UNIVERSITY OF LONDON | INTERNATIONAL PROGRAMMES

Course information 2016–17
MT3095 Further mathematics for economists

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.

Prerequisite

If taken as part of a BSc degree, courses which must be passed before this course may be attempted:
MT1174 Calculus **or both**
MT105a Mathematics 1 **and** *05b Mathematics 2*

Exclusion

This course may not be taken with:
MT2116 Abstract mathematics
MT2176 Further calculus
MT2175 Further linear algebra

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.

Assessment

This course is assessed by a three-hour unseen written examination.

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.

Recommended 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)

Students should consult the appropriate *EMFSS Programme Regulations*, which are reviewed on an annual basis. The *Regulations* provide information on the availability of a course, where it can be placed on your programme's structure, and details of co-requisites and prerequisites.

Syllabus

This is a description of the material to be examined. On registration, students will receive a detailed subject guide which provides a framework for covering the topics in the syllabus and directions to the essential reading.

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^m. Limits and continuity of functions.
Open subsets and closed subsets of R^m. Compact subsets of R^m. Convex sets, convex and concave funstions. 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.