to Canvas. If you run into problems when uploading, please send an email to me explaining the problem.

If you wish to appeal the grade on an assignment or exam, you must do so within seven days after grades have been posted. You may send the appeal by email. Please include an explanation of the basis for the appeal. Note that regrading could conceivably result in a lower grade.

Grading Scheme

The assignments will receive a weight of 40%, the midterm exam scores will get 15% each, and the final exam score will receive 30%. The numerical score will then be translated into a letter grade.

The Department of Economics has guidelines concerning the grade distribution; however, there is *not* a mandatory curve.

COURSE TEXTBOOK

Renshaw, G., Maths for Economics, Oxford University Press (2021, 5th Edition). I will assume that you are familiar with the material in the first two chapters.

SUPPLEMENTARY RESOURCES

Sydsaeter, K., P. Hammond, A. Strøm, and A. Carvajal, Essential Mathematics for Economic Analysis, Pearson (2022, 6th edition). This textbook is advanced.

Dowling, E., Introduction to Mathematical Economics, McGraw-Hill (2000, 3rd Edition). This workbook contains numerous solved problems.

[Mathematical Methods for Economic Theory](#) is a comprehensive set of notes prepared by Martin Osborne.

COURSE SCHEDULE

This course is divided into six sections.

Part One. Foundations

1. Review of linear equations (Monday, Jul. 07)
Renshaw, ch. 3.
2. Review of polynomials and other equations (Tuesday, Jul. 08)
Renshaw, ch. 4-5.

Part Two. Optimization with One Variable

3. Derivatives and differentiation (Wednesday, Jul. 09)
Renshaw, ch. 6.
4. Derivatives in action (Thursday, Jul.10)
Renshaw, ch. 7.
5. Economic applications (Monday, Jul. 14 and Tuesday, Jul. 15)
Renshaw, ch. 8.
6. Elasticity (Wednesday, Jul. 16)
Renshaw, ch. 9.

First Midterm Exam Thursday, Jul. 17

Part Three. Growth and Discounting

7. Compound growth and present discounted value (Monday, Jul. 21)
Renshaw, ch. 10.
8. Exponential functions, logarithms, and continuous growth (Tuesday, Jul. 22)
Renshaw, ch. 11, 12.
9. Derivatives of exponential and logarithmic functions, and applications (Wednesday, Jul. 23)
Renshaw, ch. 13.

Second Midterm Exam Thursday, Jul. 24

Part Four. Optimization with Multiple Variables

10. Functions of two independent variables (Monday, Jul.28)

Renshaw, ch. 14.

11. Unconstrained optima (Tuesday, Jul.29)

Renshaw, ch. 15.

12. Constrained optima (Wednesday, Jul. 30)

Renshaw, ch. 16.

13. Returns to scale and homogenous functions (Thursday, Jul. 31)

Renshaw, ch. 17.

Part Five. Integration

14. Integration (Monday, Aug. 04)

Renshaw, ch. 18.

Part Six. Linear Algebra

15. Vectors and matrices (Tuesday, Aug. 05 and Wednesday, Aug. 06)

Renshaw, ch. 19.

Final Exam Thursday, Thursday 07, 1:00 PM- 2:55 PM

ACADEMIC INTEGRITY

Students at Georgetown University are expected to maintain the highest standards of academic and personal integrity. Georgetown University faculty members are *obligated* to report possible violations of the Honor Code.

Students found in violation of the Honor Code are subject to academic penalties that may include failure of the course, termination from the program, and revocation of degrees already conferred. All students are expected to adhere fully to the policies and procedures of [Georgetown's Honor System](#) and to take the Honor Code Pledge.

Honor Code Pledge

In pursuit of the high ideals and rigorous standards of academic life, I commit myself to respect and to uphold the Georgetown University honor system:

To be honest in every academic endeavor, and

To conduct myself honorably, as a responsible member of the Georgetown community, as we live and work together.

Plagiarism

While collaboration is encouraged, all work that you submit for credit must be your own. The Georgetown University Honor System defines plagiarism as “the act of passing off as one’s own the ideas or writings of another.” More guidance is available through the [Gervase Programs](#). If you have any doubts about plagiarism, paraphrasing, and the need to credit, check out [Plagiarism.org](#).

ACCOMMODATIONS

Students with Disabilities

Under the Americans with Disabilities Act (ADA) and the Rehabilitation Act of 1973, individuals with disabilities have the right to specific accommodations that do not fundamentally alter the nature of the course. Some accommodations might include note-takers, books on tape, extended time on assignments, and interpreter services among others. Students are responsible for communicating their needs to the [Academic Resource Center](#), the office that oversees disability support services (202-687-8354; arc@georgetown.edu; <https://academicsupport.georgetown.edu/disability/>) before the start of classes to allow time to review the documentation and make recommendations for appropriate accommodations. The University is not responsible for making special accommodations for students who have not declared their disabilities and have not requested an accommodation in a timely manner. Also, the University need not modify course or degree requirements considered to be an essential requirement of the program of instruction. For the most current and up-to-date policy information, please refer to the [Georgetown University Academic Resource Center website](#). Students are highly encouraged to discuss the documentation and accommodation process with an Academic Resource Center administrator.

Accessibility and Inclusion

One of the central tenets of Georgetown’s educational mission is *cura personalis*. Georgetown is committed to showing care and concern for each student by creating an inclusive and accessible learning environment that follows universal design principles to meet the needs of its diverse student body.

I am committed to creating a learning environment that supports a diversity of thoughts, perspectives, and experiences, and honors your identities (including race, gender, class,

sexuality, religion, ability, etc.). If your name or pronoun needs to be corrected, please let me know early in the semester so that I can make the appropriate changes to my records.

SUPPORT SERVICES

Georgetown offers a variety of support services for students that can be accessed online, and it has put together [this newsletter](#), which aims to provide you with information about well-being resources and virtual meetings that can connect you with mental health professionals on and off campus. Below are some resources available to you:

- [Academic Resource Center](#)
202-687-8354 | arc@georgetown.edu
- [Counseling and Psychiatric Services](#)
202-687-6985
- [Institutional Diversity, Equity & Affirmative Action \(IDEAA\)](#)
(202) 687-4798

Title IX/Sexual Misconduct

Georgetown University and its faculty are committed to supporting survivors and those impacted by sexual misconduct, which includes sexual assault, sexual harassment, relationship violence, and stalking. Georgetown requires faculty members, unless otherwise designated as confidential, to report all disclosures of sexual misconduct to the University Title IX Coordinator or a Deputy Title IX Coordinator.

If you disclose an incident of sexual misconduct to a professor in or outside of the classroom (with the exception of disclosures in papers), that faculty member must report the incident to the Title IX Coordinator, or Deputy Title IX Coordinator. The coordinator will, in turn, reach out to the student to provide support, resources, and the option (but not the requirement) to meet.

If you would prefer to speak to someone confidentially, Georgetown has a number of fully confidential professional resources that can provide support and assistance. These resources include:

- Health Education Services for Sexual Assault Response and Prevention: confidential email sarp@georgetown.edu
- Counseling and Psychiatric Services (CAPS): 202.687.6985 or after hours, call (833) 960-3006 to reach Fonemed, a telehealth service; individuals may ask for the on-call CAPS clinician.

More information about reporting options and resources can be found on the [Sexual Misconduct Website](#).

Title IX/Pregnancy and Parenting Accommodations

Georgetown University is committed to creating an accessible and inclusive environment for pregnant and parenting students. Students may request adjustments based on general pregnancy needs or accommodations based on a pregnancy-related complication. Specific adjustments will be handled on a case-by-case basis and will depend on medical needs and academic requirements. Students seeking a pregnancy adjustment or accommodation should follow the process laid out on the [Title IX website](#).

Discrimination based on sex, including sexual misconduct and discrimination based on pregnancy or parenting status, subverts the University's mission and threatens permanent damage to the educational experience, careers, and well-being of students, faculty, and staff.

Learning Resources

Georgetown offers a host of learning resources to its students. Two that you might find particularly helpful are the [Writing Center](#) and [Refworks](#).

- The Writing Center offers peer tutoring by trained graduate and undergraduate students who can assist you at any point in the writing process. They help at any stage of your writing process, from brainstorming to revision. Tutors can offer advice on thesis development, use of evidence, organization, flow, sentence structure, grammar, and more. The Writing Center will not proofread or edit papers; rather, they will help to improve your proofreading and editing skills to become a better writer. Appointments can be booked online through their website.
- Refworks is an online research management tool that aids in organizing, storing, and presenting citation sources for papers and projects.

Technical Support

All students have access to Canvas technical support 24 hours a day, 7 days a week, including live chat and a support hotline at 855-338-2770. Use the 'Help' icon in the lower left of your Canvas window to view all available support and feedback options. If you are looking for help on a specific feature, check out the [Canvas Student Guide](#).

UNIVERSITY POLICY ON USE OF COURSE MATERIALS

The materials used in Georgetown University courses ("Course Materials") generally represent the intellectual property of course instructors, which may not be disseminated or reproduced in any form for public distribution (e.g., sale, exchange, etc.) without the written permission of the course instructor. Course Materials include all written or electronic documents and materials, including syllabi, current and past examination questions/answers, and presentations such as lectures, videos, PowerPoints, etc., provided by a course instructor. Course Materials may only be used by students enrolled in the course for academic (course-related) purposes.

Published course readings (book chapters, articles, reports, etc.) available in Canvas are copyrighted material. These works are made available to students through licensed databases or fair use. They are protected by copyright law, and may not be further disseminated or reproduced in any form for distribution (e.g., uploading to websites, sale, exchange, etc.) without permission of the copyright owner.

More information about intellectual property and copyright can be found here:
<https://www.library.georgetown.edu/copyright>

More information about computer acceptable use policy and intellectual property can be found here: <https://security.georgetown.edu/it-policies-procedures/computer-systems-aup>

RECORDINGS OF CLASSES

The creation of audio and video recordings for online instructional use is covered under the [Audio and Video Class Recordings policy](#). The policy contains the following restrictions:

- Authorized recordings may be used by students for individual private study only. Any other use or dissemination requires written approval from the instructor.
- Students are not permitted to make personal audio or video recordings of classes or presentations, unless authorized by the faculty member.