UNIVERSITY OF LONDON | INTERNATIONAL PROGRAMMES

Course information 2018–19
MT3042 Optimisation theory (half course)

This half course brings together several parts of the wide area of mathematical optimisation, as encountered in many applied fields. The emphasis is on the mathematical ideas and theory used in continuous optimisation.

Prerequisite

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

MT2116 Abstract mathematics.

Students are also strongly encouraged to take MT3041 Advanced mathematical analysis.

Aims and objectives

This half course is designed to:

- enable students to obtain a rigorous mathematical background to optimisation techniques used in areas such as economics and finance
- enable students to understand the connections between the several aspects of continuous optimisation, and about the suitability and limitations of optimisation methods for different purposes.

Essential reading

For full details please refer to the reading list.

Sundaram, R.K. *A First Course in Optimization Theory.* (Cambridge University Press)

Learning outcomes

At the end of this half course and having completed the essential reading and activities students:

- ☑ have knowledge and understanding of important definitions, concepts and results in the subject, and of how to apply these in different situations
- ☑ have knowledge of basic techniques and methodologies in the topics covered
- ☑ have basic understanding of the theoretical aspects of the concepts and methodologies covered
- ☑ be able to understand new situations and definitions, including combinations with elements from different areas covered in the course, investigate their properties, and relate them to existing knowledge
- ☑ be able to think critically and with sufficient mathematical rigour
- ☑ be able to express arguments clearly and precisely.

Assessment

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

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

This course aims to bring together several parts of the wide area of mathematical optimisation, as encountered in many applied fields.

The course concentrates on continuous optimisation, and in this sense extends the theory studied in standard calculus courses.

In contrast to the *Mathematics 1* and *Mathematics 2* half courses, the emphasis in this Optimisation Theory course will be on the mathematical ideas and theory used in continuous optimisation. This course covers the following topics:

- Introduction and review of relevant parts from real analysis, with emphasis on higher dimensions.
- Weierstrass' Theorem on continuous functions on compact set.
- Review with added rigour of unconstrained optimisation of differentiable functions.
- Lagrange's Theorem on equality constrained optimisation.
- The Kuhn-Tucker Theorem on inequality constrained optimisation.
- Finite and infinite horizon dynamic programming.