B.E. International Program

Faculty of Economics, Thammasat University

Syllabus

EE 421 Mathematical Economics I

Semester: 2/2011 (January 9– May 20, 2012)

Instructor: Dr. Thanet Makjamroen
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Time: Wednesday and Friday, 12.30-14.00 hrs.
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***Prerequisite*:**
(Curriculum 2004) EE311 and MA217 (or MA212)
(Curriculum 2009) MA217 (or MA212) and having completed or currently taking EE311

Text: **Jeffrey Baldani, et. al.**, *Mathematical Economics*, 2nd edition, Dryden 2004.

Lecture Notes: Thanet Makjamroen, *Lecture Notes for EE421 Mathematical Economics I*, May 2008.

References:

Gale [1960], *The Theory of Linear Economic Models*, McGraw-Hill.
Jehle [1991], *Advanced Microeconomics Theory*, Prentice-Hall.
Sundaram [1996], *A First Course in Optimization Theory*, Cambridge University Press.
Simon and Blume [1994], *Mathematics for Economics*, Norton.
Sydsaeter and Hammond [1995], *Mathematics for Economic Analysis*, Prentice-Hall.

Evaluation:

Midterm Exam	45%	(March 2, 2012, 12.30-14.00)
Final Exam	50%	(May 8, 2012, 09.00-12.00)

Topics:

Chapter 1 **Introduction**
1.1 Mathematical Economic Model
1.2 Use of Economic Model
1.3 An Example of Mathematical Models

Chapter 2 **Calculus of Single Variable**
2.1 Derivative

2.2 Examples of Derivatices in Economics
2.3 Derivaties and Increasing Functions
2.4 Second- and Higher-Order Derivaties
2.5 Optimization: Single Variable
    2.5.1 Necessary Conditions
    2.5.2 Sufficient Conditions
2.6 Concave and Convex Functions
2.7 Differentials

Chapter 3 Calculus of Single Variable: Applications

3.1 Labor Union
3.2 Profit Maximization in Perfect Competition
3.3 Profit Maximization of a Monopoly
3.4 Taxation on Monopoly
3.5 Profit Maximization of Duopoly (Cournot Model)
3.6 Balanced-Budget Multiplier

Chapter 4 Multivariate Calculus

4.1 Partial Derivatives
4.2 Second-Order Partial Derivatives and Cross Partial Derivatives
4.3 Total Differentials
4.4 Conventions of Matrix Notations for Derivatives of Functions of Serveral Variables
4.5 Chain Rules of Composite Functions of Several Variables
4.6 Directional Derivatives
    4.6.1 First-order Directional Derivatives
    4.6.2 Directional Derivatives and Optimization
    4.6.3 Second-order Directional Derivatives
4.7 Mean-Value Theorem
4.8 Taylor's Polynomials and Taylor's Approximation in $\boldsymbol{R}^n$
4.9 Implicit Functions and Implicit Function Theorem
4.10 LevelSets, Tangents and Gradients
4.11 Homogeneity

Chapter 5 Multivariate Calculus: Applications

5.1 Balanced-Budget Multipliers in Closed Economy
    5.1.1 Simple Keynesian Model
    5.1.2 IS-LM Model
    5.1.3 Aggregate Demand-Aggregate Supply Model
5.2 Monetary Policy Effectiveness
    5.2.1 IS-LM Model
    5.2.2 Mundell-Fleming Model with Flexible Exchange Rate
5.3 Tax Incidence in Supply-Demand Model

Chapter 6 Multivariable Optimization without Constraints

6.1 Definitions of Extreme Points
6.2 2-Variable Optimization
6.3 First-Order Necesssary Condition
6.4 Second-Order Necesssary Condition
6.5 Sufficient Conditions
6.6 Multivariable Optimization without Constraints

Chapter 12 Sensitivity Analysis and Envelope Theorems

12.1 The Meaning of the Multipliers
12.2 The Meaning of Lagrange Multiplier: One Equality Constraint Case
12.3 The Meaning of Lagrange Multiplier: Several Equality Constraint Case
12.4 The Meaning of Lagrange Multiplier: Inequality Constraint Case
12.5 Envelope Theorems
12.6 Envelope theorem: Unconstrained Case
12.7 Envelope Theorem: Equality Constraints Case
12.8 Applications: Shephard's Lemma, Roy's Identity and Demand Function
12.9 Envelope Theorem: Inequality Constraints Case
