

**ECON 5301-001: Math for Economists**  
**ECON 4323-001: Introduction to Mathematical Economics**  
**Fall 2011**  
**Course Syllabus**

**Course Details**

Time: T-R 5:30-6:50PM  
Room: COBA 139

**Instructor Details**

Instructor: Aaron D Smallwood  
Office: COBA 327  
Office Hours: T: 4-5 p.m. R: 12:30 – 1:30PM, or by appointment  
Email/Phone: smallwood@uta.edu / 817-272-3062  
Course website: [www.uta.edu/faculty/smallwood/ECON4323fall11.html](http://www.uta.edu/faculty/smallwood/ECON4323fall11.html)

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**Course Description and Student Learning Outcomes**

Mathematics has increasingly become the “language” of Economics. Having a solid mathematical foundation is necessary to understand both theoretical models and empirical estimations that you will encounter in the economics literature. Economics 5301/4323 is designed to upgrade mathematical skills for graduate work in economics and business. We will study certain basic mathematical concepts and methods and relate them to various types of economic analysis. The mathematical techniques that we will explore include those used in static and comparative-static analysis, optimization problems, and simple dynamic analysis.

The goal is that, upon completion of the course, you are able to:

- Comprehend and explain much of the mathematical analysis in the economics literature
- Identify one or more appropriate mathematical tools to use when faced with an economic/mathematics problem
- Apply mathematical tools used by economists to solve economic/mathematics problems

**Prerequisites (ECON 5301)**

MATH 1302 (College Algebra)

**Prerequisites (ECON 4323)**

MATH 1316 (Mathematics for Economics and Business Analysis), ECON 3310 (Intermediate Microeconomics) and ECON 3312 (Intermediate Macroeconomics)

**Required Text**

Dowling, Edward T. *Schaum's Outline of Theory and Problems of Introduction to Mathematical Economics*, 3<sup>rd</sup> edition, McGraw-Hill, 2001.

**Recommended Text**

Turkington, Darrell A. *Mathematical Tools for Economics*, Blackwell Publishing, 2007.

## Other Resources

Chiang, Alpha C. and Kevin Wainwright. *Fundamental Methods of Mathematical Economics*, 4<sup>th</sup> edition, McGraw-Hill, 2005.

Dadkhah, Kamran. *Foundations of Mathematical and Computational Economics*, South-Western, 2006.

Klein, M. W. *Mathematical Methods for Economics*, Addison Wesley, 1998.

Simon, C. P. and L. Blume, *Mathematics for Economists*, W.W. Norton and Company, 1994.

Sydsaeter, K. and P. J. Hammond, *Mathematics for Economic Analysis*, Prentice Hall, 1995.

## Course

Your grade will be determined by 2 in-class exams and a Final Exam. Additionally, problem sets will be administered each week and three will be collected on the dates noted below. Your grades are given as follows:

Assignments	27% (9% each assignment)
Exam #1	24%
Second Exam	24%
Final Exam	<u>25%</u>
	100%

## Problem sets

Problem sets will be posted to the course website at the end of each week. After every third week, I will randomly collect a problem set. The problem sets will be used in preparation for each exam, during the week before each exam. I will typically review problem sets at the beginning of class. Therefore, I will not accept late assignments. If you are unable to make it to class on time (or at all), we can make arrangements for you to turn in your problem sets early or via email.

## Exams

Exam dates are also listed below. ***No makeup exams will be given without approval from the instructor where absence is absolutely unavoidable.*** You can take the exam early, or later in the week ONLY if you have appropriate documentation (e.g., a doctor's note, not simply verification you went to the health center).

Please bring a pencil and ***non-programmable, scientific*** calculator to each exam

## Important Dates

First Homework Collection:	September 22
Second Homework Collection:	October 27
Third Homework Collection:	December 6

Tuesday, September 27	Exam 1
Tuesday, November 1	Exam 2
<b><i>Tuesday, December 13, 5:30-8pm</i></b>	<b><i>Final Exam</i></b>

## **Course Outline**

The following is a general schedule of the topics to be covered, as well as the readings in Dowling that go along with the topics. Please note that this is a very tentative time table and is subject to change.

### Review (Chapter 1, part Chapter 2, Chapter 7)

Exponents (1.1)

Polynomials (1.2)

Linear and Quadratic Equations (1.3)

Simultaneous Equations; Supply and Demand (1.4, 2.2)

Functions; Utility Functions and Production Functions (1.5)

Graphs; Budget Constraints and Isocosts (1.6, 2.1)

Exponential and Logarithmic Functions (Chapter 7)

### Single Variable Calculus: Differentiation and Optimization (Chapter 3, Chapter 4)

Limits and Continuity (3.1-3.2)

Slope of a Nonlinear function and the Derivative (3.3-3.5)

Rules of Differentiation (3.7, 9.1, 9.5)

Higher-Order Derivatives (3.8, 9.2)

Implicit Differentiation (3.9)

Increasing and Decreasing Functions, Concavity and Convexity (4.1-4.2)

Relative Extrema and Inflection Points (4.3-4.4)

Optimization of Functions and Second Derivative Tests (4.5-4.6, 9.4)

Economic Applications of the Derivative: Marginal Concepts, Profit Maximization under Perfect Competition and Monopoly, Elasticity, Relationship Among Total, Marginal, and Average Concepts (4.7-4.9)

### Multivariate Calculus: Differentiation and Optimization (Chapter 5, Chapter 6, part Chapter 9, part Chapter 12, Chapter 13)

Functions of Several Variables and Partial Derivatives (5.1-5.3, 9.3)

Economic Applications: Production Functions, Marginal Productivity, and MRTS; Utility Functions, Marginal Utility, and MRS; Income and Cross-Price Elasticities of Demand (6.1, 6.3, notes)

Optimization of Multivariable Functions and the Hessian (5.4, 6.5, 9.4, 12.2, 12.4)

Constrained Optimization with the Lagrangian and Bordered Hessian (5.5-5.6, 12.5)

Economic Application of Lagrangians: Utility and Production Function Maximization (notes, 6.6, 6.9, 6.10, 9.8)

Differentials; Deriving the MRS (5.7-5.8, 6.4)

Total Derivatives (5.9)

Implicit and Inverse Function Rules (5.10)

Comparative Statics with One Endogenous Variable (13.1-13.2)

Comparative Statics with More than One Endogenous Variable (13.3)

Comparative Statics for Optimization Problems (13.4)

Comparative Statics for Constrained Optimization Problems and the Envelope Theorem (13.5-13.6)

Concave Programming with Inequality Constraints (13.7)

### Matrix Algebra (Chapter 10, Chapter 11)

Basics, Definitions, Terms (10.1-10.2)

Addition, Subtraction, and Multiplications of Matrices (10.3-10.4, 10.6)

Some Algebraic “Laws” of Matrices and Special Matrices (10.7-10.8)

System of Linear Equations in Matrix Form (10.9)

Determinants, Nonsingularity, and Rank (11.1)

Higher-Order Determinants and LaPlace Expansion (11.2-11.4)

Properties of Determinants (11.5)

Cofactor and Adjoint Matrices (11.6)

Inverse of a Matrix and its Properties (11.7)

Solving Linear Equations with the Inverse (11.8)

Cramer’s Rule (11.9)

Applications of Matrices in Economics: Linear Economic Models (Supply & Demand, Keynesian Macro Model) and Econometrics (Chapter 3 in Turkington)

### Integral Calculus (Chapter 14, Chapter 15)

The Indefinite Integral: The Basics and Rules of Integration (14.1-14.2)

Integration by Substitution (14.4)

Integration by Parts (14.5)

Economic Applications of the Indefinite Integral (14.6)

The Definite Integral: The Basics and the Fundamental Theorem of Calculus (15.1-15.5)

Improper Integrals (15.6)

L’Hôpital’s Rule (15.7)

Economic Application: Consumer and Producer Surplus (15.8)

The Definite Integral and Probability (15.9)

### Differential and Difference Equations (Chapter 16, part Chapter 17, part Chapter 18)

First Order Difference Equations: The Basics (16.1)

First Order Linear Differential Equations (16.2)

Economic Application of First Order Linear Differential Equations: Price Stability in a Supply and Demand Model (16.7, notes)

First Order Nonlinear Differential Equations: Separation of Variables (16.6)

First Order Nonlinear Differential Equations: Exact Differential Equations, Partial Integration, and Integrating Factors (16.3-16.5)

Phase Diagrams for Differential Equations (16.8)

First Order Difference Equations: The Basics (17.1)

First Order Linear Difference Equations and Stability Conditions (17.2-17.3)

Economic Application of First Order Linear Difference Equations: Lagged Income Determination Model (17.4)

Phase Diagrams for Difference Equations (17.7)

Second Order Differential Equations (18.1)

Second Order Difference Equations (18.2)

## Dynamic Optimization (Chapter 20)

The Basics of Dynamic Optimization (20.1)

Euler's Equations and Finding Candidates for Extremals (20.3-20.4)

Sufficiency Conditions for Dynamic Optimization (20.5)

Economic Application: A Firm's Present Value Cost Minimization with Changing Inventory (20.8)

### ***Attendance***

You may notice that attendance is not a formal part of your assessment. However, you can expect to do poorly if you are unable to attend. This class requires consistent effort in working through problems administered in class and the in the textbook, while attending every class period.

### ***Academic Integrity***

It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline will include a grade of zero on the assignment or exam and may include suspension or expulsion from the University. According to the UT System Regents' Rule 50101, §2.2, "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts."

### ***Administrative Policies***

#### ***Drop Policy***

It is the student's responsibility to complete the course or withdraw from the course in accordance with University regulations. Students are strongly encouraged to verify their grade status before dropping a course after their first withdrawal date. A student who drops a course after the first withdrawal date may receive an "F" in the course if the student is failing at the time the course is dropped.

#### ***Student Support Services***

The University of Texas at Arlington has established a variety of programs to help students meet the challenges of college life. Support to students includes advising, counseling, mentoring, tutoring, supplemental instruction, and writing assistance. For a complete list of academic support services, visit the Academic Assistance resource page of the Office of Student Success Programs, [www.uta.edu/uac/studentsuccess/academic-assistance](http://www.uta.edu/uac/studentsuccess/academic-assistance). To help students address personal, academic and career concerns, individual counseling is also available. For more information, students are encouraged to contact Counseling Services [www.counseling.uta.edu](http://www.counseling.uta.edu) at (817) 272-3671 or visit a counselor in 216 Davis Hall.

### ***Electronic Communication***

The University of Texas at Arlington has adopted the University “MavMail” address as the sole official means of communication with students. MavMail is used to remind students of important deadlines, advertise events and activities, and permit the University to conduct official transactions exclusively by electronic means. For example, important information concerning registration, financial aid, payment of bills, and graduation are now sent to students through the MavMail system. All students are assigned a MavMail account. Students are responsible for checking their MavMail regularly. Information about activating and using MavMail is available at <http://www.uta.edu/oit/email/>. There is no additional charge to students for using this account, and it remains active even after they graduate from UT Arlington.

### ***Americans with Disabilities Act***

The University of Texas at Arlington is on record as being committed to both the spirit and letter of all federal equal opportunity legislation, including the Americans with Disabilities Act (ADA). The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. Any student requiring an accommodation for this course must provide me with official documentation in the form of a letter certified by the staff in the Office for Students with Disabilities, University Hall 102. Information regarding diagnostic criteria and policies for obtaining disability-based academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability) or by calling the Office for Students with Disabilities at (817) 272-3364. Please notify me no later than two weeks before the first exam concerning any academic accommodations you will need.