Course Outline

EE320 Introductory Mathematical Economics (Section 046401)

Semester 1/2023 (August 15 - December 4, 2023)

Lecture Time: Tuesday, 09.00-12.00 hours

Lecture Venue: Room 304, Faculty of Economics

Instructor: **Asst. Prof. Dr. Anin Aroonruengsawat**

Office Hours: by appointment

Email: anin@econ.tu.ac.th

Number of Credit: 3 Credits (3-0-6)

Prerequisite: a) EE211, EE212 and MA216 (or MA211) or

b) EE213, EE214 and MA 216 (or MA 211)

(Credits will not be awarded to students who are taking or have completed EE421)

Course Description:

Applying mathematical concepts and tools such as functions, equations, matrices, univariate and multivariate differential calculus, constrained and unconstrained optimization, and basic integral to understand the relationship between different economic variables and explain concepts of Microeconomic theory and Macroeconomic theory. An emphasis will be placed on relationships between total, average, and marginal functions, the analyses of elasticity, market equilibrium, impacts of taxation, and the basic input-output model.

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.

Expected Learning Outcomes:

1. Morality and Ethics

Applicability	Learning Goals
●	1.1 Students demonstrate integrity.
O	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.
O	1.4 Students are responsible and accountable to society, the nation, and the subject of economics.
O	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.
O	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.
O	4.3 Students show leadership skills and team spirit.
●	4.4 Students are always improving themselves.
O	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.
O	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.

Remark: ● Primary expected outcome O Secondary expected

Main Text:

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

Grading Criteria:

Norm-referenced systems grading with the following assessment.

1. Assignment/Quiz 15%
2. Midterm Exam 35%
3. Final Exam 50%

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

Course Outline and Tentative Schedule:

Topics	
1. Introduction - Importance and needs to use mathematics in economics. - The nature of theory, economic model and mathematics.	CW. Ch. 1
2. Mathematics and Economic Relations - Relations and functions - Types of functions	CW. Ch. 2

Topics	
3. Static and Comparative Static Equilibrium Analysis - 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. Linear Model, Basic Matrix Algebra and Applications - 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
5. Nonlinear Model and Differential Calculus in Economic Theory - 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
6. Optimization without Constraints: One Independent Variable Case - 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
MIDTERM (Tuesday, October 3, 2023, 12.00-14.00 hrs.)	

Topics	
7. Derivatives of More-Than-One Independent Variable Function - 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	CW. Ch. 7, 8
8. Optimization without Constraint: More-Than-One Independent Variable Cases - Conditions for maximum or minimum - Third degree price discrimination - Multiplant-firm - Multiproduct-firm	CW. Ch. 11
9. Optimization under Equality Constraint - 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
10. Integration and Its Application - 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	CW. Ch. 14
FINAL (Tuesday, December 19, 2023, 13.30-16.30 hrs.)	

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

BACHELOR OF ECONOMICS
THAMMASAT UNIVERSITY

ACADEMIC CALENDAR & HOLIDAY
SEMESTER 1/2023

Semester 1/2023 (August 15 – December 4, 2023)	
the TU Office of the Registrar (TU REG) will process the registration (semester 1/2023) for all BE students who have completed the pre-registration via BE Portal.	July 17 – 20, 2023
Tuition Fee Payment Period (Via TU Greats App)	July 21 – August 11, 2023
Create Plan from Quota via TU Greats App (*ID.66)	August 1 - 9, 2023
Registration via TU Greats App (*ID.66)	August 10, 2023
Classes Begin	August 15, 2023
Add-drop period	August 15 – 28, 2023 *(from 9.00 AM of August 15 to 10.30 PM of August 28)*
Tuition Fee Payment Period (Via TU Greats App)	August 15 – 29, 2023 *(9 AM - 10.30 PM)*
Mid-term Examination Period	October 1 – 7, 2023
*H.M. King Bhumibol Adulyadej The Great Memorial Day**	*October 13, 2023*
*King Chulalongkorn's Day**	*October 23, 2023*
Withdrawal period with "W" on record	September 4 – October 22, 2023 *(from 9.00 AM of September 4 to 10.30 PM of October 22)*
Special Withdrawal with "w" on record	October 24 – November 20, 2023
Last day of class for Semester 1/2023	December 4, 2023
Final exam period	December 12 – 23, 2023
*H.M. King Bhumibol Adulyadej The Great's Birthday**	*December 5, 2023*
*Constitution Day**	*December 10, 2023*
*Substitution for Constitution Day**	*December 11, 2023*
Submitting Forms for Degree Conferral	August 15 – 28, 2023

Remark * Holiday, No classes during this period
Updated: July 24, 2023