



# B.E. International Program

## Faculty of Economics, Thammasat University



### Course Outline

#### EE 320 Introductory Mathematical Economics

Semester 2/2013 (January 13 – May 3, 2014)

**Number of credits:** 3 credits

**Lecture time:** Tuesday & Thursday, 9:30 – 11:00 hrs. (Section 046401)  
Tuesday & Thursday, 11:00 - 12:30 hrs. (Section 046401)

**Lecture venue:** Room 203, Faculty of Economics (Section 046401 & Section 046402)

**Instructor:** Dr. Phatta Kirdruang  
Room 428, Faculty of Economics  
E-mail: phatta@econ.tu.ac.th  
Office hours: Tuesday & Thursday 13:30 – 15:00 hrs,  
and by appointment

#### Course description:

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.

**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 objectives:

1. To equip students with essential mathematical concepts and tools in studying economics
2. To expose students to the application of mathematical concepts in analysing economic problems.

**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.

**Course Outline:**

Date	Topics	
14 January 2014 (1 lecture)	<b>1. Introduction</b> - Importance and needs to use mathematics in economics. - The nature of theory, economic model and mathematics.	CW. Ch. 1
16 January 2014 (1 lecture)	<b>2. Mathematics and Economic Relations</b> - Relations and functions - Types of functions	CW. Ch.2
21, 23, 28 January 2014 (3 lectures)	<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

<p>30 January, 4 and 6 February 2014 (3 lectures)</p>	<p><b>4. Linear Model, Basic Matrix Algebra and Applications</b></p> <ul style="list-style-type: none"> <li>- Terminology (Type of matrix)</li> <li>- Matrix operations (Add, Subtract, multiply)</li> <li>- Representation of system of equation by matrix notation</li> <li>- Matrix inversion by determinants</li> <li>- Determinant and singularity of matrix</li> <li>- Cramer's rule</li> <li>- Matrix applications in <ul style="list-style-type: none"> <li>- Partial market equilibrium</li> <li>- Excise tax and market equilibrium</li> <li>- Simple macroeconomic model</li> </ul> </li> <li>- IS-LM model</li> </ul>	<p>CW. Ch. 4, 5</p>
<p>11, 13, 18 February 2014 (3 lectures)</p>	<p><b>5. Nonlinear Model and Differential Calculus in Economic Theory</b></p> <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>- 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> </ul> </li> <li>- Elasticity, total revenue and marginal revenue</li> </ul>	<p>CW. Ch. 6, 7, 8</p>
<p>20, 25, 27 February 2014 (3 lectures)</p>	<p><b>6. Optimization without Constraints : One Independent Variable Case</b></p> <ul style="list-style-type: none"> <li>- Maxima, minima and inflection point</li> <li>- Convexity and concavity</li> <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>	<p>CW. Ch. 9</p>
<p>4 March 2014</p>	<p><b>MIDTERM</b></p>	

<p>11, 13, 18, 20, 25 March 2014 (5 lectures)</p>	<p><b>7. Derivatives of More-Than-One Independent Variable Function</b></p> <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>	<p>CW. Ch. 7, 8</p>
<p>27 March, 1, 3, 8 April 2014 (4 lectures)</p>	<p><b>8. Optimization without Constraint : More-Than-One Independent Variable Cases</b></p> <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>	<p>CW. Ch. 11</p>
<p>10, 17, 22, 24 April 2014 (4 lectures)</p>	<p><b>9. Optimization under Equality Constraint</b></p> <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>	<p>CW. Ch. 12</p>
<p>29 April and 1 May 2014 (2 lectures)</p>	<p><b>10. Integration and Its Application</b></p> <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>	<p>CW. Ch. 14</p>

Note: The class schedule shown above may be adjusted during the semester as needed.

**Assessment:**

- |                        |             |
|------------------------|-------------|
| 1. Quizzes             | 20 %        |
| 2. <b>Midterm Exam</b> | <b>30 %</b> |
| 3. <b>Final Exam</b>   | <b>50 %</b> |

**Note:** Practice problems for each topic will be posted on the class website. Students are encouraged to practice these exercises by themselves regularly.

**Important Dates:**

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|------------------------------------|--|
| ◆ Classes begins                   | January 13, 2014                         |
| ◆ Period of withdrawal without “W” | January 13-27, 2014                      |
| ◆ <b>Mid-Term Examination</b>      | <b>March 4, 2014 (11.00 – 12:30 hrs)</b> |
| ◆ Period of withdrawal with “W”    | March 19-24, 2014                        |
| ◆ <b>Final Examination</b>         | <b>May 17, 2014 (9.00 – 12.00 hrs)</b>   |

*Last updated – December 26, 2013.*