

MSc Mathematics and Finance

This document provides a definitive record of the main features of the programme and the learning outcomes that a typical student may reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities provided. This programme specification is intended as a reference point for prospective students, current students, external examiners and academic and support staff involved in delivering the programme and enabling student development and achievement.

Programme Information

Programme Title	Mathematics and Finance			
Award(s)	MSc			
Programme Code	G1U4 (1YFT)	G1U424 (2YPT)		
Awarding Institution	Imperial College London			
Teaching Institution	Imperial College London			
Faculty	Faculty of Natural Sciences			
Department	Department of Mathematics			
Mode and Period of Study	1 academic year, full-time (12 months) or 2 academic years, part-time (24 months)			
Cohort Entry Points	Annually in October			
Relevant QAA Benchmark Statement(s) and/or other external reference points	Mathematics, Statistics and Operational Research			
Total Credits	ECTS:	90-93.4	CATS:	180-186.8
FHEQ Level	Level 7			
EHEA Level	2 nd cycle			
External Accreditor(s)	None			
Specification Details				
Student cohorts covered by specification	2016/17 entry			
Person responsible for the specification	Dr Antoine Jacquier			
Date of introduction of programme	October 2000			
Date of programme specification/revision	January 2017			

Description of Programme Contents

Mathematical finance is a subject that is both mathematically challenging and deployed every day by sophisticated practitioners in the financial markets.

This course aims to provide you with everything you need to get into this area at a level where you can understand – and contribute to – industry practice and the latest research. To do this, the modules we offer are orientated in different ways. Some give the necessary finance and economics background; others provide instruction in fundamental mathematics (stochastic analysis, partial differential equations, etc.).

Scientific computing (object-orientated programming in C++) is an integral part of the programme.

Learning Outcomes

The Imperial Graduate Attributes are a set of core competencies which we expect students to achieve through completion of any Imperial College degree programme. The Graduate Attributes are available at: www.imperial.ac.uk/students/academic-support/graduate-attributes

A. Knowledge

Wide variety of topics, both theoretical (taught in class) and practical (taught in class as well as through Practitioners' lectures series). This range shall cover most areas of the financial industry at large, with a particular focus on the quantitative aspects:

- (i) Numerical techniques used in the financial industry at large (banks, hedge funds, software providers, regulators)
- (ii) Quantitative aspects of risk management and regulation
- (iii) Statistical methods to analyse financial data

Skills and other Attributes

B. Intellectual Skills - able to:

1. Assimilate and understand a large array of mathematical, economic and financial concepts, as well as develop a critical opinion on the use of mathematical models in finance.
2. Understand the rigorous aspects of mathematical models and techniques used in the financial industry.

C. Practical Skills - able to:

1. Implement (in different computing languages, in particular Python, R and C++) a wide range of methods and models and test them on real data.
2. Carry out a research-oriented project, both as courseworks for some modules and as final MSc thesis.

D. Transferable Skills – able to:

1. Use the tools and techniques learned in class to solve open-ended problems.
2. Search for appropriate and relevant existing literature using textbooks, new technologies (databases), and interaction with fellow students and staff to extract important information.

3. Develop a personal opinion based on acquired knowledge: one should be able, in the financial industry, and in other industries in general, to be critical (in a constructive way) about existing models and technologies, and be open to investigate new routes (machine learning/big data in finance for example).
4. Work independently, use their initiative, organise themselves to meet deadlines, plan and execute an extended project.
5. Work and interact constructively with others (through group problem classes for example).

Entry Requirements

Academic Requirement	<p>Minimum of a high 2:1 Honours degree in mathematics or a good First Class Honours degree in a physical science with a strong mathematical content, i.e. with a majority of mathematics modules and an emphasis on analysis, probability, statistics and differential equations.</p> <p>In most cases, degrees in Accounting, Economics, Finance, Business or Management will not meet our entry requirements.</p>
Non-academic Requirements	None
English Language Requirement	Standard requirement

The programme's competency standards document can be found at:

<http://www.imperial.ac.uk/media/imperial-college/faculty-of-natural-sciences/department-of-mathematics/public/study/admissions/pg/msc/DASILVA.pdf>

Learning & Teaching Strategy

Scheduled Learning & Teaching Methods	<ul style="list-style-type: none"> • Lectures • Tutorials • Problem classes • Problem sheets
E-learning & Blended Learning Methods	N/A
Project and Placement Learning Methods	<ul style="list-style-type: none"> • Independent research project

Assessment Strategy

Assessment Methods	<ul style="list-style-type: none"> • Courseworks • Written examinations • Oral presentations • Dissertation
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Academic Feedback Policy

Any assessed coursework done as part of a module will be marked promptly and returned to the student. Students are encouraged to discuss any difficulties with the module lecturer. There is access

to lecturers informally and through a formal 'office hours' system. MSc student meetings are also held in December and February. Indicative feedback from the Programme Director or module leader is given after the May-June examinations. Students will meet their supervisor at least weekly to discuss their progress. They should choose modules to complement their project, and discuss their work on these with their supervisor.

Re-sit Policy

The College's Policy on Re-sits is available at: www.imperial.ac.uk/registry/exams/resit

Mitigating Circumstances Policy

The College's Policy on Mitigating Circumstances is available at: www.imperial.ac.uk/registry/exams

Programme Structure

Full-time	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules	0	4	4	0	0
Elective Modules	0	0-2	0-2	0	0
Projects	0	0	0	1	
Part-time (Year One)	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules	0	1-4	1-4	0	0
Elective Modules	0	0-2	0-2	0	0
Projects	0	0	0	1	
Part-time (Year Two)	Pre-session	Term One	Term Two	Term Three	Term Four
Core Modules	0	1-4	1-4	0	0
Elective Modules	0	0-2	0-2	0	0
Projects	0	0	0	1	

Assessment Structure

Marking Scheme

Pass

A student must:

- Achieve an aggregate mark of at least 50% in each module. A student may be condoned in modules up to the value of 15 ECTS with a qualifying mark of at least 40%.
- Achieve an aggregate mark of at least 50% for the programme.

Merit

A student must:

- Achieve an aggregate mark of at least 50% in each module. A student may be condoned in modules up to the value of 7.5 ECTS with a qualifying mark of at least 40%.
- Achieve an aggregate mark of at least 60% for the module 'Research Project'
- Achieve an aggregate mark of at least 60% for the programme.

Distinction

A student must:

- Achieve an aggregate mark of at least 50% in each module. A student may be condoned in modules up to the value of 7.5 ECTS with a qualifying mark of at least 40%.
- Achieve an aggregate mark of at least 70% for the module 'Research Project'
- Achieve an aggregate mark of at least 70% for the programme.

Module Weightings

Element (% Weighting)	Module	% Module Weighting
Taught (78%)	Mathematical Finance: An Introduction to Option Pricing	10.74%
	Quantitative Risk Management	10.74%
	Statistical Methods in Finance	10.74%
	Stochastic Processes	10.74%
	Interest Rate Models	10.74%
	Simulation Methods for Finance	10.74%
	Advanced Methods in Derivatives Pricing	10.74%
	Computing in C++	10.74%
	2 x elective modules*	7.04%
Research (22%)	Research Project	100%

* Students are permitted to take two half modules from the MSc Statistics programme: M5MS11 and M5MS12 which taken together, counts as one elective worth 8.4 ECTs).

Indicative Module List											
Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
M5A22	Mathematical Finance: An Introduction to Option Pricing	Core	40	147.5	0	187.5	100%	0%	0%	7	7.5
M5MF10	Quantitative Risk Management	Core	40	147.5	0	187.5	70%	30%	0%	7	7.5
M5MF38	Statistical Methods in Finance	Core	40	147.5	0	187.5	70%	30%	0%	7	7.5
M5MF3	Stochastic Processes	Core	40	147.5	0	187.5	100%	0%	0%	7	7.5
M5MF30	Interest Rate Models	Core	40	147.5	0	187.5	100%	0%	0%	7	7.5
M5MF4	Simulation Methods for Finance	Core	40	147.5	0	187.5	80%	20%	0%	7	7.5
M5MF6	Advanced Methods in Derivatives Pricing	Core	40	147.5	0	187.5	75%	25%	0%	7	7.5
M5MF25	Computing in C++	Core	40	147.5	0	187.5	80%	20%	0%	7	7.5
M5MF46	Convex Analysis and Optimization	Elective	30	95	0	125	80%	20%	0%	7	5
M5MF12	Algorithmic Trading and Machine Learning	Elective	30	95	0	125	100%	0%	0%	7	5
M5MF2	Numerical Methods for Finance	Elective	30	95	0	125	75%	25%	0%	7	5
M5MF35	Dynamic Portfolio Theory	Elective	30	95	0	125	100%	0%	0%	7	5
M5MF8	Fixed Income Markets	Elective	30	95	0	125	100%	0%	0%	7	5

Indicative Module List

Code	Title	Core/ Elective	L&T Hours	Ind. Study Hours	Place- ment Hours	Total Hours	% Written Exam	% Course- work	% Practical	FHEQ Level	ECTS
M5MF47	Stochastic Differential Equations	Elective	30	95	0	125	80%	20%	0%	7	5
M5MS11	Statistics for Extreme Events	Elective	15	90	0	105	100%	0%	0%	7	4.2
M5MS12	Financial Econometrics	Elective	15	90	0	105	100%	0%	0%	7	4.2
G1U4PRO J	Research project	Core	0	750	0	750	0%	100%	0%	7	20

Supporting Information

The Programme Handbook is available at:

<http://www.imperial.ac.uk/mathematics/postgraduate/msc/mathematical-finance/current-students/>

The Module Handbook is available at:

<http://www.imperial.ac.uk/mathematics/postgraduate/msc/mathematical-finance/current-students/>

The College's entry requirements for postgraduate programmes can be found at:

www.imperial.ac.uk/study/pg/apply/requirements

The College's Quality & Enhancement Framework is available at:

www.imperial.ac.uk/registry/proceduresandregulations/qualityassurance

The College's Academic and Examination Regulations can be found at:

<http://www3.imperial.ac.uk/registry/proceduresandregulations/regulations>

Imperial College is an independent corporation whose legal status derives from a Royal Charter granted under Letters Patent in 1907. In 2007 a Supplemental Charter and Statutes was granted by HM Queen Elizabeth II. This Supplemental Charter, which came into force on the date of the College's Centenary, 8th July 2007, established the College as a University with the name and style of "The Imperial College of Science, Technology and Medicine".

<http://www.imperial.ac.uk/admin-services/secretariat/college-governance/charters-statutes-ordinances-and-regulations/>

Imperial College London is regulated by the Higher Education Funding Council for England (HEFCE)

<http://www.hefce.ac.uk/reg/of/>

Modifications

Change to the
classification rules

Programmes'
Committee

09 May 2017

PC.2016.99