



# B.E. International Program

## Faculty of Economics, Thammasat University



### Course Outline

#### EE 320 Introductory Mathematical Economics

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

**Instructors:** Dr. Anin Aroonruengsawat  
Room 518, 5<sup>th</sup> fl, Faculty of Economics  
Office hours: By appointment  
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**Lecture Time:** Wednesday & Friday, 12:30 am. - 14:00 pm.

**Lecture Venue:** Room 203, Faculty of Economics

**Prerequisites:** EE 211, EE 212 and MA 216

Students may take EE421 as a compulsory course in substitution of EE320 (Credit will not be awarded to students who are taking or have taken EE 421).

#### Course descriptions:

Study of mathematical concepts and tools such as functions, matrices and higher-order derivatives in cases of single and multiple independent variables. Emphasis is on the application of optimization, both with and without constraints, and introductory integral, for understanding relationships of various economic variables and concepts, such as the relationship of aggregate, average and marginal functions. Other topic covered analyses of elasticities, market equilibrium, impacts of taxation and input-output models.

#### Assessment:

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| 1. Homework                                  | 10 % |
| 2. Midterm Exam (March 2, 2012, 12.30-14.00) | 35 % |
| 3. Final Exam (May 8, 2012, 09.00-12.00)     | 55 % |

**Main Text:**

Chiang, A. C. and Wainwright, K. (2005) *Fundamental Methods of Mathematical Economics*, 4<sup>th</sup> edition, McGraw-Hill, Inc., Singapore. (CW)

**Other Recommended Books:**

Dowling, E. T. (2001) *Schaum's Outline of Theory and Problem of Introduction to Mathematical Economics*, 3<sup>rd</sup> edition, The McGraw-Hill Companies, Inc.

Holden, K. and Pearson, A.W. (1992) *Introductory Mathematics for Economics and Business* Second edition, The Macmillan Press Ltd.

Sydsaeter K. and P. Hammond. (2006) *Essential Mathematics for Economic Analysis*, 2<sup>nd</sup> edition, Prentice Hall.

Number of lecture(s)	Topics	
1	<b>1. Introduction</b> - Importance and Needs to use mathematics in economics. - The Nature of theory, economic model and mathematics.	CW. Ch. 1
1	<b>2. Mathematics and Economic Relations</b> - Relations and functions - Types of functions	CW. Ch.2
3	<b>3. Static and Comparative Static Equilibrium Analysis</b> - Linear models in economics - Simultaneous system of equations - Linear equation and graph - Breakeven analysis - Individual and market demand - Individual and market supply - Partial market equilibrium - Excise tax and market equilibrium - Elasticity concept - Simple macroeconomic model - IS-LM model	CW. Ch. 3
4	<b>4. Basic Matrix Algebra and Applications</b> - Terminology (Type of matrix) - Matrix operations (Add, Subtract, multiply) - Representation of system of equation by matrix notation - Matrix inversion by determinants - Determinant and singularity of matrix - Cramer's rule - Matrix applications in - Partial market equilibrium - Excise tax and market equilibrium - Simple macroeconomic model - IS-LM model	CW. Ch. 4, 5

Number of lecture(s)	Topics	
4	<b>5. Nonlinear Model and Differential Calculus in Economic Theory</b> <ul style="list-style-type: none"> <li>- Quadratic theory</li> <li>- Other nonlinear functions</li> <li>- Slope and derivatives of a function</li> <li>- Rule of differentiation</li> <li>- Non differentiable functions</li> <li>- Convexity and Concavity</li> <li>- Maxima, minima and inflection point</li> <li>- Examples in Economics               <ul style="list-style-type: none"> <li>- Derivative and marginality</li> <li>- Relations among the total, the average and the marginal functions</li> <li>- Elasticity, total revenue and marginal revenue</li> </ul> </li> </ul>	CW. Ch. 6, 7, 8, 9
5	<b>6. Derivatives of More-Than-One Independent Variable Function</b> <ul style="list-style-type: none"> <li>- First order partial derivatives</li> <li>- Second order partial derivatives</li> <li>- Differential</li> <li>- Total differential</li> <li>- Total derivatives</li> <li>- Implicit function and its derivative</li> <li>- Examples in economics               <ul style="list-style-type: none"> <li>- Partial market equilibrium</li> <li>- Multipliers in macro models</li> <li>- Utility function</li> <li>- Production function</li> <li>- Etc.</li> </ul> </li> </ul>	CW. Ch. 7, 8
3	<b>7. Optimization without Constraints : One Independent Variable Case</b> <ul style="list-style-type: none"> <li>- Maximize profits               <ul style="list-style-type: none"> <li>- competitive market case</li> <li>- Monopoly case</li> </ul> </li> <li>- Effects of taxes               <ul style="list-style-type: none"> <li>- Lump-sum tax</li> <li>- Profit tax</li> <li>- Excise tax</li> </ul> </li> <li>- Maximization of tax revenue</li> </ul>	CW. Ch. 9
3	<b>8. Optimization without Constraint : More-Than-One Independent Variable Cases</b> <ul style="list-style-type: none"> <li>- Conditions for maximum or minimum</li> <li>- Third degree price discrimination</li> <li>- Multiplant-firm</li> <li>- Multiproduct-firm</li> </ul>	CW. Ch. 11

Number of lecture(s)	Topics	
3	<b>9. Optimization under Equality Constraint</b> <ul style="list-style-type: none"> <li>- Lagrange multiplier</li> <li>- Conditions for optimization</li> <li>- Maximize output level subject to cost constraint</li> <li>- Minimize cost subject to output constraint</li> <li>- Minimize utility subject to fixed budget</li> </ul>	CW. Ch. 12
3	<b>10. Integration and Its Application</b> <ul style="list-style-type: none"> <li>- Terminology in Integration</li> <li>- Rules of Integration</li> <li>- Definite Integration</li> <li>- Applications: <ul style="list-style-type: none"> <li>- Total revenue function from marginal revenue function</li> <li>- Total cost function from marginal cost function</li> <li>- Profit function from MR-MC</li> <li>- Utility function from marginal utility function</li> <li>- Consumption and saving functions from marginal propensity functions</li> <li>- Capital formation and investment functions</li> <li>- Consumer surplus, producer surplus and total surplus</li> <li>- First degree price discrimination</li> <li>- Differential equation (if time allows)</li> </ul> </li> </ul>	CW. Ch. 14