UNIVERSITY OF LONDON

Course information 2023-24

MT1186 Mathematical Methods

General information

COURSE LEVEL: 4

CREDIT: 30

NOTIONAL STUDY TIME: 300 hours

Summary

This unit develops a student's proficiency in working with mathematical methods, and it investigates some applications to problems in economics, management and related areas. The unit also develops the student's understanding of the theoretical concepts behind these methods.

Conditions

Prerequisite: A-level mathematics or equivalent

Exclusions: You may not register for this course in the same year as:

- MT105a Mathematics 1
- MT105b Mathematics 2
- MT1174 Calculus

Aims and objectives

The objectives specifically include:

- To enable students to acquire skills in the methods of calculus (including multivariate calculus) and linear algebra, as required for their use in further mathematics and economics-based subjects.
- To prepare students for further units in mathematics and/or related disciplines.

Learning outcomes

At the end of the 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
- solve unseen mathematical problems involving understanding of these concepts and application of these methods
- explain how mathematics can be used to solve problems in economics and related subjects
- demonstrate knowledge and understanding of the underlying mathematical principles.

Please consult the current EMFSS Programme Regulations for further information on the availability of a course, where it can be placed on your programme's structure, and other important details.

Essential reading

For full details, please refer to the reading list.

Binmore, K. and J. Davies *Calculus: Concepts and Methods*. (Cambridge: Cambridge University Press, 2011) second revised edition [ISBN 978-0521775410]

Anthony, M. and N. Biggs *Mathematics for Economics and Finance*. (Cambridge: Cambridge University Press, 1996) [ISBN 978-0521559133]

Assessment

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

Syllabus

This unit develops basic mathematical methods and will include their applications to problems in economics, management and related areas.

Basics: Functions (including exponential and trigonometric functions); graphs of functions; combinations of functions, inverse functions (Including logarithmic and inverse trigonometric functions); identities; supply and demand functions (including the effects of taxation).

Differentiation: The definition of the derivative; standard derivatives; the product, quotient and chain rules; tangent lines; using derivatives to find approximations; some applications of derivatives.

One-variable optimisation: First-order conditions for a stationary point; first and second-order tests for the nature of a stationary point; curve sketching; optimisation; some applications of optimisation.

Integration: Indefinite integrals; definite integrals and areas; standard integrals; integration by substitution (including trigonometric substitutions); integration by parts; using partial fractions and trigonometric identities to simplify integrands; some applications of integration.

Functions of several variables: Contours, sections and partial derivatives; the chain rule; homogeneous functions.

Multivariate optimisation: Unconstrained optimisation; constrained optimisation (including the method of Lagrange multipliers and the meaning of the Lagrange multiplier); some applications of unconstrained and constrained optimisation.

Matrices and linear equations: Vectors, matrices and their algebra; solving systems of linear equations using row operations; determinants and Cramer's rule; inverse matrices; eigenvalues, eigenvectors and diagonalisation of 2x2 matrices; some economic applications of matrices.

Differential equations: Separable and linear first-order differential equations; second-order differential equations with constant coefficients; systems of first-order differential equations (solved by reduction and diagonalisation); some applications of differential equations.

Difference equations: First-order difference equations; second-order difference equations with constant coefficients; systems of first-order difference equations (solved by reduction and diagonalisation); some applications of difference equations.