UNIVERSITY OF LONDON

Course information 2026-27

EC3120 Mathematical Economics

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

The problem of scarcity pervades economic analysis: decision-makers allocate finite time, wealth, and resources to competing ends. This course introduces the mathematics of constrained optimisation and comparative statics. These tools allow the analyst to characterise optimal policies spanning optimal labour supply, firm investment or fiscal policy, and trace policy changes as scarcity constraints are slackened.

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

This course aims to:

- Help students acquire strong mathematical intuition and the skills to read and write proofs.
- Provide students with the analytical skills required for solving economic models.
- Familiarize students with several canonical optimisation models and highlight tractability assumptions.
- Enable students to formulate their own models.

Learning outcomes

Students will be able to set up and solve constrained optimization problems, deduce comparative statics results, and apply these techniques to canonical economic models.

Global 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.

Dixit, Avinash K. Optimization in Economics Theory. (Oxford University Press, 1990) second revised edition [ISBN 978-0198772101]

Sydsæter, Knut, Peter Hammond, Atle Seierstad and Arne Strom Further Mathematics for Economic Analysis. (Pearson Prentice Hall, 2008) second edition [ISBN 978-0273713289]

Assessment

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

Syllabus

I. Static constrained optimisation

Lagrangian, Kuhn Tucker necessity and sufficiency theorems, shadow prices and envelope theorem.

Applications cover portfolio choice in finance and consumer theory, including the Slutsky equation.

II. Monotone comparative statics

Complementary assumptions in comparative statics.

Decision-making under uncertainty and risk aversion.

III. Dynamic constrained optimisation

Variational calculus, optimal control, dynamic programming and Bellman's principle of optimality.

Tools for optimal control: ordinary differential equations (linear systems, steady states and stability).

Applications cover intertemporal consumption, optimal stopping and monotone search, investment (Tobin's q), growth (Ramsey), and resource extraction.