

Course Title	: Tools for Economic Analysis
Course Code	: ECO3104
Recommended Study Year	: 2 and 3
No. of Credits/Term	: 3
Mode of Tuition	: Sectional Approach
Class Contact Hours	: 3 hours per week
Category in Major Prog.	: Major in Economics (Required Course)
Discipline	: Economics
Prerequisite(s)	: N/A
Co-requisite(s)	: N/A
Exclusion(s)	: N/A
Exemption Requirement(s)	: N/A

Brief Course Description

The course provides a solid foundation in mathematics for students in economics. Mathematics is a useful tool in economics that can assist the analysis of complicated phenomena. The course will help students better understand complicated economic theories.

Aims

The course aims to:

1. provide students with the basic mathematical techniques used in economics;
2. demonstrate to students how mathematical methods and probability concepts and theory may be used in empirical and theoretical studies;
3. train students in the application of mathematical techniques to economic analysis.

Learning Outcomes (LOs)

Upon completion of this course, successful students should be able to:

1. recall and explain the basic concepts of mathematics in economics;
2. manipulate functions and algebra in basic economic models; apply probability theory and calculus techniques in economics; and
3. apply appropriate quantitative methods to analyse economic problems.

Indicative Contents

- I. Review of basic algebra
 - a. Real numbers

- b. Operations
 - c. Factoring
 - d. Absolute value
 - e. Mathematical notations
- II. Linear functions
- a. Functions and graphs
 - b. Systems of linear equations
 - c. Applications and linear functions
- III. Nonlinear functions
- a. Quadratic functions
 - b. Exponential functions
 - c. Logarithmic functions
- IV. Introduction to probability
- a. Basic counting principle
 - b. Conditional probability
 - c. Independent events
 - d. Bayes's formula
 - e. Discrete random variables
 - f. Binomial distribution
- V. Basic calculus: Differentiation
- a. The meaning of derivative as slope of a function
 - b. The derivative
 - c. Rules of differentiation
 - d. Partial derivatives
- VI. Basic calculus: Integration
- a. Integration formulas
 - b. Area under a curve
 - c. Consumers' and producers' surplus

Teaching Method

Lectures will be combined with assignments and discussions. Examples and actual economic data will be used to illustrate the application of different mathematical models. Students are expected to participate in class discussions to enhance their understanding of the topics covered.

Measurement of Learning Outcomes

1. A mid-term test will assess students' understanding of mathematics as commonly used in economics. (LO 1)
2. Performance in tutorials discussions will be assessed to ensure that students keep up with the course contents and receive timely feedback on their understanding of the course materials, and on their interpretation of economic data. (LOs 1-3)
3. Assignments will be given to students to monitor their progress in mathematic computation and conduct quantitative analyses in economics. (LOs 1-2)
4. A final examination will be designed to evaluate students' comprehension and overall understanding of the mathematic concepts as well as their ability to apply quantitative methods to analyse economic problems. (LOs 1-3)

Assessment

Continuous assessment : 40%

Final examination : 60%

Required/Essential Reading

Haeussler, E., and Richard, P., *Introductory Mathematical Analysis for Business, Economics and the Life and Social Sciences*, 12th Edition, Harlow: Pearson Prentice Hall, 2007.

Recommended/Supplementary Readings

Dadkhah, Kamran, *Foundations of Mathematical and Computational Economics*, Florence: Thomson South-Western, 2007.

Sydsaeter, Knut, Peter Hammond, *Essential Mathematics for Economic Analysis*, 3rd Edition, Harlow: Financial Times/ Prentice Hall, 2008.

Simon, Carl P., and Lawrence E. Blume, *Mathematics for Economists*, New York: W. W. Norton and Company, 1994.

Important Notes:

- (1) Students are expected to spend a total of 9 hours (i.e. 3 hours of class contact and 6 hours of personal study) per week to achieve the course learning outcomes.
- (2) Students shall be aware of the University regulations about dishonest practice in course work, tests and examinations, and the possible consequences as stipulated in the Regulations Governing University Examinations. In particular, plagiarism, being a kind of dishonest practice, is "the presentation of another person's work without proper acknowledgement of the source, including exact phrases, or summarised ideas, or even footnotes/citations, whether protected by copyright or not, as the student's own work". Students are required to strictly follow university regulations governing academic integrity

- (3) and honesty.
- (4) Students are required to submit writing assignment(s) using Turnitin.
- (5) To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on <https://pla.ln.edu.hk/>.
- (6) Students must adhere to the University's guidelines and practices when using Generative Artificial Intelligence (AI) tools. The official documents "Guidelines for Using GAI Tools at Lingnan University" and "Best Practices for Ethical and Responsible Use of GAI Tools in Course Assessments" can be found here: <https://www.ln.edu.hk/tlc/generative-artificial-intelligence/gai-guidelines-best-practices>.

Assessment Rubrics for Assignments and Participation (20%)

Learning Outcome	Excellent A, A-	Good B+ to B-	Fair C+ to C-	Pass D+ to D-	Failure F
1. Explain the basic concepts of mathematics in economics (5%)	Accurate grasp of the concept	Good grasp of the concept	Medium grasp of the concept	Basic grasp of the concept	Little grasp of the concept
2. Manipulate functions and algebra in basic economic models; (5%)	Thorough understanding of manipulating functions and algebra in basic economic models	Good understanding of manipulating functions and algebra in basic economic models	Medium understanding of manipulating functions and algebra in basic economic models	Basic understanding of manipulating functions and algebra in basic economic models	Little understanding of manipulating functions and algebra in basic economic models

3. Apply probability theory and calculus techniques in economics (5%)	Excellent mastery of applying probability theory and calculus techniques in economics	Good knowledge of applying probability theory and calculus techniques in economics	Medium knowledge of applying probability theory and calculus techniques in economics	Basic knowledge of applying probability theory and calculus techniques in economics	Little knowledge of applying probability theory and calculus techniques in economics
4. Apply appropriate quantitative methods to analyse economic problems (5%)	Excellent mastery of applying appropriate quantitative methods to analyse economic problems	Good knowledge of applying appropriate quantitative methods to analyse economic problems	Medium knowledge of applying appropriate quantitative methods to analyse economic problems	Basic knowledge of applying appropriate quantitative methods to analyse economic problems	Little knowledge of applying appropriate quantitative methods to analyse economic problems

Assessment Rubrics for Midterm (20%)

Learning Outcome	Excellent A, A-	Good B+ to B-	Fair C+ to C-	Pass D+ to D-	Failure F
1. Explain the basic concepts	Accurate grasp of the concept	Good grasp of the concept	Medium grasp of the concept	Basic grasp of the concept	Little grasp of the concept

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of mathematics in economics (5%)					
2. Manipulate functions and algebra in basic economic models; (5%)	Thorough understanding of manipulating functions and algebra in basic economic models	Good understanding of manipulating functions and algebra in basic economic models	Medium understanding of manipulating functions and algebra in basic economic models	Basic understanding of manipulating functions and algebra in basic economic models	Little understanding of manipulating functions and algebra in basic economic models
3. Apply probability theory and calculus techniques in economics (5%)	Excellent mastery of applying probability theory and calculus techniques in economics	Good knowledge of applying probability theory and calculus techniques in economics	Medium knowledge of applying probability theory and calculus techniques in economics	Basic knowledge of applying probability theory and calculus techniques in economics	Little knowledge of applying probability theory and calculus techniques in economics
4. Apply appropriate quantitative	Excellent mastery of applying	Good knowledge of applying	Medium knowledge of applying	Basic knowledge of applying	Little knowledge of applying

methods to analyse economic problems (5%)	appropriate quantitative methods to analyse economic problems	appropriate quantitative methods to analyse economic problems	appropriate quantitative methods to analyse economic problems	appropriate quantitative methods to analyse economic problems	appropriate quantitative methods to analyse economic problems
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Assessment Rubrics for Final Examination (60%)

Learning Outcome	Excellent A, A-	Good B+ to B-	Fair C+ to C-	Pass D+ to D-	Failure F
1. Explain the basic concepts of mathematics in economics (15%)	Accurate grasp of the concept	Good grasp of the concept	Medium grasp of the concept	Basic grasp of the concept	Little grasp of the concept
2. Manipulate functions and algebra in basic economic models; (15%)	Thorough understanding of manipulating functions and algebra in basic economic models	Good understanding of manipulating functions and algebra in basic economic models	Medium understanding of manipulating functions and algebra in basic economic models	Basic understanding of manipulating functions and algebra in basic economic models	Little understanding of manipulating functions and algebra in basic economic

					models
3. Apply probability theory and calculus techniques in economics (15%)	Excellent mastery of applying probability theory and calculus techniques in economics	Good knowledge of applying probability theory and calculus techniques in economics	Medium knowledge of applying probability theory and calculus techniques in economics	Basic knowledge of applying probability theory and calculus techniques in economics	Little knowledge of applying probability theory and calculus techniques in economics
4. Apply appropriate quantitative methods to analyse economic problems (15%)	Excellent mastery of applying appropriate quantitative methods to analyse economic problems	Good knowledge of applying appropriate quantitative methods to analyse economic problems	Medium knowledge of applying appropriate quantitative methods to analyse economic problems	Basic knowledge of applying appropriate quantitative methods to analyse economic problems	Little knowledge of applying appropriate quantitative methods to analyse economic problems