

## Course Outline

### EE 320 Introductory Mathematical Economics (046401)

Semester 1/2020 (August 10 – November 28, 2020)

**Number of credits:** 3 credits

**Lecture time:** Tuesday & Thursday, 11:00 - 12:30 hrs.

**Lecture venue:** Room 302, Faculty of Economics

**Instructor:** Asst. Prof. Dr. Kitichai saelee  
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Office hours: by appointment (please email)

#### 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 topics covered analyses of elasticities, market equilibrium, impacts of taxation and input-output models.

**Prerequisites:** a) EE 211, EE 212 and MA 216 (or MA211)  
or b) EE 213, EE 214 and MA216 (or MA 211)

#### 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 analyzing 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)

Saelee, Kittichai (2019) *Lecture on introductory mathematical economics*

(KS)

**Expected Learning Outcomes:**

**1. Morality and Ethics**

Applicability	Learning Goals
●	1.1 Students demonstrate integrity.
○	1.2 Students prioritize social and public benefits over personal ones.
●	1.3 Students are punctual and comply with the code of conduct of the institution and society at large.
○	1.4 Students are responsible and accountable to society, the nation, and the subject of economics.
○	1.5 Students realize the cultural and environmental value of the sustainable society.

**2. Knowledge**

Applicability	Learning Goals
●	2.1 Students know and understand modern economics principles and theories, and are up to date with new developments.
●	2.2 Students know and understand Thai and global economic structure, and the importance of major international economic events.
●	2.3 Students know and understand instruments of economic analysis.
●	2.4 Students know and understand applied fields in economics, including monetary, public, international, business, natural resource and environmental, industrial, agricultural, cooperative, political, developmental, and entrepreneurial economics as well as agribusiness.
○	2.5 Students are informed about related fields including sociology, business administration, education, law policy, and science.

### 3. Intellectual Development

Applicability	Learning Goals
●	3.1 Students have developed individual critical thinking.
●	3.2 Students are sufficiently trained in research skills.
●	3.3 Students demonstrate an ability to analyze and synthesize data, as well as appropriately integrate economics concepts to understand causes of current economic problems in Thailand. Based on analysis and synthesis, students demonstrate an ability to propose policy guidelines to resolve problems.

### 4. Interpersonal Skills and Responsibilities

Applicability	Learning Goals
●	4.1 Students are responsible for assigned tasks and work in groups effectively.
●	4.2 Students have problem-solving skills.
○	4.3 Students show leadership skills and team spirit.
●	4.4 Students are always improving themselves.
○	4.5 Students have good interpersonal skills, adapting and working under different conditions.

### 5. Quantitative Analysis, Communication and Information Technology

Applicability	Learning Goals
●	5.1 Students select and apply appropriate statistical and mathematical methods for data processing, interpretation, conclusions, and recommendations to resolve problems.
○	5.2 Students communicate effectively and select appropriate presentation methods.
●	5.3 Students use information and communication technologies appropriately to gather data as well as process, interpret, and present results.

## Course Outline:

Topics	
<b>1. Introduction</b> <ul style="list-style-type: none"> <li>- Importance and needs to use mathematics in economics.</li> <li>- The nature of theory, economic model and mathematics.</li> </ul>	CW. Ch. 1
<b>2. Mathematics and Economic Relations</b> <ul style="list-style-type: none"> <li>- Relations and functions</li> <li>- Types of functions</li> </ul>	CW. Ch.2
<b>3. Static and Comparative Static Equilibrium Analysis</b> <ul style="list-style-type: none"> <li>- Linear models in economics</li> <li>- Simultaneous system of equations</li> <li>- Linear equation and graph</li> <li>- Breakeven analysis</li> <li>- Individual and market demand</li> <li>- Individual and market supply</li> <li>- Partial market equilibrium</li> <li>- Excise tax and market equilibrium</li> <li>- Elasticity concept</li> <li>- Simple macroeconomic model</li> <li>- IS-LM model</li> </ul>	CW. Ch. 3
<b>4. Linear Model, Basic Matrix Algebra and Applications</b> <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> <li>- IS-LM model</li> </ul> </li> </ul>	CW. Ch. 4, 5
<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>- 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>	CW. Ch. 6, 7, 8

<b>Topics</b>	
<b>6. Optimization without Constraints: One Independent Variable Case</b> <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>	CW. Ch. 9
<b>MIDTERM (Tuesday, September 29, 2020, 12.00 - 14.00 hrs.)</b>	
<b>7. 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 macroeconomic models</li> <li>- Utility function</li> <li>- Production function</li> <li>- Etc.</li> </ul> </li> </ul>	CW. Ch. 7, 8
<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
<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

Topics	
<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
<b>Final Examination (Monday, December 14, 2020, 13.30 – 16.30 hrs.)</b>	


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

### Assessments:

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|----------------------|---------------------------------------|
| 1. Quizzes           | 15 % (6 quizzes, drop the lowest one) |
| 2. Group assignments | 10 % (maximum 4 persons)              |
| 3. Midterm Exam      | 30 %                                  |
| 4. Final Exam        | 45 %                                  |

### Remarks:

- ◆ No class on Oct, 13<sup>th</sup>; make-up session will be announced later.
- ◆ Mid-Term Examination (Tuesday, September 29, 2020, 12.00 - 14.00 hrs.)
- ◆ Final Examination (Monday, December 14, 2020, 13.30 – 16.30 hrs.)

 <b>ACADEMIC CALENDAR 2020</b> <b>SEMESTER 1/2020</b>	
Event	Semester 1 (August - December 2020)
Pre-Registration period (BE Portal)	July 13 - 15, 2020
Course Registration (Reg TU)	July 28 - 31, 2020
Payment	July 28 - August 3, 2020
Classes Begin	August 10, 2020
<i>H.M. Queen Sirikit The Queen Mother's Birthday*</i>	<i>August 12, 2020</i>
Adding and Dropping Courses W/O Record	August 10 - 23, 2020
Payment	August 10 - 24, 2020
Mid-term Examination Period	September 28 - October 3, 2020
Course Withdrawal With "W"	October 12 - November 15, 2020
<i>H.M. King Bhumibol Adulyadej The Great Memorial Day *</i>	<i>October 13, 2020</i>
<i>King Chulalongkorn's Day*</i>	<i>October 23, 2020</i>
Last Day of Classes	November 28, 2020
Final Examination Period	November 30 - December 16, 2020
<i>H.M. King Bhumibol Adulyadej The Great's Birthday*</i>	<i>December 5, 2020</i>
<i>Substitution for H.M. King Bhumibol Adulyadej The Great's Birthday*</i>	<i>December 7, 2020</i>
<i>Constitution Day*</i>	<i>December 10, 2020</i>

*\* Public Holiday, No Classes during this period*