BACHELOR OF ECONOMICS
THAMMASAT UNIVERSITY

Course Outline

EE 320 Introductory Mathematical Economics (046401)

Semester 2/2021 (January 10 – December 16, 2019)

Number of credits: 3 credits

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

Lecture venue: Room xxx, Faculty of Economics

Instructor: Asst. Prof. Dr. Kitichai Saelee
Office: Room 516, 5th Floor, Faculty of Economics
Email: kittichai_lee@econ.tu.ac.th
Office hours: by appointment (please email)

Learning platform:
BE moodle

Online meeting
Link: https://us02web.zoom.us/j/88481892967?pwd=NWR3WDhBRTNHTWVVS29OZWhvZE5udz09
Meeting ID: 884 8189 2967
Passcode: EE320Kitti

Official Line Group (for online exam submission, in case of)

https://page.line.me/161ukazb

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: 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*, 4th edition, McGraw-Hill, Inc., Singapore. (**CW**)

Saelee, Kittichai (2021) *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 sustenainable 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 analsyis 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	Chapter	Activities
1. Introduction (1 lecture) - Importance and needs to use mathematics in economics. - The nature of theory, economic model and mathematics.	CW. Ch. 1 KS Ch.1	Individual placement test
2. Mathematics and Economic Relations (2 lectures) - Relations and functions - Types of functions; linear and non-linear function	CW. Ch.2 KS. Ch.2	
3. Static and Comparative Static Equilibrium Analysis (4 lectures) - 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 KS. Ch. 3	Group assignment 1

4. Linear Model, Basic Matrix Algebra and Applications (3 lecture)
- 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
	KS Ch. 4
		Group assignment 2

Topics	Chapter	Activities
5. Nonlinear Model and Differential Calculus in Economic Theory (1 lectures) - Quadratic theory - Other nonlinear functions - Slope and derivatives of a function - Rule of differentiation - Non differentiable functions - Examples in Economics - Derivative and marginality - Relations among the total, the average and the marginal functions - Elasticity, total revenue and marginal revenue	CW. Ch. 6, 7, 8 KS. Ch.5	Group assignment 3
6. Optimization without Constraints: One Independent Variable Case (3 lectures) - Maxima, minima and inflection point - Convexity and concavity - Maximize profits - Competitive market case - Monopoly case - Effects of taxes - Lump-sum tax - Profit tax - Excise tax - Maximization of tax revenue	CW. Ch. 9 KS. Ch.5	Group assignment 4
Midterm Examination (Tuesday, March 1, 2021, 12.00 - 14.00 hrs.)		
7. Derivatives of More-Than-One Independent Variable Function (3 lectures) - First-order partial derivatives - Second-order partial derivatives - Differential - Total differential - Total derivatives - Implicit function and its derivative - Examples in economics - Partial market equilibrium - Multipliers in macroeconomic models - Utility function - Production function - Etc.	CW. Ch. 7, 8 KS. Ch.6	Group assignment 5

Topics	Chapter	Activities
8. Optimization without Constraint: More-Than-One Independent Variable Cases (4 lectures) - Conditions for maximum or minimum - Third degree price discrimination - Multiplant-firm - Multiproduct-firm	CW. Ch. 11 KS. Ch.7	Group assignment 6
9. Optimization under Equality Constraint (6 lectures) - Lagrange multiplier - Conditions for optimization - Maximize output level subject to cost constraint - Minimize cost subject to output constraint - Minimize utility subject to fixed budget	CW. Ch. 12 KS. Ch.7	Group assignment 7
10. Integration and Its Application (3 lectures) - Terminology in Integration - Rules of Integration - Definite Integration - Applications: - Total revenue function from marginal revenue function - Total cost function from marginal cost function - Profit function from MR-MC - Utility function from marginal utility function - Consumption and saving functions from marginal propensity functions - Capital formation and investment functions - Consumer surplus, producer surplus and total surplus - First degree price discrimination - Differential equation (if time allows)	CW. Ch. 14 KS. Ch.8	Group assignment 8
Final Examination (Thursday, May 12, 2021, 13.30 – 16.30 hrs.)		

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

Assessments:

1. Group Homework 15 % (maximum 4 persons)*
2. Midterm Exam 35 %
3. Final Exam 50 %

Note:

1. Practice problems for each topic will be posted on the class website. Students are encouraged to practice these exercises by themselves regularly.
2. Group assignment is due one week after the assigned date. (Your assignment will be graded by TA. Two questions will be randomly selected for the grading.)

Remarks:

- Midterm Examination (Tuesday, March 1, 2021, 12.00 - 14.00 hrs.)
- Final Examination (Thursday, May 12, 2021, 13.30 – 16.30 hrs.)