AEB 3510: Quantitative Methods in Food and Resource Economics

Fall 2024

Instructor: Prof. Patrick S. Ward
Lecture: MWF 12:50 PM – 1:40 PM
Office hours: Monday 2:00 – 3:00 PM
                     Wednesday 9:00 – 10:00 AM
Teaching Assistant: Yingchen Xu
Office hours: Th 2:00 – 3:00 PM

Email: wardp@ufl.edu
Lecture location: Little Hall 0201
Office hour location: McCarty B 1121
Phone: (352) 294-9050
Email: yingchenxu@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: Mr. Trey Gifford; 1170B McCarty Hall A; (352) 294-7640; E-mail: agifford1@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 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: 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 have to 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 (asking questions, attempting to answer questions posed by the instructor) will also enhance your overall learning experience and will create a vibrant learning environment that will benefit everyone in class.

Problem sets: 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, no questions asked. These cards can be redeemed at any time, but 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: 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 (i.e., market clearing prices and quantities), 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: There will be one midterm exam and one final exam; the midterm exam will be held on October 9, 2024 (in class) and the final exam will be held on December 13, 2024 from 7:30 – 9:30 AM (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. 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	30 points
Participation	30 points
Problem sets (best 8 scores)	240 points (30 points each)
Application exercises (3)	300 points (100 points each)
Midterm exam (October 9, 2024)	200 points
Final exam (December 13, 2024; 7:30 – 9:30 AM)	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 are not 'rounded' or 'adjusted' at the end of the term.

This class adheres to UF grading policies:
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Grades and Grade Points: For information on current UF policies for assigning grade points, see
https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

Attendance and Make-Up Work: Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:
https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Course Evaluation: Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at: https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at: https://gatorevals.aa.ufl.edu/public-results/.

Academic Honesty: As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment.*"

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams).

Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see: http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code.

Software Use: All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Services for Students with Disabilities: The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

0001 Reid Hall, 352-392-8565, https://disability.ufl.edu/

Campus Helping Resources: Students experiencing crises or personal problems that interfere with their general wellbeing are encouraged to utilize the university's counseling resources. The Counseling & Wellness Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

Health and Wellness: *U Matter, We Care*: If you or someone you know is in distress, please contact umatter@ufl.edu, 352-392-1575, or visit U Matter, We Care website to refer or report a concern and a team member will reach out to the student in distress.

Counseling and Wellness Center: Visit the Counseling and Wellness Center website or call 352-392-1575 for information on crisis services as well as non-crisis services. Address: 3190 Radio Road. Services provided:
- Counseling services
- Groups and workshops
- Outreach and consultation
- Self-help library
- Wellness coaching

Student Success Initiative: https://studentsuccess.ufl.edu/ Services provided:
- Advising
- Peer mentoring
- Coaching
- Peer tutoring

Student Health Care Center: Call 352-392-1161 for 24/7 information to help you find the care you need, or visit the Student Health Care Center website.

Academic Resources

E-learning technical support: Contact the UF Computing Help Desk at 352-392-4357 or via e-mail at helpdesk@ufl.edu.

Career Connections Center: Reitz Union Suite 1300, 352-392-1601. Career assistance and counseling services.

Library Support: Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center: Broward Hall, 352-392-2010 or to make an appointment 352- 392-6420. General study skills and tutoring.

Writing Studio: 2215 Turlington Hall*, 352-846-1138. Help brainstorming, formatting, and writing papers.

Student Complaints On-Campus: https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/

On-Line Students Complaints: https://pfs.tnt.aa.ufl.edu/state-authorization-status/#student-complaint

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	8/23	Course introduction	
2	8/26, 8/28, 8/30	Review of algebra (continued)	PS1
3	9/2	**Labor Day – No class**	PS2
	9/4, 9/6	Review of algebra; solving systems of 2 linear equations	
4	9/9, 9/11, 9/13	Simple linear systems in economics; linear systems in n-variables	App1, PS3
5	9/16, 9/18, 9/20	Linear systems in n-variables; linear systems in matrix form	PS4
6	9/23, 9/25, 9/27	Linear systems in matrix form; the determinant and its properties; matrix algebra	
7	9/30, 10/2, 10/4	Matrix inversion; solutions to linear systems of the form $\mathbf{Ax} = \mathbf{b}$; equilibrium displacement: theory and practice	App2
8	10/7	Review	
	10/9	**Midterm Exam**	**Exam**
	10/11	Limits	
9	10/14, 10/16, 10/18	Continuity; the derivative; differentiability; derivative notation derivative rules for functions of a single variable	PS5
10	10/21, 10/23, 10/25	Differentiation of exponential and logarithmic functions; marginal concepts in economics; higher order derivatives; increasing and decreasing functions; concavity and convexity	PS6
11	10/28, 10/30, 11/1	Optimization of functions with a single variable; partial derivatives; rules for partial differentiation	PS7
12	11/4, 11/6, 11/8	Second-order partial derivatives; optimization of functions with multiple variables	PS8
13	11/11	**Veterans' Day – No class**	
	11/13, 11/15	First- and second-order conditions; restrictions on variables	App3
14	11/18, 11/20, 11/22	Constrained optimization	PS9
15	11/25, 11/27, 11/29	**Thanksgiving Week – No class**	
16	12/2, 12/4	Applications of constrained optimization in economics	
	12/6	Review for Final Exam	
	12/13 7:30 – 9:30 AM	**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!!