UNIVERSITY OF LONDON

Course information 2026-27

MT3095 Further Mathematics for Economists

General information

MODULE LEVEL: 6

CREDIT: 30

NOTIONAL STUDY TIME: 300 hours

MODE: Locally Taught and Independent Learner Route (not available for Online Taught students)

Summary

This course provides students with the mathematical techniques and methods which find application in economics and related areas, and enables students to understand why, and in what circumstances, these techniques work.

Conditions

Please refer to the relevant programme structure in the EMFSS Programme Regulations to check:

- where this course can be placed on your degree structure; and
- details of prerequisites and corequisites for this course.

You should also refer to the Exclusions list in the EMFSS Programme Regulations to check if any exclusions apply for this course.

Aims and objectives

The course is designed to:

- enable students to acquire skills in further methods of calculus and linear algebra, as required for their use in advanced economics-based subjects
- enable students to understand the underlying theory behind these techniques and those of more basic mathematics courses (such as 05a Mathematics 1 and 05b Mathematics 2)
- prepare students for advanced study in theoretical aspects of economics-based subjects

Learning outcomes

At the end of this course and having completed the essential reading and activities students should be able to:

- use the concepts, terminology, methods and conventions covered in the unit to solve mathematical problems in this subject.
- demonstrate an understanding of the underlying principles of the subject.
- solve unseen mathematical problems involving understanding of these concepts and application of these methods.
- prove statements and to formulate precise mathematical arguments.

Employability skills

Below are the three most relevant employability skills that students acquire by undertaking this course which can be conveyed to future prospective employers:

1. Complex problem solving
2. Decision making
3. Adaptability and resilience

Essential reading

For full details please refer to the reading list. Most topics in this subject are covered in great detail by many texts. For this reason we do not specify essential reading for this course. However, textbook reading is essential to provide more in-depth explanation and many examples to study and exercises to work through. Listed in order of usefulness, rather than alphabetically, the first three we recommend are:

Simon, C.P. and L. Blume Mathematics for Economists. (New York and London: W.W. Norton and Company)

Anton, Howard A. Elementary Linear Algebra. (Wiley Text Books)

Ostaszewski, A. Advanced Mathematical Methods. (Cambridge: Cambridge University Press)

Assessment

This course is assessed by a three-hour and fifteen-minute closed-book written examination.

Syllabus

Linear algebra: Vector spaces, linear independence and dependence, bases and dimension, rank and nullity of a matrix. Linear mappings, their rank and nullity, their matrix representation, and change of basis. Eigenvalues and eigenvectors. Diagonalisation of matrices, with applications to systems of difference and differential equations (including stability). Quadratic forms and orthogonal diagonalisation. Inner product spaces, norms, orthogonality and orthonormalisation.

Functions and mathematical analysis: Sets and functions. Supremum and infinum of bounded sets. Limits of sequences in R and R^n. Limits and continuity of functions.

Open subsets and closed subsets of $\mathbf{R}^n$

Compact subsets of R^n. Convex sets, convex and concave functions. Gradients and directional derivatives. The Jacobian derivative. The Edgeworth Box and contract curves.

Optimisation: Inconstrained optimisation and the second-order conditions. Constrained optimisation and the Kuhn-Tucker theorem. Envelope Theorems. Theory of linear programming (computational methods will not be included). Duality, with applications. Basic Game Theory.

Note: Candidates will be expected to work with formal definitions and be able to prove results as well as apply techniques and methods.