

1. COURSE INFORMATION

Course Name	Math Applications in Agricultural Economics
Pre/Co-requisites	Pre-Calculus or Math Placement test.
Course Website	Canvas https://canvas.rutgers.edu
Format	In person
Room	Heckman Hall (HCK) 127
Lecture Time	Tuesdays and Thursdays – 3.50 PM – 5.10 PM
Recitation	Tuesdays – 7.45 PM – 8.40 PM (COB 112)
Dates	September 3rd , 2024 – Wednesday December 11th, 2024

2. INSTRUCTOR INFORMATION

Instructor:	Dr. Isaac Vellangany
Email:	isaacv@rutgers.edu
Office:	Cook Office Building (112)
Virtual Office	https://rutgers.zoom.us/my/isaacv
Office Hours:	MW 9.00 -10.00 AM and by appointment
Department Website:	https://dafre.rutgers.edu

For a complete course sequence follow the modules on Canvas

3. REQUIRED TEXTBOOK: College Mathematics for Business, Economics, Life Sciences, and Social Sciences, 14th edition, 2019 |Pearson.

<https://www.pearson.com/en-us/subject-catalog/p/college-mathematics-for-business-economics-life-sciences-and-social-sciences/P200000006081/9780137553341>

TEXTBOOK OPTIONS

Pearson+ subscription is \$10.99 per month for four months or \$43.96 one-time payment.
College Mathematics for Business, Economics, Life Sciences, and Social Sciences
ISBN-13: 9780137553341 (2021 update)

Loose-Leaf \$159.99 from Pearson website

College Mathematics for Business, Economics, Life Sciences, and Social Sciences
ISBN-13: 9780134676081 (2018 update)

MyLab \$89.99

Up to 18-week access Math with Pearson eText (18 Weeks) for College Mathematics for Business, Economics, Life Sciences, and Social Sciences ISBN-13: 978013596330

4. COURSE DESCRIPTION:

Mathematical Application in Agricultural Economics uses quantitative methods to describe agricultural business and economic phenomena. This course can help students improve their mathematical skills and apply them to Business, Economics, and Social Sciences. Some course topics include:

Functions

Identifying, solving, and interpreting characteristics of different types of functions, such as linear, exponential, and quadratic.

Mathematics of finance.

Helps individuals to make financial decisions (buy or rent a car, buy a house or rent a house, how much to save for retirement, etc.), and companies make business decisions and predictions.

Calculus

Analyzing nonlinear functions using differential calculus and understanding differentiation rules for multivariable functions

Optimization

Finding solutions to unconstrained optimization problems by identifying maximums and minimums of functions. Utility maximization, profit maximization, cost minimization, etc.

Economic modeling

Understanding mathematical tools used in basic and advanced economic modeling

Econometric hypotheses

Applying mathematical models to assess econometric hypotheses in complex applications

5. COURSE LEARNING GOALS: FOUNDATION SKILLS

A. ARITHMETIC

1. Compute arithmetic expressions having positive and negative numbers, sums, products, differences, quotients, exponents, and parenthetical expressions using the correct order of operations.
2. Translate between proportions, ratios, fractions, decimals, and percentages.
3. Convert quantities measured in one unit to another.
4. Translate between unit changes, percentage changes, and percentage point changes.
5. Translate word problems (i.e., problems set up in English) into arithmetic expressions.

B. GEOMETRY & GRAPHS

1. Be able to represent algebraic relationships graphically
 - a. Represent linear relationships graphically
 - b. Represent non-linear relationships graphically
2. Read values off graphs of functions using appropriate units.
3. Read off and interpret growth rates from graphs of functions.

4. Be able to solve equations using graphs.
5. Describe the behavior of functions using graphs.
6. Compute areas of rectangles, triangles, and trapezoids.
7. Interpret bar charts, pie charts, and histograms.

C. ALGEBRA

1. Understand how functions work.
 - (a) Calculate and interpret the value of a function for numeric and arbitrary values of an exogenous variable.
 - (b) Describe function behavior, given a linear or non-linear function
 - (c) Calculate values of composite functions [e.g. $f(g(x))$]
2. Solve equations with simple polynomials, exponentials, and logs. Solutions may be numeric or contain parameters.
3. Solve systems of up to 3 linear equations with 3 unknowns (use matrix)
4. Write down functional relationships.
 - (a) Write down linear functions that describe given "data" (points, graphs, tables, etc.)
5. Translate word problems/descriptions to functional relationships
6. Know the definition of the inverse function and apply it to linear functions.

INTERMEDIATE SKILLS

B. GEOMETRY & GRAPHS

8. Be able to solve inequalities using graphs.

C. ALGEBRA

4. Write down functional relationships.
 - (b) Substitute variables to obtain new formulations of the same function
 - (c) Reparametrize functions
7. Obtain the inverses of non-linear functions.

D. CALCULUS

1. Compute limits of function, i.e., Describe the behavior of a function as its argument approaches some value.
2. Approximate the slope of the curve given tabular data
3. Take a derivative of a function of a single variable.
 - (a) Take derivatives of polynomials, logs, and exponentials.
 - (b) Apply the product rule, the quotient rule, and the chain rule.
4. Take a first and second partial derivative of a function of multiple variables.

5. Describe the behavior of a function using derivatives
 - (a) Find the maxim and minimum of a function (i.e., x such that $f'(x) = 0$ and $f''(x) < 0$)
 - (b) Find critical points of the function (maximizers, minimizers, saddle points).
 - (c) Substitute constraints into a maximization problem to transform it into an unconstrained maximization problem.

6. Integrate linear functions, polynomials, exponentials, and logs
 - (a) Obtain an indefinite integral
 - (b) Calculate a definite integral and interpret it as the area under the curve

ADVANCED CALCULUS

1. Solve constrained optimization problems using Lagrangians.
 - (a) Set up the Lagrangians given the problem's objective function and constraints.
 - (b) Solve for the critical points using the First Order Conditions
 - (c) Check for the optima using the Second Order Conditions
 - (d) Interpret the Lagrange multiplier given the context of the problem.

6.. GRADING POLICY

This class uses a points-based system to calculate grades. Points are earned and not rewarded. Assignments are weighted for points based on the difficulty and effort needed to complete. The description of each assignment includes how many points it is worth. The total number of points for this class is 500.

- Assignments are due by 11:59 PM on the due dates listed below unless otherwise noted. You will be allowed to do the makeup quiz if you have pre-approved extension.
- Grades on Canvas will be updated regularly; if you notice any discrepancies or have questions, please do not wait until the end of the semester – let your instructor know right away

Letter Grade	GPA scale	Points Needed	Percent (%)
A	4.0	450-500	90-100
B+	3.5	425-449	85-89.9
B	3.0	400-424	80-84.9
C+	2.5	375-399	75-79.9
C	2.0	350-374	70-74.9
D	1.0	300-349	60-69.9
F	0	0-299	0-59.9

7. ASSIGNMENTS

Online Reading Quizzes (15 points/ Reading Quiz – 150 points total)

There will be 10 quizzes based on the readings assigned for each upcoming week. They cover material from upcoming readings for the assigned week. The format of quizzes will be a combination of true or false, multiple choice, matching, and/or short answer questions. Online quizzes must be completed using Canvas Quizzes by 11:59 PM at the start of each week during the semester. Each quiz’s due date is outlined in the course schedule.

In-Class Assignments (Varied Points/ Assignment – 25 points total)

The purpose of in-class assignments are to provide more in-depth experience on select topics that occur throughout the semester. Some examples include addressing conceptual issues as well as practical issues in the field. In-class activities are unannounced and are not eligible for make-ups due to absences. Students will need to be present in class to complete in-class assignments.

Exams (100 Points/ Exam)

Students will take two exams based on assigned readings and lectures. The exam format will be a combination of true or false and multiple choice. All Exams will be taken in person during the class meeting time.

Final Exam (150 points)

The final exam is cumulative, covering all content throughout the semester. The final exam date and time is Wednesday, December 11th, 2024, from 3:50 PM to 5:10 PM.

8. SUMMARY OF ASSIGNMENTS WITH DUE DATES

Assignment	Due Date	Total Points	Percent of Grade
Online Reading Quizzes	Varied	150	30%
In-Class Assignments	Varied	25	5%
Exam 1	October 14 th	75	15%
Exam 2	November 11 th	100	20%
Final Exam	December 11 th .	150	30%
Total		500	100.00%

9. COURSE POLICIES AND PROCEDURES

9.1 Academic Integrity

Students should become familiar with the definitions, procedures, and sanctions outlined in Rutgers University Academic Integrity Policy before submitting any assignment or exam. The policy can be found at: <http://nbacademicintegrity.rutgers.edu/home/academic-integrity-policy/>.

All students should conduct themselves with the highest standards of academic honesty. Examples of academic dishonesty include: copying others' written work, not citing sources, and submitting the same assignments/papers multiple times in different courses. All incidences of questionable academic integrity are a serious matter and may result in a no grade (0.0) for the assignment or course. Academic dishonesty will not be tolerated and will be treated by Rutgers University's Academic Integrity Policy.

9.2 Expectations

- Engage with all class material
 - Spending nine hours per week on class material. This includes reading the textbook, note-taking lectures, and completing assignments.
- Complete all assigned readings and assignments on time
- Actively participate in all class activities, including discussions.
- Follow the honor code when completing all quizzes, and exams
- Communicate with the instructor if you have questions about the material or the course
- Check your email and Canvas announcements regularly to stay informed about class updates.

9.3 Email Etiquette

When emailing your instructor, please use your Rutgers e-mail address and identify yourself by full name and course number. Students are expected to place the course number, followed by the subject, in the subject line, use e-mail etiquette, and maintain reasonable expectations for instructor responses. The instructor will respond to student emails within 1-2 business days.

9.4 Plagiarism

By enrolling in this course, you are showing implicitly that you have read, understood, and accepted Rutgers University's policies and procedures regarding academic integrity and dishonesty. Plagiarism and cheating will not be tolerated, and all University policies apply. Specifically, if plagiarism or cheating is suspected, the student(s) will be asked to meet with the instructor. If the instructor concludes that an instance of plagiarism or cheating has occurred, the student(s) will be subject to a suitable sanction or penalty outlined in Rutgers University Academic Integrity Policy.

9.5 Make-up Policy

No make-ups or extensions will be offered for missed assignments except in one of the following situations, provided that the instructor is notified in advance:

Department of Agricultural, Food and Resource Economics

- Athletic or other Rutgers-sponsored trips: Travel dates and times accompanied by a signed memo from the group's advisor/coach must be presented to the instructor before travel dates.
- Religious observances.
- Extenuating circumstances: This includes (but is not limited to) family emergencies, severe illnesses, accidents, etc. It will be up to the prerogative of the instructor whether or not the student will be allowed to take the make-up or receive an extension.

9.6 Laptops, Tablets, Cell Phones, and Other Electronic Technologies

- Access to Canvas should be on a laptop or desktop computer for full functionality.
- All timed quizzes and exams should be completed on reliable equipment such as a desktop computer or a laptop that is plugged in.
- Avoid accessing material on a mobile device as Canvas functionality will be degraded.
- Please visit the Rutgers Student Tech Guide page for resources available to all students. If you do not have the appropriate technology for financial reasons, please email the Dean of Students at deanofstudents@echo.rutgers.edu or complete the contact form for assistance. If you are facing other financial hardships, please visit the Office of Financial Aid at <https://financialaid.rutgers.edu/>.

9.7 Assignment Submissions

- Let's face it technology breaks at the most inconvenient times. Servers go down, computers get viruses, transfers time out, printers don't work, and files become corrupt. The list goes on and on. These are not considered emergencies. They are part of the normal production process.
- Students agree that by taking this course all required assignments may be subject to submission for textual similarity review to Turnitin.com (directly or via a learning management system, i.e. Canvas) for the detection of plagiarism. All submitted assignments will be included as source documents in the Turnitin.com reference database solely to detect plagiarism in such papers. Use of the Turnitin.com service is subject to the Usage Policy posted on the Turnitin.com site. Students who do not agree should contact the course instructor immediately.

9.8 Diversity & Inclusion

- The Department of Kinesiology and Health supports an inclusive learning environment wherein diversity and authenticity are valued. We are committed to creating a culture of equality that respects the diverse voices of our students, faculty, and staff. We will continuously strive to create a curriculum and academic environment to reflect the community we serve and drive innovation, social responsibility, and excellence. Our diversity in thought, skill, and academic discipline is a resource and strength, which stands to help the whole and positively contribute to university and global reach.

1. UNIVERSITY SERVICES

Service	Description	Contact Information
Student Accommodations	If you are a student in need of accommodations, please register with the Office of Disability Services in order to initiate the accommodations process. Please present your letter of accommodation to your instructor during the first week of the semester. Please note that accommodations are not retroactive.	(848) 445-6800 Lucy Stone Hall, Suite A 145, Livingston Campus, 54 Joyce Kilmer Avenue, Piscataway, NJ 08854 https://ods.rutgers.edu/
Just In Case Web App	Access helpful mental health information and resources for yourself or a friend in a mental health crisis on your smartphone or tablet and easily contact CAPS or RUPD.	http://health.rutgers.edu/medical-counseling-services/counseling/caps-next-step/
Counseling, ADAP & Psychiatric Services (CAPS)	CAPS is a university mental health support service that includes counseling, alcohol and other drug assistance, and psychiatric services staffed by a team of professional within Rutgers Health services to support students' efforts to succeed at Rutgers University. CAPS offers a variety of services that include individual therapy, group therapy and workshops, crisis intervention, referral to specialists in the community and consultation and collaboration with campus partners.	(848) 932-7884 17 Senior Street, New Brunswick, NJ 08901 www.rhscaps.rutgers.edu/ Medical Services: http://health.rutgers.edu/medical-counseling-services/medical/ Counseling Services: http://health.rutgers.edu/medical-counseling-services/counseling/
Violence Prevention & Victim Assistance (VPVA)	The Office for Violence Prevention and Victim Assistance provides confidential crisis intervention, counseling and advocacy for victims of sexual and relationship violence and stalking to students, staff and faculty. To reach staff during office hours when the university is open or to reach an advocate after hours, call 848-932-1181.	(848) 932-1181 3 Bartlett Street New Brunswick, NJ 08901 www.vpva.rutgers.edu/
Scarlet Listeners	Free and confidential peer counseling and referral hotline, providing a comforting and supportive safe space.	(732) 247-5555 scarlet.listeners@gmail.com https://scarletlisteners.wixsite.com/scarletlisteners

Department of Agricultural, Food and Resource Economics

Academic Support	School of Arts and Sciences Academic Advising for personal, career, and educational goals.	SAS: https://sasundergrad.rutgers.edu/
	Department of Kinesiology & Health Academic Advising for questions about Exercise Science or Sport Management major/minor requirements.	Dept. of Kinesiology & Health: Lin Williams lin.williams@rutgers.edu Loree Gym, Room 148 Becky DeMarco becky.demarco@rutgers.edu https://kines.rutgers.edu/academics/academic-advising
Last Updated: 7-26-2023		

Tentative schedule: (I reserve the right to alter the schedule as and when necessary, during the semester).

Week	Chapter contents	Comments
Part One Chapter 1: A Library Of Elementary Functions	1. Linear Equations and Graphs 1.1 Linear Equations and Inequalities 1.2 Graphs and Lines 1.3 Linear Regression	Complete the worksheet and bring it to recitation for discussion.
Chapter 2: Functions and Graphs	2.1 Functions 2.2 Elementary Functions: Graphs and Transformations 2.3 Quadratic Functions 2.4 Polynomial and Rational Functions 2.5 Exponential Functions 2.6 Logarithmic Functions	Complete review exercises or Chapter 1 and take Quiz 1
Part Two Chapter 3: Finite Mathematics	3.1 Simple Interest 3.2 Compound and Continuous Compound Interest 3.3 Future Value of an Annuity; Sinking Funds 3.4 Present Value of an Annuity; Amortization.	Complete the worksheet and bring it to recitation for discussion. Take Quiz 2 Do not use the calculator, use the TVM table (PVIF, FVIF)

Department of Agricultural, Food and Resource Economics

Chapter 4: Systems of Linear Equations Matrices	4.1 Review: Systems of Linear Equations in Two Variables 4.2 Systems of Linear Equations and Augmented Matrices 4.3 Gauss-Jordan Elimination 4.4 Matrices: Basic Operations 4.5 Inverse of a Square Matrix 4.6 Matrix Equations and Systems of Linear Equations 4.7 Leontief Input-Output Analysis	Complete the worksheet and bring it to recitation for discussion. Complete review exercises for the chapter 4 and take quiz 3
Chapter 5: Linear Inequalities and Linear Programming	5.1 Linear Inequalities in Two Variables 5.2 Systems of Linear Inequalities in Two Variables 5.3 Linear Programming in Two Dimensions: A Geometric Approach	Complete review exercises and take quiz 4
Chapter 6: Linear Programming: The Simplex Method	6.1 The Table Method: An Introduction to the Simplex Method 6.2 The Simplex Method: Maximization with Problem Constraints of the Form \leq 6.3 The Dual; Minimization with Problem Constraints of the form \geq 6.4 Maximization and Minimization with Mixed Problem Constraints	Complete the worksheet and bring it to recitation for discussion. Complete review exercises and take quiz 5
7: Logic, Sets, and Chapter Counting	7.1 Logic 7.2 Sets 7.3 Basic Counting Principles 7.4 Permutations and Combinations	Complete the worksheet and bring it to recitation for discussion and take quiz 6

Department of Agricultural, Food and Resource Economics

Chapter 8: Probability	8.1 Sample Spaces, Events, and Probability 8.2 Union, Intersection, and Complement of Events; Odds 8.3 Conditional Probability, Intersection, and Independence 8.4 Bayes' Formula 8.5 Random Variables, Probability Distribution, and Expected Value	Complete the worksheet and bring it to recitation for discussion. Complete review exercises and take quiz 6
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PART THREE: CALCULUS Chapter 10: Limits and the Derivative	10.1 Introduction to Limits 10.2 Infinite Limits and Limits at Infinity 10.3 Continuity 10.4 The Derivative 10.5 Basic Differentiation Properties 10.6 Differentials 10.7 Marginal Analysis in Business and Economics	Complete the worksheet and bring it to recitation for discussion. Complete the review exercise and take quiz 7
Chapter 11: Additional Derivative Topics	11.1 The Constant e and Continuous Compound Interest 11.2 Derivatives of Logarithmic and Exponential Functions 11.3 Derivatives of Products and Quotients 11.4 The Chain Rule 11.5 Implicit Differentiation 11.6 Related Rates 11.7 Elasticity of Demand	Complete the worksheet and bring it to recitation for discussion. Complete the review exercise and take quiz 8
Chapter 12: Graphing and Optimization	12.1 First Derivative and Graphs 12.2 Second Derivative and Graphs 12.4 Curve Sketching Techniques 12.5 Absolute Maxima and Minima 12.6 Optimization	Complete the review exercise and take quiz 9

Department of Agricultural, Food and Resource Economics

Chapter 15: Multivariable Calculus	15.1 Functions of Several Variables 15.2 Partial Derivatives 15.3 Maxima and Minima 15.4 Maxima and Minima Using Lagrange Multipliers 15.5 Method of Least Squares 15.6 Double Integrals Over Rectangular Regions 15.7 Double Integrals Over More General Regions	Complete the worksheet and bring it to recitation for discussion. Complete the review exercise and take the quiz 10
PART FOUR: DATA ANALYSIS	Descriptive and Inferential Statistics Simple and Multiple Regression Analysis	Complete the data analysis in group and submit the final version. One submission per group via assignments on Canvas.

Note: I will inform you if I make any changes to this schedule in class and via announcements on Canvas.

All the best, let's have fun with Math!