Lingnan University
Department of Economics

Course Title	:	Tools for Economic Analysis
Course Code	:	ECO3104
Recommended Study Year	:	Second or Third Year
No. of Credits/Term	:	3
Mode of Tuition	:	Lecture-Tutorial
Class Contact Hours	:	3 hours per week
Category in Major Prog.	:	Major in Economics (Required Course)
Discipline	:	Economics
Prerequisite(s)	:	Nil
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 Content

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 and tutorials 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%
		(class participation, attendance and assignments 20%,
		mid-term test 20%)
Final examination	:	60%

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 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	Excellent mastery of applying probability	Good knowledge of applying probability	Medium knowledge of applying probability	Basic knowledge of applying probability	Little knowledge of applying probability

techniques in economics (5%)	theory and calculus techniques in economics	theory and calculus techniques in economics	theory and calculus techniques in economics	theory and calculus techniques in economics	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 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

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.

Warning:

According to Lingnan University and Social Science Programme policy, plagiarism is "presentation of another person's work without proper acknowledgment of the source." Plagiarism (unattributed copying) will be heavily penalized and may attract a zero mark and disciplinary action. With regard to your coursework in particular, you are reminded that you must note the sources of quotations, data, and general information in the essay. These sources and references should appear in alphabetical order in your list of references or bibliography.

Important Notes:
(1) Students are expected to spend a total of 6 hours (i.e. 3 hours of class contact and 3 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".

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Students are required to strictly follow university regulations governing academic integrity and honesty.

(3) Students are required to submit writing assignment(s) using Turnitin.

(4) To enhance students' understanding of plagiarism, a mini-course "Online Tutorial on Plagiarism Awareness" is available on https://pla.ln.edu.hk/.

(5) Students are required to fill in a mid-term survey and the end of course CTLE survey.