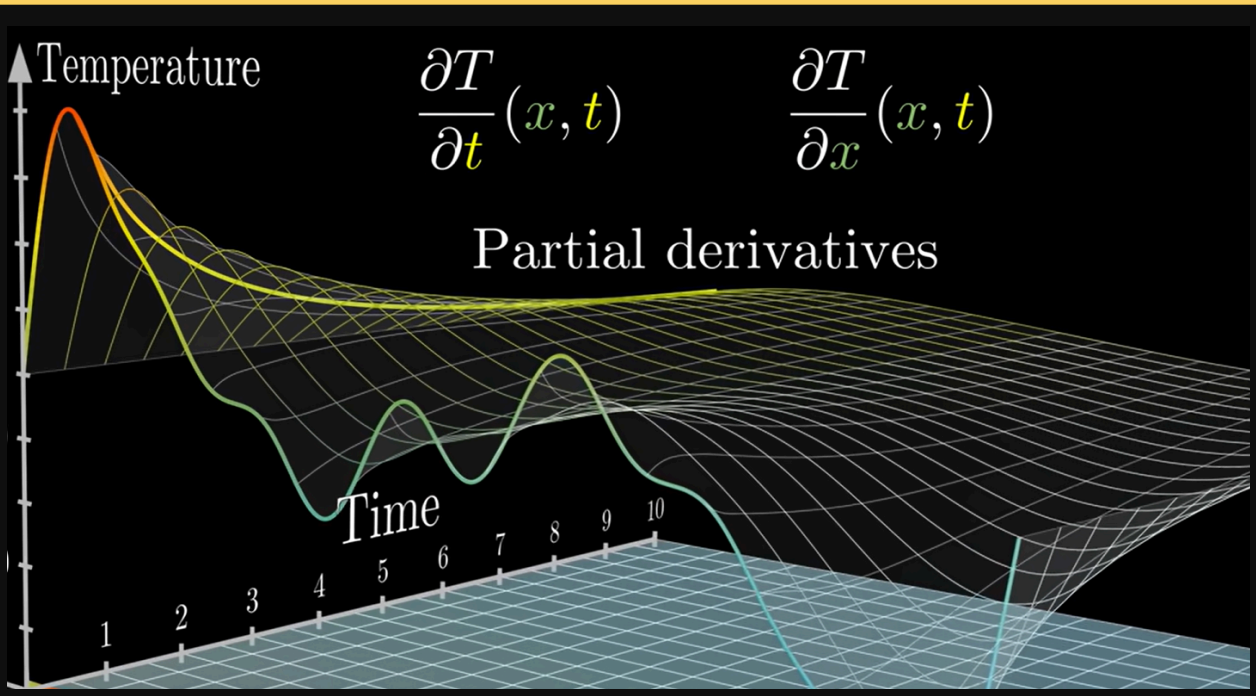
MATHEMATICAL TOOLS
FOR AGRICULTURAL AND APPLIED ECONOMICS



https://youtu.be/ly4S0oi3Yz8?t=351

Why take this course?

This course is your gateway to mastering the mathematical tools that will empower you in your graduate studies and future career in Agricultural and Applied Economics. By focusing on practical applications, you'll gain the confidence to tackle advanced topics like microeconomics, macroeconomics, linear programming, and econometrics. Together, we'll explore calculus, matrix algebra, optimization theory, and statistics, and discover how these tools can help you solve real-world economic challenges.

TIME & LOCATION

Tuesday & Thursday

12:00 PM - 01:15 PM

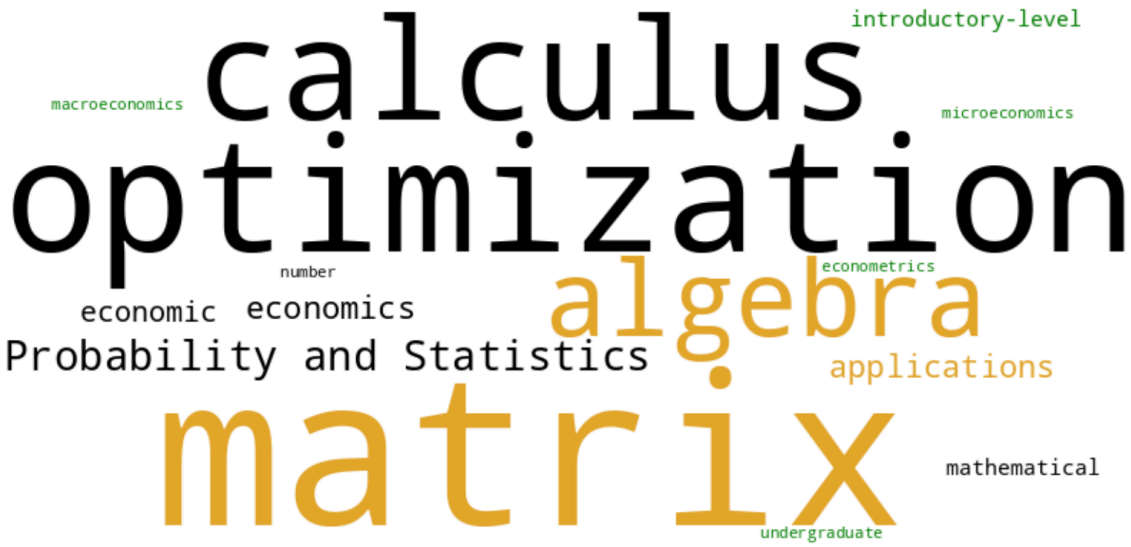
RAWL 1071

AGEC 516
FALL 2024
3 CREDITS

COURSE Information

Official Description

This course provides first year graduate students and advanced undergraduate students with the specific set of applied mathematical tools needed to support graduate coursework in microeconomics, macroeconomics, economic programming, and econometrics. The course reviews skills and concepts from a number of fields of mathematics including matrix algebra, calculus, optimization theory, and mathematical statistics. The course emphasizes specific applications to economic theory and applied problems in agricultural economics and related areas. Students should be comfortable with introductory-level calculus before entering the course. Permission of instructor required. Typically offered Fall.



> *Mathematical economics is an approach to economic analysis, in which the economist makes use of mathematical symbols in the statement of the problem and also draws upon known mathematical theorems to aid in reasoning. As far as the specific subject matter of analysis goes, it can be micro- or macroeconomic theory, public finance, urban economics, or what not.*
>
> Quoted from Chapter 1 of the textbook

LEARNING OUTCOMES

By the end of this course, you will:

- Confidently apply the mathematical tools of calculus and matrix algebra to perform various calculations, operations, and derivations that are essential in economic analysis.
- Develop the skills to solve constrained optimization problems using the Lagrangian method, complete with detailed mathematical steps, and conduct comparative statics analysis to explore different economic scenarios.
- Establish a solid foundation in probability and statistics, preparing you for more advanced economic studies and research.

LEARNING RESOURCES & TEXTBOOKS

- ***Required textbook:*** Alpha C. Chiang and Kevin Wainwright, *Fundamental Methods of Mathematical Economics*, 4th Edition, McGraw Hill Education. You can purchase it from Amazon.
- ***Optional books:*** Carl P. Simon and Lawrence Blume, *Mathematics for Economists*, W. W. Norton & Company, 1994. ISBN-13: 9780393957334
- ***Optional books:*** Silberberg, Eugene, and Wing Chuen Suen. *The Structure of Economics: A Mathematical Analysis,* 3rd Edition. McGraw-Hill.
- ***Other resources:*** I will share tools, videos, and other opensource materials that are related to our course and please feel free to explore them yourselves.

Yi Wang wang5263@purdue.edu

A NOTE FROM ME

Welcome to our class! I'm thrilled to be your instructor for this course. Whether you're passionate about mathematics or feeling a bit uncertain, my goal is to make this subject accessible, engaging, and relevant to your studies in Agricultural and Applied Economics.

I believe that learning is a collaborative journey. In this course, we'll tackle challenges together, celebrate successes, and create a supportive environment where everyone has the opportunity to succeed. I encourage you to be curious, ask questions, and engage actively in our discussions.

Office Hour
Wednesdays
1 - 3 PM

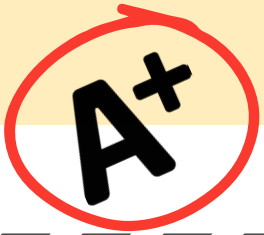
You can find me in Krannert Building, Room 632

Let's call it Student Hours as they are dedicated times specifically set aside for you to ask questions, seek clarification, and discuss any concerns you may have about the course. Think of this time as your opportunity to connect directly, without any pressure. It's your right to utilize these hours, and you should never feel intimidated about stopping by. Whether you have a quick question or need more in-depth help, these hours are for you, so make the most of them.

ASSIGNMENTS & GRADING POLICY

Assignments	Points
11 Homework **Midterm 1** **Midterm 2** **Final**	**30** **20** **20** **30**
Total	**100**

- Homework will be assigned on a weekly basis and must be turned in at the beginning of the class on the next Thursday. Late submission without prior approval of the instructor will receive a 25% penalty. Papers turned in after corrected papers have been distributed will be marked, but no credit will be given. A hard copy of your work is appreciated.
- Homework will be graded based on both completion and correctness. There are a total of 11 assignments. Out of these, 7 will be randomly selected for grading. For each of these graded assignments, 2 questions will be chosen at random to be graded in detail.
- Group-work is encouraged and expected. Explaining problem solutions to your peers is one of the best ways to improve your own understanding. However, each homework needs to be completed and submitted individually.



IMPORTANT DATES & TIME

Events	Dates & Time	Location
Midterm 1	Sep. 19 (Thur) 12:00 PM - 01:15 PM	RAWL 1071
Midterm 2	Oct. 24 (Thur) 12:00 PM - 01:15 PM	RAWL 1071
Final	TBD	TBD

EXAM POLICIES

- While the exams are not strictly cumulative in nature, many of the skills required for the midterms will be useful in completing the final.
- A make-up exam will not be given unless there is a documented university approved absence.
- Draft sheets and answer sheets will be provided for all exams. You are welcome to use calculators, rulers, and other standard tools. However, please note that cheat sheets and any other electronic devices are not permitted.

GRADING SCALE

Letter Grades	Scales
A+	97 - 100% of points
A	94 - 96% of points
A-	90 - 93% of points
B+	87 - 89% of points
B	84 - 86% of points
B-	80 - 83% of points
C+	77 - 79% of points
C	74 - 76% of points
C-	70 - 73% of points
D+	67 - 69% of points
D	64 - 66% of points
D-	60 - 63% of points
F	< 60% of points

COURSE SCHEDULE

Week	Topics	Assignments
Week 1	Introduction and Revie of Basic Algebra	Homework 1
Week 2	Basic Algebra and Calculus I (single variable)	Homework 2
Week 3	Calculus II (multiple variables)	Homework 3
Week 4	Calculus III (multiple variables and integration)	Homework 4 (w/AK)
Week 5	Matrix Algebra I (vectors)	Midterm 1: Calculus
Week 6	Matrix Algebra I (matrix)	Homework 5
Week 7	Matrix Algebra II (inverse matrix)	Homework 6
Week 8	Matrix Algebra III (linear system)	Homework 7 (w/AK)
Week 9	Matrix Algebra IV (Jacobian and definiteness)	/
Week 10	Matrix Algebra IV (definiteness)	Midterm 2: Matrix Algebra
Week 11	Optimization I (single variable)	Homework 8
Week 12	Optimization II (multiple variables)	Homework 9
Week 13	Optimization III (with equality constraints)	Homework 10
Week 14	Optimization IV (comparative statics)	/
Week 15	Probability and Statistics (single variable)	/
Week 16	Probability and Statistics; Course Review	Homework 11 (w/AK)

Schedule and assignments are subject to change. Any changes will be posted on Brightspace.

COURSE EVALUATION

Toward the end of this semester, you will be provided with an opportunity to give feedback on this course and your instructor. Purdue uses an online course evaluation system, and I will not have access to this anonymous feedback until after final grades are submitted. You will receive an official email from evaluation administrators with a link to the online evaluation site and will receive a prompt to complete the survey when you login to Brightspace. The subject line will be: Please take 2-5 minutes to complete the survey. Check your "Junk E-mail" folder occasionally to be sure the evaluation emails were not accidentally routed there. Your participation is an integral part of this course, and your feedback is vital to improving education at Purdue University. I strongly urge you to participate in the evaluation system.

Beyond the official end-of-semester course evaluation, I genuinely value your thoughts and experiences throughout the course. I want to create a learning environment that works best for you, so your feedback during the semester is important to me. Together, we can make any necessary adjustments to enhance our time in class and ensure that everyone feels supported and engaged.

DISCLAIMER

This syllabus is subject to change. You will be notified of any changes as far in advance as possible via an announcement on Brightspace. Monitor your Purdue email daily for updates.

ATTENDANCE POLICY

This course follows the University Academic Regulations regarding class attendance, which state that students are expected to be present for every meeting of the classes in which they are enrolled. Attendance will be taken at the beginning of each class and lateness will be noted. When conflicts or absences can be anticipated, such as for many University-sponsored activities and religious observations, you should inform me of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to is not possible, contact me as soon as possible by Purdue email. For absences that do not fall under excused absence regulations, this course follows the following procedures:

1. Do not come to class if you are feeling ill, but DO email me at wang5263@purdue.edu, with the subject line: xxx [AGEC 516] absence. I do not need details about your symptoms. Just let me know you are feeling ill and cannot come to class. If it is an emergency, please follow the University regulations on medical care.
2. Unless it falls under the University excused absence regulations, any work due should be submitted on time.
3. If that day's class involves assessed work such as a test or presentation, you and I will plan if and how you can make up the work, following the assignment guidelines. This plan must be done before the next class period, so again, email me immediately when you know that you will miss class.
4. The most important consideration in any absence is how it will affect your achievement of the assignment objectives and the course learning outcomes.

ACADEMIC INTEGRITY

Academic integrity is one of the highest values that Purdue University holds. Individuals are encouraged to alert university officials to potential breaches of this value by either emailing integrity@purdue.edu or by calling 765-494-8778. While information may be submitted anonymously, the more information is submitted the greater the opportunity for the university to investigate the concern. More details are available on our course Brightspace under University Policies and Statements.

See the University Policies and Statements section of Brightspace for guidance on Use of Copyrighted Materials. Effective learning environments provide opportunities for students to reflect, explore new ideas, post opinions openly, and have the freedom to change those opinions over time. Students and instructors are the authors of the works they create in the learning environment. As authors, they own the copyright in their works subject only to the university's right to use those works for educational purposes Students may not copy, reproduce, or post to any other outlet (e.g., YouTube, Facebook, or other open media sources or websites) any work in which they are not the sole or joint author or have not obtained the permission of the author(s).

"As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue"

RESPONSIBLE USE OF AI IN COMPLETING COURSEWORK

Advancements in Artificial Intelligence (AI) provide students with unparalleled access to information and problem-solving capabilities. However, with these advantages come the responsibilities of ethical use and academic integrity. This statement outlines the expectations and guidelines for the responsible use of AI in our course.

Guidelines for Responsible Use:

- **Original Work:** You should ensure that assignments submitted are original and based on their understanding. While AI can assist in research or provide general guidance, it should not produce work on behalf of the student.
- **Prohibited Uses:** AI should not be used to complete assignments or exams unless explicitly permitted by the instructor.
- **Data Privacy:** Be cautious when you share personal or sensitive information with AI platforms and should be familiar with the terms of service of any third-party AI tools.

Consequences for Misuse:

Misuse of AI tools in coursework, which includes but is not limited to producing unoriginal work, uncited use of AI-generated content, or unauthorized assistance on assessments, will be considered a breach of academic integrity. Consequences will follow Purdue's policies on academic dishonesty as detailed in this syllabus, which may include grade penalties, course failure, or more severe disciplinary actions.

NONDISCRIMINATION STATEMENT

A link to Purdue's Nondiscrimination Policy Statement is included in the Brightspace template under University Policies and Statements content.

ACCESSIBILITY

Purdue University strives to make learning experiences accessible to all participants. If you anticipate or experience physical or academic barriers based on disability, you are encouraged to contact the Disability Resource Center at: drc@purdue.edu or by phone: 765-494-1247, as soon as possible.

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances beyond the instructor's control. Relevant changes to this course will be posted onto the course website or can be obtained by contacting the instructors via email or phone. You are expected to read your @purdue.edu email on a frequent basis.

A link to Purdue's Information on Emergency Preparation and Planning is located on our Brightspace under "University Policies and Statements."

MENTAL HEALTH/WELLNESS STATEMENT

If you find yourself beginning to feel some stress, anxiety and/or feeling slightly overwhelmed, try Therapy Assistance Online (TAO), a web and app-based mental health resource available courtesy of Purdue Counseling and Psychological Services (CAPS). TAO is available to all students at any time by creating an account on the TAO Connect website, or downloading the app from the App Store or Google Play. It offers free, confidential well-being resources through a self-guided program informed by psychotherapy research and strategies that may aid in overcoming anxiety, depression and other concerns. It provides accessible and effective resources including short videos, brief exercises, and self-reflection tools.

If you need support and information about options and resources, please contact or see the Office of the Dean of Students. Call 765-494-1747. Hours of operation are M-F, 8 a.m.- 5 p.m.

If you find yourself struggling to find a healthy balance between academics, social life, stress, etc., sign up for free one-on-one virtual or in-person sessions in West Lafayette with a Purdue Wellness Coach at RecWell. Student coaches can help you navigate through barriers and challenges toward your goals throughout the semester. Sign up is free and can be done on BoilerConnect.

If you're struggling and need mental health services: Purdue University is committed to advancing the mental health and well-being of its students. If you or someone you know is feeling overwhelmed, depressed, and/or in need of mental health support, services are available. For help, such individuals should contact Counseling and Psychological Services (CAPS) at 765-494-6995 during and after hours, on weekends and holidays, or by going to the CAPS offices in West Lafayette or Indianapolis.