



# B.E. International Program

## Faculty of Economics, Thammasat University



### Course Outline

#### EE 320 Introductory Mathematical Economics

Semester 2/2015 (January 18 – May 14, 2016)

**Number of credits:** 3 credits

**Lecture time:** Tuesday & Thursday, 11:00 - 12:30 hrs. (Section 046402)

**Lecture venue:** Room 303, Faculty of Economics (Section 046402)

**Instructor:** Kittichai Saelee

Room 516, Faculty of Economics

E-mail: *kittichai\_lee[at]econ.tu.ac.th*

Office hours: Tuesday & Thursday 14:00 – 15:00 hrs,  
and by appointment

**Teaching assistant:** Sahaphon (kay) Vairungroj

#### 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)**
- Instructor's lecture note

**Other Recommended Books:**

- Sydsaeter, K. and P. Hammond. (2006). *Essential Mathematics for Economic Analysis*, 2<sup>nd</sup> edition, Prentice Hall.
- Holden, K. and Pearson, A.W. (1992). *Introductory Mathematics for Economics and Business* Second edition, The Macmillan Press Ltd.

**Course Outline:**

| Date  | Topics   |                 |
|---|--|-----------------|
| 19 January 2016<br>(1 lecture)                      | <b>1. Introduction</b><br>- Importance and needs to use mathematics in economics.<br>- The nature of theory, economic model and mathematics.   | CW. Ch. 1       |
| 21 January 2016<br>(1 lecture)                      | <b>2. Mathematics and Economic Relations</b><br>- Relations and functions<br>- Types of functions  | CW. Ch.2        |
| 26, 28 January &<br>2 February 2016<br>(3 lectures) | <b>3. Static and Comparative Static Equilibrium Analysis</b><br>- Linear models in economics<br>- Simultaneous system of equations<br>- Linear equation and graph<br>- Breakeven analysis<br>- Individual and market demand<br>- Individual and market supply<br>- Partial market equilibrium<br>- Excise tax and market equilibrium<br>- Elasticity concept<br>- Simple macroeconomic model<br>- IS-LM model<br>- Policy multiplier                                   | CW. Ch. 3       |
| 4, 9, & 11<br>February 2016 (3<br>lectures)         | <b>4. Linear Model, Basic Matrix Algebra and Applications</b><br>- Terminology (Type of matrix)<br>- Matrix operations (add, subtract, multiply)<br>- Representation of system of equation by matrix notation<br>- Matrix inversion by determinants<br>- Determinant and singularity of matrix<br>- Cramer's rule<br>- Matrix applications in:<br>- Partial market equilibrium<br>- Excise tax and market equilibrium<br>- Simple macroeconomic model<br>- IS-LM model | CW.<br>Ch. 4, 5 |

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|---|---|----------------------------|
| <p>16, 18, &amp; 23<br/>February 2016 (3<br/>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,<br/>7, 8</p> |
| <p>25 February &amp; 1,<br/>3 March 2016 (3<br/>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>8 March 2016</p>   | <p><b>MIDTERM (11 am – 12 pm)</b></p>   |                            |
| <p>15, 17, 22, 24, &amp;<br/>29 March 2016 (5<br/>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 macroeconomic models</li> <li>- Utility function</li> <li>- Production function</li> <li>- Etc.</li> </ul> </li> </ul> | <p>CW.<br/>Ch. 7, 8</p>    |

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|---|--|-----------------------|
| <p>31 March, 5, 7, &amp;<br/>19 April 2016<br/>(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.<br/>Ch. 11</p> |
| <p>21, 26, 28, April<br/>2016 &amp; 2 May<br/>2016<br/>(4 lectures)</p> | <p><b>9. Optimization under Equality Constraint</b></p> <ul style="list-style-type: none"> <li>- Substitution method</li> <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.<br/>Ch. 12</p> |
| <p>3, 5, 10 &amp; 12 May,<br/>2016<br/>(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.<br/>Ch. 14</p> |

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

**Assessments:**

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|--|------|
| 1. Quizzes   | 10 % |
| - 6 times/ dropping out the lowest one.                              |      |
| 2. Homework (6 times/ no dropping rule applied here.)                | 10 % |
| - 6 times/ no dropping rule applied here.                            |      |
| - Grading will be based on a couple of questions, randomly selected. |      |
| 3. Midterm Exam  | 30 % |
| 4. Final Exam  | 50 % |

**Rules/Logistic information:**

- Class starts at 11:10 am and finishes at 12.30 pm. (You have ten minutes for walking the room that you have attended before my class.)
- I don't check for your class attendances; however, you are encouraged to attend my lecture on regular basis.
- **No cellphone and No talk during the class.** Any violation will result in a pop-up quiz.
- Lecture materials will be posted on BE Moodle. Check your email regularly. (The one that you used when you signed up the Moodle account for the first time.)
- *Practice* problem sets will be assigned *almost* weekly. This is different from the problem sets in your assignment. You only need to turn in the assignment problem sets, but the practice problem sets. Solution guide to the practice problem sets will be posted when the file is uploaded- though no details given. Your TA will be responsible for going over some of the practice problem sets in details during his discussion section.
- My TA will be running his discussion section every Thursday between 5 pm and 6 pm, in room 303. I am sorry, but this is the only that fits with everyone's schedule. You are encouraged to attend. In some weeks, you have to do quiz.

**Important Dates:**

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|------------------------------------|--|
| ◆ Classes begins                   | January 18, 2016                         |
| ◆ Period of withdrawal without "W" | January 17-31, 2016                      |
| ◆ <b>Mid-Term Examination</b>      | <b>March 8, 2016 (11.00 – 13:00 hrs)</b> |
| ◆ Period of withdrawal with "W"    | March 23-28, 2016                        |
| ◆ <b>Final Examination</b>         | <b>May 30th, 2016 (9.00 – 12.00 hrs)</b> |