AEB 3510: Quantitative Methods in Food and Resource Economics

Fall 2025

Instructor: Prof. Patrick S. Ward
Lecture: MWF 12:50 PM – 1:40 PM
Office hours: Tuesday 9:00 – 10:00 AM
Wednesday 2:00 – 3:00 PM
Teaching Assistant: Aimable Nyishimirente
Office hours: Thursday 9:00 – 10:00 AM

Email: wardp@ufl.edu
Lecture location: Norman Hall 1037
Office hour location: McCarty A 1185
Phone: (352) 294-9050
Email: aimable.nyishimi@ufl.edu
Office hour location: TBD

Course Description: Develops understanding of finite mathematical tools used in economics and business decision making. Topics include linear equations, matrix algebra and calculus. Lectures and problems show how these tools are used to examine economic, financial and managerial problems.

Credits: 3

Grading scheme: Letter grade

Prerequisites: (AEB 3103 or ECO 2023) and (MAC 2233 or MAC 2311).

Communication: E-mail (either to my email address or via Canvas messaging) is the best way to reach me. Any issues that require action MUST be handled by email so that there is a written record of need. Phone calls or after class conversations are not likely to result in action. Class cancellations, changes in office hours, meeting locations, or the syllabus will be announced on Canvas. Be sure that you receive those notifications in a timely manner (controlled in your Canvas settings).

Because of the nature of the problem sets and application exercises, I will not provide assistance on problem sets or application exercises over email; if you have specific questions, please plan to attend office hours. If you have not made efforts to solve the problem, I will not provide hints on how to do so. It is not necessary for you to make appointments during office hours. Visitors will be seen on a first-come, first-served basis. Groups of students are encouraged.

Undergraduate Advisor:	Ms. Michelle Baldwin; 1170B McCarty Hall A; (352) 294-7640; E-mail: baldwin.ma@ufl.edu; Schedule an appointment
Undergraduate Coordinator:	Dr. Misti Sharp; 1189 McCarty Hall A; (352)294-7632; E-mail: mistisharp@ufl.edu; Schedule an appointment

Course motivation (or, "Why you should be excited about taking this course"): The Italian Renaissance polymath Galileo is quoted as saying "Mathematics is the language with which the universe has been written." Although Galileo was likely speaking metaphorically, there are some similarities between the elements of language (e.g., nouns, verbs, sentences, etc.) and the elements of mathematics (e.g., numerals, variables, expressions, operations such as addition, subtraction, multiplication, and division, and relations such as equalities or inequalities, etc.). The field of economics uses mathematics to formally represent theories in a meaningful and unambiguous way, as well as to analytically and numerically solve complex problems that would be difficult to solve using less formal methods. This course exposes students to the various mathematical tools used in economics and business decision making, including solving systems of linear equations, matrix algebra, and calculus for performing marginal analysis and optimizing objective functions. Lectures and problem sets show how these tools are used, while application exercises bridge

theory and application allowing students to practice using these skills to examine economic, financial and managerial problems that food and resource economists confront on a daily basis.

Expected Student Learning Outcomes: After the successful completion of AEB 3510, a typical student should be able to:

- Demonstrate mastery of mathematical concepts, including algebra, functions and graphs, systems of linear equations, calculus of single and several variables, and optimization (with and without constraints).
- Apply these mathematical skills in a variety of economic decision-making contexts.
- Conceptualize and solve economic problems using quantitative and analytical models and frameworks.
- Develop mathematical models for economic analysis using Microsoft Excel.

Required Course Materials:

- ***Text:*** *Introduction to mathematical economics*, 3rd edition, by Edward T. Dowling, PhD (Schaum's Outlines). McGraw Hill. 2012. ISBN: 978-0-07-176251.
- ***E-learning:*** There is an E-Learning Canvas webpage for this course that can be accessed using your GatorLink username and password. On Canvas, I will provide a comprehensive set of typeset notes to complement the text and the material covered in lectures. If you are having difficulties accessing E-learning, please contact the UF Computing Help Desk by calling (352)-392-HELP or via email helpdesk@ufl.edu.
- ***Other:*** This course combines analytical concepts with practical application. As such, students are expected to have or develop a basic knowledge of mathematics as well as the use of computational tools (namely Microsoft Excel) for applying mathematical concepts. **If you do not have an adequate background in mathematics or Microsoft Excel, please access tutorials or other resources from Khan Academy (https://www.khanacademy.org), YouTube (there are many available, such as those on https://www.youtube.com/c/HamblinMath/featured), or LinkedIn Learning (available from http://elearning.ufl.edu).**

Class Structure: The class format is that of a traditional lecture. To maximize your learning experience, you should attend every class. As will be discussed below, regular class attendance and active class participation account for a portion of your final grade.

Course Assignments and Expectations:

Attendance and participation (60 points): Although you may be familiar with some of the mathematical methods that will be discussed in this class, you most likely will not have seen these mathematical methods applied to specific problems that arise in economics and business. It is therefore important that you attend class meetings regularly to ensure that you familiarize yourself with these specific applications. If you must miss class for any reason, please email the instructor as far in advance as possible so you can be prepared for the material that is expected to be covered in your absence. Active participation in class will also enhance your overall learning experience and will create a vibrant learning environment that will benefit everyone in class.

Problem sets (240 points): These are meant to give you opportunities to master the mathematical methods that we discuss in the regular class meetings. There will be 9 problem sets over the course of the

semester, so you will be expected to stay up-to-speed with the material that is covered in class. Many of the methods that we will cover will build on one another, so the problem sets are structured in a scaffolded framework, and it is important that you master the material in a sequential fashion to ensure a solid foundation. The eight problem sets with the highest scores will be incorporated in the final course grade. Problem sets must be handed in at the beginning of the class period in which they are due to be eligible for full credit. Late submissions will be deducted 10 points for each 24-hour period past the due date/time (*including* weekends). Each student will be given a "Life Happened" card that can be used to redeem *up to* 20 points on a late problem set submission (you are still required to submit the problem set), no questions asked. These cards can be redeemed *at any time* prior to the reading period, but may be used only once. I will not accept any problem set submitted more than 72 hours past due (without a "Life Happened" card); such late submissions will not receive any credit.

Application exercises (300 points): These group-based exercises are meant to bridge the gap between theory and practice. In these exercises, students will work in groups of 4-5 students and have the opportunity to use Microsoft Excel to apply the mathematical methods learned in class to the types of real-world problems that food and resource economists encounter in their day-to-day work. The final submissions will be in the form of written reports of 3-5 pages addressing a series of discussion questions that will be provided, along with analytical or numerical elements to support the discussion. The types of exercises include simple economic modeling and computing market equilibrium, equilibrium displacement and evaluating the impacts of supply and/or demand shocks (e.g., weather shocks), and optimizing economic functions (e.g., profit maximization).

Exams (400 points): There will be one midterm exam and one final exam; the midterm exam will be held on October 8, 2025 (in class) and the final exam will be held on December 11, 2025 (during the final exam period). The midterm exam will focus on concepts and methods from the first half of the semester, primarily related to linear algebra and solving systems of linear equations. The final exam will primarily focus on the concepts and methods from the second half of the semester, primarily applications of calculus (though there are some elements of linear algebra that will arise).

Composition of Final Score:

Course Assignments	**Total Points**
Attendance and participation	60 points
Problem sets (best 8 scores)	240 points (30 points each)
Application exercises (3)	300 points (100 points each)
Midterm exam (October 8, 2025)	200 points
Final exam (December 11, 2025; 12:30 – 2:30 PM)	200 points
Total	1000 points

Letter grade distribution:

Grade	Percentage	Total points	Grade Points
A	93% or more	≥ 930	4.00
A-	90.0 – 92.9%	900 - 929	3.67
B+	86.0 – 89.9%	860 - 899	3.33
B	83.0 – 85.9%	830 - 859	3.00
B-	80.0 – 82.9%	800 - 829	2.67
C+	76.0 – 79.9%	760 - 799	2.33
C	73.0 – 75.9%	730 - 759	2.00
C-	70.0 – 72.9%	700 - 729	1.67
D+	66.0 – 69.9%	660 - 699	1.33
D	63.0 – 65.9%	630 - 659	1.00
D-	60.0 – 62.9%	600 - 629	0.67
E	59.9% or less	≤ 629	0.00

Please note that grades will be 'rounded', but I will not make any other 'adjustments' at the end of the term. If you want a certain grade in this course, you will have to earn it.

This class adheres to all UF Academic Policies: https://go.ufl.edu/syllabuspolicies

Lauren's Promise: I will listen and believe you if someone is threatening you.

Lauren McCluskey, a 21-year-old honors student athlete, was murdered on October 22, 2018, by a man she briefly dated on the University of Utah campus. We must all take actions to ensure this never happens again. Any form of sexual harassment or violence will not be excused or tolerated at the University of Florida.

If you are experiencing sexual assault, relationship violence, or stalking, you can take the following actions:

- If you are in immediate danger, call 911.
- Report it to me, and I will connect you to resources.
- Seek confidential sources of support and help:
    - UFPD Office of Victim Services: 51 Museum Road, 352-392-5648
    - Sexual Assault Recovery Services (SARS): Infirmary Building, 352-392-1161
    - Alachua County Rape Crisis Center (confidential): 352-264-6760

Tentative Weekly Schedule:

Week	Dates	Content	Assessments
1	8/22	Course introduction	
2	8/25, 8/27, 8/29	Review of algebra	PS1
3	9/1	Labor Day – No class	
	9/3, 9/5	Solving systems of 2 linear equations; examples of simple linear systems in economics	PS2, App1
4	9/8, 9/10, 9/12	Linear systems in n-variables	PS3
5	9/15, 9/17, 9/19	Linear systems in matrix form	PS4
6	9/22, 9/24, 9/26	Determinants; matrix algebra; matrix inversion	
7	9/29, 10/1, 10/3	Equilibrium displacement modeling	App2
8	10/6	Review for midterm exam	
	10/8	**Midterm Exam**	**Exam**
	10/10	Limits; continuity; the derivative; differentiability; derivative notation	
9	10/13, 10/15	Derivative rules for functions of a single variable	PS5
	10/17	Homecoming – No class	
10	10/20, 10/22, 10/24	Differentiation of exponential and logarithmic functions; marginal concepts in economics; increasing and decreasing functions; concavity and convexity	PS6
11	10/27, 10/29, 10/31	Optimization of functions with a single variable; partial derivatives	PS7
12	11/3, 11/5, 11/7	Second-order partial derivatives; optimization of functions with multiple variables	PS8
13	11/10, 11/12, 11/14	Optimization of functions with multiple variables (continued); first- and second-order conditions; restrictions on variables	App3
14	11/17, 11/19, 11/21	Constrained optimization and applications in economics	PS9
15	11/24, 11/26, 11/28	Thanksgiving break – No class	
16	12/1	Applications of constrained optimization in economics	
	12/3	Review for final exam	
12/11 12:30 PM –2:30 PM		**Final Exam**	**Exam**

Note: The instructor reserves the right to change the terms and dates stated in this course syllabus at any time. Any changes will be communicated on Canvas as an announcement. It is solely the student's responsibility to stay informed of any changes.

****By enrolling in this course, you are agreeing to the terms outlined in this syllabus!!****