

ECON 5100 Mathematics for Business and Economics

2026–27 Fall, Department of Economics, HKUST

BASIC INFORMATION

Time: Monday and Wednesday 12:00PM - 1:20PM

Classroom: Room 1007

Course Material: Lecture Notes and Problem Sets

Enrollment Requirement: None

Teaching and Learning Activities: Lectures and Tutorials

Course Credit: 3

INSTRUCTOR

Rui Tang
Office Hour

email: ruitang@ust.hk
LSK6082, Monday 14:45–15:45

COURSE DESCRIPTION

This course introduces mathematical concepts and analytical tools that are widely used in economics and business research. The goal is to provide first-year PhD students with the mathematical foundations needed for subsequent courses in microeconomics, macroeconomics, econometrics, and related fields.

The course begins with sets, functions, correspondences, and basic concepts from real analysis. It then studies metric spaces, topology, compactness, and fixed-point arguments. We introduce lattice theory and monotone fixed-point methods, followed by measure theory and differentiation. The course also covers convex analysis and optimization, linear algebra, and ordinary and partial differential equations.

COURSE OBJECTIVE AND INTENDED LEARNING OUTCOME

Students are expected to develop a rigorous understanding of the mathematical tools commonly used in graduate-level economics and business research. By the end of the course, students should be able to understand and construct mathematical arguments involving sets, functions, limits, continuity, compactness, and fixed points; use order and lattice methods to study monotone problems; work with basic concepts from measure theory and differentiation; apply convex analysis and optimization methods; use linear algebra in economic and econometric problems; and analyze basic differential equations. Students are also expected to learn how to identify the mathematical structure of an economic or business research problem and choose appropriate tools for its analysis.

EVALUATION AND EXAM SCHEDULE

Homework: 20%

Midterm: 40%, first half of the course

Final: 40%, second half of the course

Midterm Exam Schedule: Oct 21 (closed book)

Final Exam Schedule: TBA (closed book)

AI policy: AI adoption is encouraged

RECOMMENDED READINGS

Aliprantis, C. D. and K. C. Border, *Infinite Dimensional Analysis: A Hitchhiker's Guide*, Springer, 2006.

Lecture notes will be the main course material. The recommended readings provide additional background and references for selected topics. Students can also use AI tools to learn topics that are relevant with their research in more depth.

RUBRICS FOR FINAL GRADE

Excellent Performance (A range): Demonstrates a deep understanding of the mathematical concepts and methods covered in the course. Can construct rigorous mathematical arguments and apply the appropriate tools to economic and business problems.

Good Performance (B+, B): Shows a solid grasp of the mathematical concepts covered in the course. Demonstrates good ability to apply the methods learned in class to standard problems.

Marginal Performance (B-, C+, C): Has basic knowledge of the mathematical materials covered in the course. Can apply some of the methods to standard problems but has difficulty with more complicated arguments or applications.

Fail: Demonstrates insufficient understanding of the mathematical concepts and methods covered in the course and is unable to apply them to basic problems.

COURSE OUTLINE

1. Sets, Functions and Basic Mathematical Concepts
2. Metric Spaces and Topology
3. Lattice Theory
4. Measure Theory, Integration and Differentiation
5. Convex Analysis, Optimization, and Duality
6. Linear Algebra
7. Differential Equations