

# AEB 3510: Quantitative Methods in Food and Resource Economics

## Spring 2026

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**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:** TBD

**Office hours:** TBD

**Email:** [wardp@ufl.edu](mailto:wardp@ufl.edu)

**Lecture location:** Turlington 2319

**Office hour location:** McCarty A 1185

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**Office hour location:** TBD

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**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;

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**Undergraduate Coordinator:** Dr. Misti Sharp; 1189 McCarty Hall A; (352)294-7632;

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**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:

- Critically analyze mathematical concepts—including algebra, functions and graphs, systems of linear equations, and calculus of single and several variables—by interpreting their relevance and limitations within economic models and problem-solving contexts
- Integrate and apply advanced mathematical techniques to formulate and solve complex economic decision-making scenarios, demonstrating the ability to select optimal tools and justify methodological choices
- Construct and assess quantitative and analytical models for economic problems, critiquing the underlying assumptions and implications of various frameworks
- Design and evaluate mathematical models for economic analysis using Microsoft Excel

**Required Course Materials:**

- **Text:** *Introduction to mathematical economics*, 3<sup>rd</sup> 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](mailto: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 February 27, 2026 (in class) and the final exam will be held during the final exam period from April 30, 2026 10:00 AM – 12:00 PM. 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).

### **Grading policy on multi-part problems**

Exam questions will frequently have multiple interconnected parts. On these questions, you will receive full credit on subsequent parts if your methodology is correct and your answers are internally consistent with your earlier work, even if an initial error led to incorrect numerical answers. However, the initial error will receive a deduction with the severity of the conceptual or methodological flaw. This policy rewards conceptual understanding and proper problem-solving techniques while maintaining academic rigor. It ensures you are evaluated on your economic reasoning and analytical skills rather than being penalized multiple times for a single mistake.

**Example:** Suppose an exam question asks you to solve for a competitive market equilibrium in part (a), and then to solve for consumer and producer surplus in parts (b) and (c). If you calculate an incorrect equilibrium price in part (a) and use that incorrect price consistently and correctly throughout parts (b) and (c), you will only lose points on part (a). Parts (b) and (c) will receive full credit *as long as* your economic reasoning, formulas, and calculations are correct based on your initial value.

**Important:** This policy only applies when:

- Your subsequent work follows logically from the initial error
- Your methodology and economic reasoning are correct
- Your work is internally consistent

This policy does *not* apply to:

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- Multiple independent errors
- Incorrect methodologies or formulas
- Conceptual misunderstandings

### 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 (February 27, 2026)                | 200 points                   |
| Final exam (April 30, 2026 10:00 AM – 12:00 PM) | 200 points                   |
| <b>Total</b>                                    | <b>1000 points</b>           |

### Letter grade distribution:

| Grade | Percentage    | Total points | Grade Points |
|-------|---------------|--------------|--------------|
| A     | 93% or more   | $\geq 930$   | 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 | $\leq 629$   | 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/syllabuspolices>

**Responsible use of generative artificial intelligence (AI):**

The University of Florida promotes the innovative and responsible use of AI applications to enhance academic and operational activities. Similarly, this course embraces the potential of emerging technologies like generative AI to enhance learning while emphasizing responsible and ethical use. To maintain academic integrity and foster meaningful scholarship, the following policy applies to all students:

- **Permitted Use:** Students may use generative AI tools as aids for brainstorming, drafting, and exploring ideas. These tools can support research and writing but must not replace students' original critical thinking or analysis.
- **Transparency and Attribution:** Any content generated or significantly assisted by AI must be clearly disclosed and appropriately cited in students' work. Failure to do so may be considered a violation of academic integrity standards.
- **Academic Integrity:** Students should only submit work that reflects their own understanding and effort. AI-generated text or responses cannot be submitted verbatim without significant modification, original input, and acknowledgment. Use of large language models (LLMs) must comply with the UF Honor Code and policies on plagiarism.
- **Review and Responsibility:** Students are fully responsible for the accuracy, quality, and originality of all submitted materials, regardless of AI assistance. Because LLMs can produce inaccurate or biased outputs, students should always critically evaluate AI outputs before incorporation. Students should also properly cite or attribute information derived from AI output.
- **Restricted Use:** Use of AI tools is prohibited during exams, quizzes, or any assessments explicitly designated by the instructor as independent work.
- **Equity and Access:** If a student encounters barriers to accessing AI tools necessary for coursework, please contact the instructor promptly to explore accommodations.

**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                  | 1/12, 1/14, 1/16 | Course introduction; Review of algebra                                                                                          | PS1         |
| 2                  | 1/19             | Dr. Martin Luther King, Jr. Day – No class                                                                                      |             |
|                    | 1/21, 1/23       | Review of algebra, Solving systems of 2 linear equations                                                                        | PS2         |
| 3                  | 1/26, 1/28, 1/30 | Examples of simple linear systems in economics; Linear systems in $n$ variables (Method of Substitution)                        | PS3, App1   |
| 4                  | 2/2, 2/4, 2/6    | Linear systems in $n$ -variables (Method of Elimination of Variables); linear systems in matrix form                            | PS4         |
| 5                  | 2/9, 2/11, 2/13  | Linear systems in matrix form; determinants and the rank criterion; matrix algebra                                              | PS4         |
| 6                  | 2/16, 2/18, 2/20 | Matrix inversion; equilibrium displacement modeling                                                                             | App2        |
| 7                  | 2/23             | Equilibrium displacement modeling                                                                                               |             |
|                    | 2/25             | Review for midterm exam                                                                                                         |             |
|                    | 2/27             | <b>Midterm Exam</b>                                                                                                             | <b>Exam</b> |
| 8                  | 3/2, 3/4, 3/6    | Limits; continuity; the derivative; differentiability; derivative notation; derivative rules for functions of a single variable | PS5         |
| 9                  | 3/9, 3/11, 3/13  | Derivative rules for functions of a single variable; marginal concepts in economics                                             | PS6         |
| 10                 | 3/16, 3/18, 3/20 | Spring Break                                                                                                                    |             |
| 11                 | 3/23, 3/25, 3/27 | Increasing and decreasing functions; concavity and convexity, optimization of functions with a single variable                  | PS7         |
| 12                 | 3/30, 4/1, 4/3   | Partial derivatives, second-order partial derivatives; optimization of functions with multiple variables                        | PS8         |
| 13                 | 4/6, 4/8, 4/10   | Optimization of functions with multiple variables (continued); first- and second-order conditions; restrictions on variables    |             |
| 14                 | 4/13, 4/15, 4/17 | Constrained optimization                                                                                                        | App3        |
| 16                 | 4/20, 4/22       | Applications of constrained optimization in economics                                                                           |             |
|                    | 4/24             | Review for final exam                                                                                                           |             |
| <b>Finals Week</b> |                  | <b>Final Exam</b>                                                                                                               | <b>Exam</b> |

*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!!\*\*\***