University College London
Department of Economics

ECON0010: MATHEMATICS FOR ECONOMICS

Assumed knowledge
A thorough knowledge of single-variable calculus.

Term 1 content

Aims
To provide students with the mathematics to take them from GCE A level standard to that required for the remainder of the economics degree.

Objectives
At the end of the first term of the course, students should:
(i) understand elementary matrix algebra in a form suitable for application to econometrics and optimisation;
(ii) understand calculus of several variables, including optimisation of functions of several variables, and be able to apply their knowledge to simple economic problems;
(iii) understand simple first-order differential and difference equations and be able to apply their knowledge to simple problems in economic dynamics.

Outline Syllabus
Vectors, linear dependence and independence. Matrix algebra. Systems of linear equations, Gaussian elimination, reduction to echelon form. Inverse of a matrix. Determinants. Quadratic forms.

Calculus of several variables: differentiation, constrained optimisation, applications to consumer theory and production theory. First-order differential and difference equations.

Recommended reading
Malcolm Pemberton and Nicholas Rau, Mathematics for Economists: An introductory textbook, Fifth Edition, Manchester University Press, 2023

Term 2 content

Aims
To consolidate the mathematics background needed for the rest of the degree programme at a level appropriate for economics specialists.

Objectives

At the end of the course, students should:

(i) understand constrained optimisation including interpretation of Lagrange multipliers, envelope theorems and inequality constraints and be able to apply their knowledge to economic models;

(ii) understand harder first-order and linear second-order differential and difference equations and be able to apply their knowledge to economic models;

(iii) understand linear and non-linear systems of differential and difference equations and be able to apply their knowledge to economic models.

Outline Syllabus

Constrained optimisation: meaning of Lagrange multipliers, envelope theorems, inequality constraints and the Kuhn-Tucker theorem.

Mean value theorem, l'Hôpital's rule, Taylor's theorem. The circular functions. Complex numbers.

Harder first-order differential equations: solution by integrating factor, Bernoulli's equation. Linear second-order differential and difference equations.

Eigenvalues and eigenvectors. Linear systems of difference and differential equations, stability of stationary solutions. Nonlinear systems of differential equations: linearisation, stability of stationary solutions.

Recommended reading

Malcolm Pemberton and Nicholas Rau, Mathematics for Economists: An introductory textbook, Fifth Edition, Manchester University Press, 2023

Typical Assessment

20% course work

80% examination