



ECON 111B
Mathematical Methods in Economics II
2nd Term, 2024-2025

Lecture Hours and Location:

Wed 2:30pm - 4:15pm (YIA LT5)

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Course Objective:

The purpose of this course is to introduce the relevant mathematical tools and help students develop skills for formulating and applying mathematical models in analyzing economic problems.

Course Description:

This course is the second part of a 2 term course in which we will introduce basic mathematical tools that are indispensable in modern economics. Topics include integration, partial differentiation, implicit function method, optimization for multiple variable functions, and Lagrangian method. Economic applications are also covered, including equilibrium analysis, comparative statics, profit maximization, consumer demand, and dynamic analysis. Students should have knowledge of elementary calculus, and are advised to take ECON1101 before taking this course. Related economic applications will also be discussed.

Recommended Textbooks:

Stewart J., 2021, *Calculus*, 9th edition, Cengage Learning

Chiang, Alpha C. and Kevin Wainwright, 2005, *Fundamental Methods of Mathematical Economics*, 4th edition, McGraw-Hill. [CW]

Supplementary Reference:

Sydaeter K., and P. Hammond, 2021, *Essential Mathematics for Economic Analysis*, 6th edition, Pearson. [SH]

Course Assessment Scheme:

Class participation	10%
Mid-term	30%
Final	60%

Course Activities:

• ***Tutorials and Problem Sets***

Weekly problem sets will be posted on the class Blackboard as we go along. Problem sets will **NOT** count towards your grade. However, it is an essential adjunct to the lecture material, and will assist you in preparing for the exams. Therefore, it is very important that you work on your own before tutorial class. Tutorials will start on the third week of class. It will go through some of the challenging problem set questions.

• ***Mid-term (12th Mar 2025; 6:30pm-8:15pm YIA LT1 (tentative))***

Please note carefully the date, time and venue of the mid-term; there will be **no makeup exam** for the mid-term. This is **not negotiable**. If you miss the mid-term, due to a documented illness or emergency, and have **received my approval prior to the mid-term exam**, your final exam score will receive the weight of the mid-term in addition to its own weight.

• ***Final (time and date will be announced later)***

Final will be arranged by the University, please observe the date and venue. The University has very strict regulations on how the final exam works. So please make sure you can make it.

Course Content and Tentative Schedule:

<u>Week</u>	<u>Topic</u>	<u>Contents</u>	<u>Readings</u>
1-2	Integral Calculus	Indefinite Integral, Integration Rules, Definite Integral, Improper Integral, Applications	[CW] Ch. 14.
4-5	Differentiation (Multiple Variable Function)	Partial Differentiation, Differential, Total Differentiation, Implicit Function Method, Simultaneous-Equation, Comparative-Static Analysis, Applications	[CW] Ch. 7 and 8.
7, 10	Unconstrained Optimization (Multiple-Variable Case)	First-Order Condition, Hessian Matrix and Second-Order Condition, Concave and Convex Functions, Global Extremum, Convex Set, Applications	[CW] Ch. 11.
11-13	Optimization with Equality Constraints	Lagrangian Method, Interpretation of Lagrangian Multiplier, First-Order Conditions, Bordered Hessian and Second-Order Conditions, Quasiconcave and Quasiconvex Functions, Utility Maximization and Consumer Demand, Cost Minimization, Homogenous Functions, Euler Theorem, Applications	[CW] Ch. 12
14-15	Optimization with Inequality Constraints	Constrained Optimization with Inequality Constraints, Kuhn-Tucker Conditions (depending on time)	[CW] Ch. 13.

Grade Descriptors:

<u>Grade</u>	<u>Descriptions</u>
A / A-	Outstanding/Generally outstanding performance on all learning outcomes.
B+ / B / B-	Substantial performance on all learning outcomes, OR high performance on some learning outcomes which compensates for less satisfactory performance on others, resulting in overall substantial performance.
C+ / C / C-	Satisfactory performance on the majority of learning outcomes, possibly with a few weaknesses
D+ / D	Barely satisfactory performance on a number of learning outcomes
F	Unsatisfactory performance on a number of learning outcomes, OR failure to meet specified assessment requirements.

Note: • Course notes and announcements will be posted on the class Blackboard. (<https://blackboard.cuhk.edu.hk/ultra/stream>) Please check frequently.

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details may be found at http://www.cuhk.edu.hk/policy/academic_honesty/.

With each assignment, students will be required to submit a signed [declaration](#) that they are aware of these policies, regulations, guidelines and procedures. For group projects, all students of the same group should be asked to sign on the declaration.

For assignments in the form of a computer-generated document that is principally text-based and submitted via VeriGuide, the statement, in the form of a receipt, will be issued by the system upon students' uploading of the soft copy of the assignment. Assignments without the receipt will not be graded by teachers. Only the final version of the assignment should be submitted via VeriGuide.