

Department of Economics
Barnard College
Spring 2023

Economics BC 1007: Mathematical Methods for Economics

Professor Sharon G. Harrison

Course description: This class will cover the mathematics you need to succeed in Intermediate Macroeconomics, Intermediate Microeconomics, and upper level electives in Economics. We start with the basics: algebra, solving equations, and graphing. Other topics include differentiation, functions and optimization. We will make extensive use of examples in Economics to solidify the concepts. These include equilibrium, marginal concepts, and elasticities as well as unconstrained and constrained optimization.

Learning Objectives: Upon completion of this course, you will be able to:

1. Show fluency in the basic concepts, models and tools of microeconomics and macroeconomics.
2. Recognize the applicability of particular tools to particular problems in microeconomics and macroeconomics.
3. Recognize the multiple approaches – algebraic, graphic and intuitive – to understanding the solution to a problem in microeconomics and macroeconomics.
4. Work cooperatively with others to solve problems in microeconomics and macroeconomics.

Course prerequisites and sequencing: There are no prerequisites for this class. Usually students take this course after taking Intro to Economic Reasoning, Econ BC 1003, or its equivalent. This course focuses on preparation for Intermediate Microeconomics, BC 3035. Therefore, you may not take this course if you have already taken BC 3035, or its equivalent. The material covered will be repetitive for you.

Class meetings: This class will meet on Mondays and Wednesdays from 10:10 to 11:25 am.

Contact Information: My office is in Room **1006 Milstein Center**. My phone number there is **854-3333**. The best way to reach me is by e-mail at **sh411@columbia.edu**.

Courseworks: Assignments, important announcements, and other information will be posted throughout the semester on the courseworks page for this class (go to <https://courseworks.columbia.edu/>).

Office Hours: TBA.

Textbook: The required text for this class is: *Essential Mathematics for Economics and Business*, fourth edition, by Teresa Bradley. You can purchase a hard copy version if you prefer, or an e-copy at: <http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP003102.html#student>. A copy is also on reserve at the Barnard library.

Class meetings: This is a lecture class, but in order for you learn the material, it is important to me that you participate. The best way for you to learn math,, and its applications, is to do problems yourself. Hence, I will strive to dedicate time, about once a week to active learning. I will ask you to work (with your classmates) to solve *in-class problems* based on the lecture material. After class, the solutions to these will be posted on courseworks.

Evaluation: Your grade in this class will depend on your performance on: 1 midterm exam (35%), a non-cumulative final exam (40%), and 4 quizzes (25%). I will drop your lowest quiz grade. Quizzes are explained in more detail on the last page. The date of the midterm is **Wednesday, March 8**. The final exam will be on the date determined by the official schedule.

Other course materials: I will also post weekly-ish *Sample Problems*, and solutions to follow a few days later. These will not be graded. I recommend that you work on them in a timely manner, as additional preparation for quizzes and exams.

Teaching assistant: Your teaching assistant is John Park. His email address is jjpark@barnard.edu. He will hold weekly recitation sections and office hours. Times will be decided during the second week of class. Section meetings are mandatory, and attendance will be taken. However, if you cannot make the scheduled time, you can come to office hours instead. He will also be responsible for grading your quizzes; and he will discuss his policies with you during the first week of recitation section. **Please email him not me**, with any issues regarding grading of quizzes.

Honor code: I value Barnard's Honor Code for the integrity it fosters. The Honor Code was established in 1912 and updated in 2016. All exams and assignments in this class are to be completed in accordance with the Barnard Honor Code. Columbia students commit themselves to the Honor Code upon registering for a Barnard course. The codes says, in part:

“We affirm that academic integrity is the honorable creation and presentation of our own work. We acknowledge that it is our responsibility to seek clarification of proper forms of collaboration and use of academic resources in all assignments or exams. We consider academic integrity to include the proper use and care for all print, electronic, or other academic resources. ”

Please note that The Barnard Honor Code includes relevant language for the proper use of electronic class material: any recorded class content is the intellectual property of your professor and your fellow students, and should not be distributed or shared outside of class.

Students with Disabilities: If you believe you may encounter barriers to the academic environment due to a documented disability or emerging health challenges, please feel free to contact me and/or the Center for Accessibility Resources & Disability Services (CARDS). Any student with approved academic accommodations is encouraged to contact me during office hours or via email. If you have questions regarding registering a disability or receiving accommodations for the semester, please contact CARDS at (212) 854-4634, cards@barnard.edu, or learn more at barnard.edu/disabilityservices. CARDS is located in 101 Altschul Hall.

Wellness Statement: It is important for undergraduates to recognize and identify the different pressures, burdens, and stressors you may be facing, whether personal, emotional, physical, financial, mental, or academic. We as a community urge you to make yourself—your own health, sanity, and wellness—your priority throughout this term and your career here. Sleep, exercise, and eating well can all be a part of a healthy regimen to cope with stress. Resources exist to support you in several sectors of your life, and we encourage you to make use of them. Should you have any questions about navigating these resources, please visit these sites:

http://health.columbia.edu/files/healthservices/pdf/alice_Stressbusters_Support_Network.pdf;
<http://barnard.edu/primarycare>; <http://barnard.edu/wellwoman/about>;

Affordable Access to Texts Statement: All students deserve to be able to study and make use of course texts and materials regardless of cost. Barnard librarians have partnered with students, faculty, and staff to find ways to increase student access to textbooks. By the first day of advance registration for each term, faculty will have provided information about required texts for each course on CourseWorks (including ISBN or author, title, publisher, copyright date, and price), which can be viewed by students. A number of cost-free or low-cost methods for accessing some types of courses texts are detailed on the Barnard Library Textbook Affordability guide (library.barnard.edu/textbook-affordability). Undergraduate students who identify as first-generation and/or low-income students may check out items from the FLIP lending libraries in the Barnard Library (library.barnard.edu/flip) and in Butler Library for an entire semester. Students may also consult with their professors, the Dean of Studies, and the Financial Aid Office about additional affordable alternatives for having access to course texts. Visit the guide and talk to your professors and your librarian for more details."

Center for Engaged Pedagogy: Check out these useful guides from the CEP:

Class participation: <https://cep.barnard.edu/guide-participating-class>

Attending Office Hours: <https://cep.barnard.edu/guide-office-hours>

Notetaking: <https://cep.barnard.edu/note-taking-guide>

Other class policies:

1. Please have a calculator with you for every class. Please use a scientific calculator. You must be able to calculate logarithms and exponentials with your calculator. Please do not use a graphing calculator, or your phone.
2. Your TA, John Park, will hold weekly recitation sections and office hours. Times will be decided during the second week of class. John will be responsible for grading all of the quizzes; and he will discuss his policies with you. Please address any questions about grading of quizzes to him, not me. John also composes and posts the answers to the quizzes and Sample Problems.
3. I will drop your lowest quiz grade. Hence, there is no need to email me with requests for extensions on take-home quizzes, or make-up dates on in-class quizzes. If you cannot take an in-class quiz on the scheduled day hand a take-home quiz in on time, I will likely recommend that you take advantage of this policy by dropping this grade, and planning to devote your full resources to the rest of the quizzes. If you think you have an exceptional situation, please let me know as soon as possible. I am available during office hours, or email me to make an appointment at another time.
4. As noted above, I make use of the courseworks page to communicate with you throughout the semester. I will post which Chapter(s) I plan to cover, and which sections I will skip. The default is that you are not responsible for sections I skip. I will let you know if instead you need to learn any material I skip in lecture. I will also post if an “emergency” comes up. For example, if I have to miss class unexpectedly, or if there is a typo in a take-home quiz, or in an answer to a Sample Problem.
5. Speaking of typos, there are many typos in the Bradley text book. Hence, I have compiled a list and posted it under “Miscellaneous” in “Files” on Courseworks. The page numbers match the hardcopy text, but they are a bit off for the e-book. Take note of these typos before you drive yourself crazy over something in the text book that seems wrong to you. If you do find another typo, please let me know.
6. Please note: the courseworks page may calculate a course grade for you, based on the entered assignment grades. This may or may not be a reflection of your actual course grade, as it may weight every assignment equally, and I put different weights on them, as noted above.
7. Jewish and other holidays: please let me know as soon as possible if you anticipate missing any classes or quizzes due to a religious holiday. I can plan accordingly.
8. Please note that, in order to minimize anxiety on your part, after I submit final grades, I will not respond to emails regarding them.

(Rough) Schedule of Topics to be Covered

(Chapter numbers in (.))

(Check courseworks regularly for updates)

WEEK 1: January 18

- Preliminaries (1)
 - Arithmetic operations and fractions
 - Solving equations
 - Working with percentages

WEEK 2: January 23, 25:

- Graphing Linear Equations (2)
 - The equation of the line
 - Graphs
 - Applications: supply and demand

WEEK 3: January 30, February 1:

- Simultaneous equations (3)
 - Two equations in two unknowns
 - Three equations in three unknowns
 - Applications: equilibrium and its implications

WEEK 4: February 6, 8:

- Non-linear equations (4)
 - Quadratic, exponential and logarithmic functions
 - Applications: growth

WEEK 5: February 13, 15

- Differentiation (6)
 - Definition and rules
- Applications of Derivatives (6)
 - Marginal functions

WEEK 6: February 20, 22:

- Applications of Derivatives cont'd (6)
 - Optimization
 - Applications: utility, output, revenue, profit, and cost

WEEK 7: February 27, March 1:

- Applications of Derivatives cont'd (6)
 - Curvature and second derivatives: utility, output, revenue, profit, and cost

WEEK 8: March 6, 8:

- **Wednesday, March 8: Midterm Exam**
- Product rule, Quotient Rule and Chain Rule (6)

WEEK 9: March, 13, 15

- **Spring Break**

WEEK 10: March 20, 22:

- Functions of several variables (7)
 - Partial derivatives
 - Production functions and isoquants

WEEK 11: March 27, 29

- Functions of several variables cont'd (7)
 - Utility functions and indifference curves

WEEK 12: April 3, 5

- Functions of several variables cont'd (7)
 - Unconstrained optimization
 - Applications: total cost, total revenue, profit

WEEK 13: April 10, 12

- Functions of several variables cont'd (7)
 - Constrained optimization
 - Application: utility

WEEK 14: April 17, 19

- Functions of several variables cont'd (7)
 - Constrained optimization
 - Applications: output, revenue

WEEK 15: April 24, 26

- Functions of several variables cont'd (7)
 - Elasticities

WEEK 16: May 1

- Catch-up and Review

Quizzes:

Will be roughly every four weeks. Two will be in class (IC), for 20 minutes at the start. The other two will be open book, take-home (TH), ready a week in advance and due on the date indicated. Here is the tentative schedule, which is subject to change if necessary.

Wed, Feb 1 (IC)
Wed, March 1 (TH)
Wed, March 29 (IC)
Wed, April 26(TH)