SCHOOL OF AGRICULTURE

COURSE NUMBER: AGR 536  CREDIT HOURS: 3

I. TITLE:
Quantitative Methods for Agribusiness

II. CATALOG DESCRIPTION:
A study of the use and theory of mathematics as it applies to the fields of agriculture, finance, and economics. Attention is given to the elementary uses of algebra, matrix algebra, and the calculus as they apply to optimization problems in resource use efficiency. The same mathematics will be applied to time value of money topics. Prerequisites: MAT 140, ECO 230, ECO 231. (Spring, Odd years)

*To receive graduate credit for this course, a student must be admitted to graduate studies prior to registering for the course.*

III. PURPOSE:
To provide students in Agribusiness with a command of basic mathematics as it applies to economic principles, agriculture, and agribusiness.

IV. COURSE OBJECTIVES:
To develop understanding of the more useful principles and analysis tools applicable to the mathematics of agriculture and to assist students more effectively in dealing with economic problems.

V. CONTENT OUTLINE:
A. Chapter 1 – Introduction
   1-1 The Dread of Mathematics in Economics
   1-2 The Method of Presentation and the Level of Difficulty
   1-3 Points to Remember when Learning Mathematical Methods
B. Chapter 2 – Mathematical Representation of Economic Relationships
   2-1 Economic Models
   2-2 Sets
   2-3 Relations and Functions
   2-4 Indices
   2-5 Polynomial Functions
2-6 Functions of more than one Independent Variable
2-7 Equalities, Inequalities, and Absolute Values
2-8 Logarithms

C. Chapter 3 – Static-Equilibrium Models
3-1 The Slope of a Straight Line
3-2 Market Demand and Supply
3-3 A Linear Partial-Equilibrium Model
3-4 The Effect of an Excise Tax in a Competitive Market
3-5 The Number of Equations and the Number of Unknowns
3-6 A Nonlinear Market Model

D. Chapter 4 – Matrix Algebra
4-1 Matrices Defined
4-2 The Algebra of Matrices
4-3 Identity and Null Matrices
4-4 The Transpose of a Matrix
4-5 The Inverse of a Matrix
4-6 Determinants
4-7 Properties of Determinants
4-8 Calculating the Inverse Matrix
4-9 Cramer’s Rule

E. Chapter 5 – Linear Models in Matrix Form
5-1 A Partial-Equilibrium Market Model in Matrix Form
5-2 Input and Output Analysis

F. Chapter 6 – Differentiation of a Function of One Variable
6-1 The Difference Quotient and the Slope of a Curve
6-2 The Derivative
6-3 Rules of Differentiation for a Function of One Variable
6-4 Second and Higher Derivatives

G. Chapter 7 – Economic Applications and Derivatives
7-1 The Derivatives of Demand and Supply Functions
7-2 Elasticity
7-3 Total Revenue, Marginal Revenue, and the Price Elasticity of Demand
7-4 Other Derivatives in Economics

H. Chapter 8 – Maximization and Minimization
8-1 Relative and Absolute Extrema
8-2 Criteria for Relative Extrema
8-3 Points of Inflection

I. Chapter 9 – Economic Applications of Maximization and Minimization
9-1 Profit Maximization
9-2 Revenue Maximization
9-3 Revenue form Taxation
9-4 The Theory of Production
9-5 The Theory of Cost
9-6 Demand for a Productive Service
J. Chapter 10 – Partial and Total Differentiation
   10-1 Partial Differentiation
   10-2 Techniques of Partial Differentiation
   10-3 Second Order Partial Differentiation
   10-4 Differentials and Total Differentials
   10-5 Total Derivatives
   10-6 Derivatives of Implicit Functions
K. Chapter 11 – Economic Applications of Partial and Total Differentiation
   11-1 Comparative Static Analysis
   11-2 Partial Elasticities
   11-3 Differentials and Elasticity
   11-4 Production Function Analysis
L. Chapter 12 – Unconstrained Extrema
   12-1 Unconstrained Extrema of a Function of Two Variables: Graphical Analysis
   12-2 The First Order Condition for a Relative Extremum: \( z = f(x, y) \)
   12-3 Economic Applications of Unconstrained Extrema
M. Chapter 13 – Constrained Extrema
   13-1 Constrained Extrema of a Function of Two Variables: Graphical Analysis
   13-2 Constrained Extrema via the Lagrangian – Multipliers Method
   13-3 Economic Applications of Constrained Extrema

VI. **INSTRUCTIONAL ACTIVITIES:**

Three lectures per week, with 12 unannounced quizzes, 3 major exams, and a final exam. Practical applications of economic principles to agriculture will be stressed.

A. Assignments – oral and extemporaneous.
B. Classroom activity – lecture, discussion, and participatory projects.
C. Other information
   1. Obtaining assignments and the pursuant work is the responsibility of the individual student.
   2. Conditions of this syllabus may be changed and announced at any class meeting.
   3. Every effort will be made to inform the student of course expectations. Trickery and subterfuge will be avoided. Students are encouraged to consult with the teacher on academic progress or any other matter affecting class performance. Extra group or individual study periods will be scheduled if requested by the student(s).
   4. Final exams as scheduled in class schedule bulletin.

VII. **FIELD AND CLINICAL EXPERIENCES:**

None.
VIII. **RESOURCES:**

A. Hand held/pocket calculator

B. Appropriate journals and books in the Waterfield Library:
   1. Journal of Political Economy
   2. American Journal of Agricultural Economics
   3. Journal of Economic Theory

IX. **GRADING PROCEDURES:**

Tests and Scoring:
- Announced exams (comprehensive) (3) 60%
- Quizzes (average of 10) 15%
- Final exam (comprehensive) 25%

Total 100%

Letter grades are derived from the weighted average of the points as explained above.

- 90 – 100 = A
- 80 – 89 = B
- 70 – 79 = C
- 60 – 69 = D
- Below 60 = E

Extra work to raise your grade at the end of the semester is not allowed. Students are advised to keep up as class progresses.

All make-up exams must be taken during the last regularly scheduled class period. There is no make-up for the final.

**In order to receive graduate credit for this course, students will be required to review three articles from the Journal of Agricultural Economics, America Economic Review, or the Journal of Political Economics. Students will also be asked to write a paper using the methods learned in class. This paper will be 10% of the course grade and the exam’s percentage will be reduced to 50%.

No make-up of quizzes and in class laboratory assignments is permitted! Quizzes and laboratory assignments not completed will receive a grade of zero (0)!

To receive graduate credit for this course, a student must be admitted to graduate studies prior to registering for the course.
X. **ATTENDANCE POLICY:**

Please refer to the most current copy of the *Murray State University’s Undergraduate Bulletin and Graduate Bulletin*.

XI. **ACADEMIC HONESTY POLICY:**

Please refer to the most current copy of the *Murray State University’s Undergraduate Bulletin and Graduate Bulletin*.

NOTE: The School of Agriculture Faculty have adopted and implemented an Academic Honesty Policy in addition to the University Honesty Policy, which can be found in the current *Undergraduate Bulletin and Graduate Bulletin*. The policy sets guidelines regarding acts of dishonesty and the procedure to follow should an event occur. It is each Agriculture student’s responsibility to obtain and read a copy of this document. The School’s Academic Honesty Policy can be obtained by asking for a copy from any Agriculture Faculty member or the Secretary.

XII. **TEXT AND REFERENCES:**


XIII. **PREREQUISITES:**

MAT 140, ECO 230, ECO 231

XIV. **STATEMENT OF AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY:**

Murray State University endorses the intent of all federal and state laws created to prohibit discrimination. Murray State University does not discriminate on the basis of race, color, national origin, gender, sexual orientation, religion, age, veteran status, or disability in employment, admissions, or the provision of services and provides, upon request, reasonable accommodation including auxiliary aids and services necessary to afford individuals with disabilities equal access to participate in all programs and activities. For more information, contact Sabrina Y. Dial, Director of Equal Opportunity, Murray State University, 103 Wells Hall, Murray, KY 42071-3318. Telephone: 270-809-3155 (voice), 270-809-3361 (TDD).

XV. **MSU SCHOOL OF AGRICULTURE CELL PHONE POLICY**
The School of Agriculture recognizes that in today’s world cell phones are a familiar and often necessary form of communication for students.

It shall be the policy of the School that no cell phone usage shall be allowed in class and/or labs without the prior consent of the course instructor. This shall include verbal calling, incoming calls, email, text messaging, and use of cell phone calculators on tests and quizzes.

Cell phones must be kept off and out of sight (i.e. secured to a person’s belt or kept in a bag or purse away from desks and lab counters).

Should a student’s cell phone be visible, ring, or other form of unauthorized usage that is interruptive to the class or lab, the student may be asked to leave class and not return for that class/lab period.

Upon prior consent of the instructor, a student may obtain permission to have their phone on in case of an emergency or in critical family situations.

This policy also includes pagers and other electronic equipment such as blackberries and/or computers/laptops.