Course information 2016–17
EC3120 Mathematical economics

Mathematical modelling is particularly helpful in analysing a number of aspects of economic theory. The course content includes a study of several mathematical models used in economics. Considerable emphasis is placed on the economic motivation and interpretation of the models discussed.

Prerequisite
If taken as part of a BSc degree, courses which must be passed before this course may be attempted:

EC2066 Microeconomics **and either**
MT105a Mathematics 1 **and** *MT105b Mathematics 2* **or**
MT1174 Calculus

Aims and objectives
The course is specifically designed to:
▪ demonstrate to the student the importance of the use of mathematical techniques in theoretical economics
▪ enable the student to develop skills in mathematical modelling

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 and explain the underlying principles, terminology, methods, techniques and conventions used in the subject
☑ solve economic problems using the mathematical methods described in the subject

Essential reading
For full details, please refer to the reading list.

Dixit, Avinash K. *Optimization in Economics Theory*. (Oxford University Press)
Sydsæter, Knut, Peter Hammond, Atle Seierstad and Arne Strom *Further Mathematics for Economic Analysis*. (Pearson Prentice Hall)

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.

Techniques of constrained optimisation. This is a rigorous treatment of the mathematical techniques used for solving constrained optimisation problems, which are basic tools of economic modelling. Topics include: Definitions of a feasible set and of a solution, sufficient conditions for the existence of a solution, maximum value function, shadow prices, Lagrangian and Kuhn Tucker necessity and sufficiency theorems with applications in economics, for example General Equilibrium theory, Arrow-Debreu securities and arbitrage.

Intertemporal optimisation. Bellman approach. Euler equations. Stationary infinite horizon problems. Continuous time dynamic optimisation (optimal control). Applications, such as habit formation, Ramsey-Kass-Coopmans model, Tobin's q, capital taxation in an open economy, are considered.

Tools for optimal control: ordinary differential equations. These are studied in detail and include linear 2nd order equations, phase portraits, solving linear systems, steady states and their stability.