

IB352-15 Applied Optimization Methods

26/27

Department

Warwick Business School

Level

Undergraduate Level 3

Module leader

Juergen Branke

Credit value

15

Module duration

10 weeks

Assessment

Multiple

Study location

University of Warwick main campus, Coventry

Description

Introductory description

This is an elective module available to students on the MORSE or MMORSE joint degree and non-WBS students only. To apply for this module, log in to my.wbs.ac.uk using your normal IT login details and apply via the my.wbs module application system. Once you've secured a place on my.wbs you should apply via your home department's usual process, which usually takes place via eVision. Note that you do not require the module leader's permission to study a WBS module, so please do not contact them to request it.

[Module web page](#)

Module aims

To introduce general algorithms for convex and non-convex optimization problems arising in various application areas such as financial portfolio optimization, energy system planning, and engineering design optimization, and their computational aspects using a numerical software tool such as Matlab.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Module introduction with examples of several optimization problems in various application areas such as financial portfolio optimization, energy system planning, and engineering design optimization, and review of mathematical background materials (linear algebra, calculus-derivatives, etc.).

Introduction to a software for modelling and solving optimization problems.

Optimality conditions.

Unconstrained optimization.

Quadratic programming.

Constrained optimization.

Discrete optimization and exact methods.

Heuristics.

Global optimization.

Multi-objective optimization.

We plan to cover various applications such as financial portfolio optimization, energy system planning, and engineering design optimization, and several solution algorithms.

Learning outcomes

By the end of the module, students should be able to:

- Derive general optimality conditions for convex optimization problems.
- Apply numerical algorithms for unconstrained and constrained convex optimization problems.
- Apply exact methods for discrete optimization problems with general non-linear convex objective as well heuristics methods.
- Understand global optimization methods.

Indicative reading list

[Reading lists can be found in Talis](#)

Subject specific skills

Use Matlab or similar numerical software to solve optimization problems using numerical algorithms and builtin/add-on optimization solver.

Transferable skills

Distinguish between convex and non-convex optimization problems and different solution techniques.

Study

Study time

Type	Required
Lectures	10 sessions of 1 hour (7%)
Tutorials	10 sessions of 1 hour (7%)
Online learning (independent)	11 sessions of 1 hour (7%)
Private study	46 hours (31%)
Assessment	73 hours (49%)
Total	150 hours

Private study description

Private Study.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group D6

	Weighting	Study time	Eligible for self-certification
Group Work	20%	15 hours	No
Numerical problem solving.			
Weekly Online Multiple Choice Questions	5%	4 hours	No
Centrally-timetabled examination (On-campus)	75%	54 hours	No
Exam			

- Answerbook Pink (12 page)
- Students may use a calculator

	Weighting	Study time	Eligible for self-certification
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- Graph paper

Assessment group R2

	Weighting	Study time	Eligible for self-certification
Individual Assignment	25%		Yes (extension)
In-person Examination	75%		No

- Answerbook Pink (12 page)
- Students may use a calculator
- Graph paper

Feedback on assessment

For the assignment, students will receive individual feedback. For the exam, general feedback will be provided about typical errors made.

[Past exam papers for IB352](#)

Availability

Pre-requisites

To take this module, you must have passed:

- Any of
 - [IB104-12 Mathematical Programming I](#)
 - [IB207-12 Mathematical Programming II](#)

Courses

Course availability information is based on the current academic year, so it may change.

This module is Core optional for:

- USTA-G300 Undergraduate Master of Mathematics, Operational Research, Statistics and Economics
 - Year 3 of G30A Master of Maths, Op.Res, Stats & Economics (Actuarial and Financial Mathematics Stream)
 - Year 3 of G30J Master of Maths, Op.Res, Stats & Economics (Data Analysis Stream)
 - Year 3 of G30B Master of Maths, Op.Res, Stats & Economics (Econometrics and

Mathematical Economics Stream)

- Year 3 of G30C Master of Maths, Op.Res, Stats & Economics (Operational Research and Statistics Stream)
- Year 3 of G30C Master of Maths, Op.Res, Stats & Economics (Operational Research and Statistics Stream)
- Year 3 of G30D Master of Maths, Op.Res, Stats & Economics (Statistics with Mathematics Stream)
- Year 3 of G300 Mathematics, Operational Research, Statistics and Economics
- Year 3 of G300 Mathematics, Operational Research, Statistics and Economics
- Year 3 of G300 Mathematics, Operational Research, Statistics and Economics
- USTA-Y602 Undergraduate Mathematics,Operational Research,Statistics and Economics
 - Year 3 of Y602 Mathematics,Operational Research,Stats,Economics
 - Year 3 of Y602 Mathematics,Operational Research,Stats,Economics

This module is Optional for:

- USTA-GG14 Undergraduate Mathematics and Statistics (BSc)
 - Year 3 of GG14 Mathematics and Statistics
 - Year 3 of GG14 Mathematics and Statistics