IMPERIAL

Module Specification

Basic details

UID		Cohorts covered (Earliest cohort)	
Long title	Optimisation		
New code	ELEC70098	New short title	

Brief description of module *(approx. 600 chars.)*

The aim of this module is to equip you with the tools to formulate and solve general constrained and unconstrained optimisation problems. The module covers several introductory topics in optimisation such as necessary and sufficient conditions of optimality, basic optimization algorithms (gradient, Newton, conjugate directions, quasi-Newton), Kuhn-Tucker conditions, penalty method, recursive quadratic programming, and global optimization. Each topic is covered in a mathematical rigorous way with attention to regularity, convergence conditions, and complexity.

The module assumes prior basic calculus and linear algebra knowledge such as multivariable calculus, sequences, compactness, and eigenvalues.

Available as a standalone module/ short course? N

Statutory details

	ECTS	CATS	Non-credit	
Credit value	5	10	N	HECOS codes
FHEQ level	Level 7			

Allocation of study hours

	Hours	
Lectures	20	
Group teaching	0	*Incl. seminars, tutorials, problem classes.*
Lab/ practical	0	
Other scheduled	0	*Incl. project supervision, fieldwork, external visits.*
Independent study	105	*Incl. wider reading/ practice, follow-up work, completion of assess*
Placement	0	*Incl. work-based learning and study that occurs overseas.*
Total hours	125	
ECTS ratio	25.00	

Project/placement activity

Is placement activity allowed? No

Module delivery

Delivery mode	Taught/ Campus	Other	
Delivery term	Term 1	Other	

Ownership

Primary department	Electronic and Electrical Engineering
Additional teaching departments	

Delivery campus	South Kensington

Collaborative delivery

Collaborative delivery?	N
External institution	N/A
External department	N/A
External campus	N/A

Associated staff

Role	CID	Given name	Surname
Module Leader		Thomas	Parisini

Learning and teaching

Module description

Learning outcomes	Upon successful completion of this module, you will be able to: 1 - Formulate simple unconstrained and constrained optimization problems 2 - Classify optimal solutions 3 - Apply the correct methods to solve such problems 4 - Write basic unconstrained optimization algorithms and assess their convergence and numerical properties 5 - Apply the notion of penalty in the solution of constrained optimization problems 6 - Change constrained optimization problems into equivalent unconstrained problems 7 - Apply basic algorithms for the solutions of global optimization problems
Module content	Necessary and sufficient conditions of optimality Line search The gradient method, Newton's method, conjugate direction methods, quasi-Newton methods, methods without derivatives Kuhn-Tucker conditions Penalty function methods Exact methods Recursive quadratic programming Global optimization
Learning and Teaching Approach	This module is taught as a traditional module with theoretical lectures supported by exercises and examples. The lectures cover the topics from a theoretical point of view. Concepts, problems and solution methods are explained and justified from a theoretical and intuitive point of view. The coursework is an application of some of the methods seen in the module to a well-known optimization problem. The module makes use of a set of lecture notes which contains all material taught in the lectures and over 100 exercises.
Assessment Strategy	A final exam will test the theoretical concepts covered during the lectures.
Feedback	Formative feedback will be provided on an ongoing basis: in the classroom (as general comments) and during office hours.
Reading list	R. Fletcher, Practical Methods of Optimization, Second Edition,

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Quality assurance

Date of first approval	February 2022
Date of last revision	July 2026
Date of this approval	
Module leader	Thomas Parisini
Notes/ comments	

Office use only

QA Lead	
Department staff	
Date of collection	
Date exported	
Date imported	

Template version

Assessment details

Grading method	Numeric	Pass mark	50%

Assessments

Assessment type	Assessment description	Weighting	Pass mark	Must pass?
Examination	Final examination	100%	50%	N
		100%		