Programme Specification (PG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	MSc Financial Mathematics
Name of interim award(s):	PG Cert in Mathematics and PG Dip in Mathematics
Duration of study / period of registration:	2 years [part-time]
Queen Mary programme code(s):	PMSP-QMMATH1/PSFIM G1N0
QAA Benchmark Group:	Mathematical Finance
FHEQ Level of Award:	Level 7
Programme accredited by:	N/A
Date Programme Specification approved:	
Responsible School / Institute:	School of Mathematical Sciences

Schools / Institutes which will also be involved in teaching part of the programme:
School of Economics and Finance

Collaborative institution(s) / organisation(s) involved in delivering the programme:
N/A

Programme outline

The MSc in Financial Mathematics is ideally suited to individuals planning a career in the more quantitative areas of banking and financial markets. It also provides the necessary training to those wishing to undertake academic research in financial mathematics.

The programme has been carefully curated, so that, on completion, students will have gained a solid understanding of all of the key areas of modern financial mathematics, together with a range of numerical and computational techniques (many state-of-the-art) that form an important part of the toolkit of a typical practitioner.

The modules studied in Semester A of the programme provide a complete introduction to the field, including the structure of financial instruments and the operations of the markets, foundations of mathematical modelling in finance, machine learning with python, and introductory computer programming in C++.

The modules studied in Semester B of the programme present more advanced material, such as pricing complex financial derivatives using a variety of mathematical models, techniques for managing risk, and advanced computational finance, including writing programs to price exotic derivatives using stochastic volatility and jump-diffusion models. We also cover many topics in finance of contemporary importance, such as credit valuation adjustment and related concepts.

A major component of the MSc is the project which is undertaken under the close supervision of a member of staff. This allows students to perform a detailed study of an area of financial mathematics that is of interest to them, introducing them to some of the latest, cutting-edge research being published in the field.

The programme boasts a number of distinctive features:

-- The programme structure is flexible, allowing students to choose either the computational or the more mathematical modules in Semester B each year, depending on their backgrounds, interests and future plans.
-- In Semester B year 1 and 2, students can choose from a range of interesting, applied modules, including systematic trading strategies.
-- A number of staff members involved with the programme have considerable commercial experience in investment banking and financial markets.
-- All MSc students enjoy the use of a dedicated computer laboratory with high specification computers for high-performance computing with GPGPU (general purpose computing on graphics processing units).
-- We offer a number of Bloomberg terminals, and also the opportunity to obtain Bloomberg certification.
-- We run various unassessed courses on EViews (for statistical analysis) and LaTeX (for document preparation).
-- We also run extra-curricular workshops on programming in Excel/VBA and "modern" C++, to give students the extra skills that will enhance their employment prospects.
-- All students will attend specialist seminars on aspects of career development in finance and banking, etc.

Most of the programme is delivered by the School of Mathematical Sciences (SMS), which has a strong and growing research presence in financial mathematics and related fields. The School also has significant and proven expertise in teaching financial mathematics, both at undergraduate and postgraduate level. However, students will also take two modules taught by the School of Economics and Finance (SEF). SEF is one of the best economics departments in the UK, with an excellent reputation and vast experience in financial economics.

Aims of the programme

This programme aims to give students the knowledge and skills necessary to obtain employment in the financial markets or banking sectors, in roles that require a high level of numeracy, problem-solving and computing expertise. Typical roles would be in areas such as quantitative analysis, software development, derivatives trading, risk management, investment management, sales, marketing, consultancy, etc. The core content of the programme includes all of the key material that a typical applicant for a graduate-level role might be expected to have encountered. The programme also prepares students for further academic study in financial mathematics, including research leading to an MPhil or PhD.

The programme is targeted at students who wish to apply their modelling skills to the financial markets, either as a practitioner or as an academic. No prior knowledge of finance is expected.

Graduates will be well-equipped to apply for entry-level roles in investment banks, hedge funds, fund managers and consultancy firms, amongst others. Graduates will also be suitably qualified to apply for postgraduate research degree courses at Queen Mary and elsewhere.

What will you be expected to achieve?

Students who successfully complete the programme will be able to apply a wide range of mathematical and statistical techniques to model the behaviour of the financial markets, in order to calculate the prices and risk measures of complex financial derivatives and other instruments, using various numerical and analytical methods.

Academic Content:

A 1	The structure of the principal types of financial instruments, and the markets in which they are traded.
A 2	Mathematical models for the behaviour of asset prices, such as geometric Brownian motion and stochastic volatility.
A 3	Techniques for calculating the prices of derivative securities using the principle of no-arbitrage.
A 4	Programming in C++ to an intermediate/advanced level, with a range of finance-related applications including binomial trees, Monte Carlo, and finite difference methods.
A 5	Calibrating models to market data.
A 6	Using statistical tools to analyse historical time series data of the prices of assets such as shares, currencies and commodities.
A 7	Determine the optimal composition of investment portfolios by maximising expected future utility and other methods.

Disciplinary Skills - able to:	
B 1	Understand the practical uses of various financial instruments and their risk/return characteristics.
B 2	Evaluate the strengths and weaknesses of various financial pricing models, and choose a suitable model for a given problem.
B 3	Select the optimal numerical method for pricing a complex derivative security, and implement this as a computer program.
B 4	Extract and assimilate key concepts from published academic research papers in financial mathematics.
B 5	Work independently to undertake research on a topic of interest, at an appropriate level.
B 6	Write a detailed report on work undertaken.

Attributes:	
C 1	Gain a wide and deep understanding of the importance of the financial markets in the wider economy.
C 2	Appreciate how erroneous assumptions in mathematical modelling may have significant negative consequences.
C 3	Understand the importance of information technology in the finance sector and beyond.
C 4	Be familiar with the latest developments in financial mathematics and information technology, as appropriate.

How will you learn?

You will learn primarily through a combination of lectures, tutorials and examples classes, in addition to a significant amount of independent study and research. Success on the programme requires intensive engagement with all of the taught sessions and the various coursework assignments.

For modules that cover computer programming, we run weekly teaching sessions in our dedicated PC laboratory which you are required to attend.

Each lecturer holds at least one "office hour" per week, when students are free to drop in without an appointment to discuss any questions that they may have about the module.

We make extensive use of the university's computer-based learning environment, for providing teaching materials such as lecture notes and coursework assignment sheets, past exam papers, and so on.

Whilst undertaking your research project during the summer, you will attend a series of one-to-one meetings with your supervisor to discuss both your progress, and your ideas and plans for subsequent work.

We also run extra-curricular seminars delivered by industry professionals, as well as in-house training workshops covering, for example, programming in Visual Basic for Applications (VBA).

Students have access to IT facilities, including Bloomberg terminals and numerous specialist software packages such as Mathematica and Matlab.

How will you be assessed?

You will be assessed by a combination of in-term class tests (some of which are computer-based) and written examinations. Some modules may also have in-term assessed coursework assignments or projects.

For the in-term class tests and assignments (but excluding those that are the final element of assessment for a module) we generally aim to release provisional marks, and to give detailed feedback, within two weeks.

The project will be assessed by a written dissertation. Students may also be required to make a presentation of their work, and possibly to attend a viva (oral examination).

How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

The programme consists of two compulsory taught modules in Semester A and two elective taught modules in Semester B in Year 1, and two compulsory taught modules in Semester A and two elective taught modules in Semester B in Year 2, as well as a dissertation project.

Part-time students are expected to complete the programme in two academic years, spreading their studies evenly to complete four taught modules in their first year of study, four taught modules in the second year of study and work on the project dissertation across the two academic years. Part time students will complete the compulsory module MTH700P Research Methods in Mathematical Sciences in the first year of study.

Students choose their elective modules according to their academic background and interests, in consultation with the Programme Director and other staff as needed.

Semester A _ Year 1

Two compulsory modules
MTH761P [7] Financial Instruments and Markets
MTH771P [7] Foundations of Mathematical Modelling in Finance

Semester A _ Year 2

Two compulsory modules
MTH786P [7] Machine Learning with Python
MTH790P [7] Programming in C++ for Finance

Semester B Year 1 and 2. Choose two each year from:

MTH773P [7] Advanced Computing in Finance
MTH787P [7] Advanced Derivatives Pricing and Risk Management
MTH793P** [7] Advanced Machine Learning
MTH776P [7] Bayesian Statistics
ECOM074* [7] Bond Market Strategies
MTH791P [7] Computational Statistics with R
MTH762P [7] Continuous-time Models in Finance
ECOM091* [7] Credit Ratings
MTH741P [7] Digital and Real Asset Analytics
MTH792P [7] Financial Data Analytics
MTH767P [7] Neural Networks and Deep Learning
ECOM147* [7] Private Equity and Venture Capital
ECOM055* [7] Risk Management for Banking
ECOM123* [7] Systematic Trading Strategies

Semester C
MTHM038 [7] Dissertation

(*) At most 2 ECOM modules be taken in total.
(**) Requires MTH786P [7] Machine Learning with Python

Academic Year of Study PT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Financial Instruments and Markets	MTH761P	15	7	Compulsory	1	Semester 1
Foundations of Mathematical Modelling in Finance	MTH771P	15	7	Compulsory	1	Semester 1
Advanced Computing in Finance	MTH773P	15	7	Elective	1	Semester 2
Advanced Derivatives Pricing and Risk Management	MTH787P	15	7	Elective	1	Semester 2
Advanced Machine Learning	MTH793P	15	7	Elective	1	Semester 2
Bayesian Statistics	MTH776P	15	7	Elective	1	Semester 2
Bond Market Strategies	ECOM074	15	7	Elective	1	Semester 2
Computational Statistics with R	MTH791P	15	7	Elective	1	Semester 2

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Continuous-time Models in Finance	MTH762P	15	7	Elective	1	Semester 2
Credit Ratings	ECOM091	15	7	Elective	1	Semester 2
Financial Data Analytics	MTH792P	15	7	Elective	1	Semester 2
Neural Networks and Deep Learning	MTH767P	15	7	Elective	1	Semester 2
Private Equity and Venture Capital	ECOM147	15	7	Elective	1	Semester 2
Risk Management for Banking	ECOM055	15	7	Elective	1	Semester 2
Systematic Trading Strategies	ECOM123	15	7	Elective	1	Semester 2

Academic Year of Study PT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Machine Learning with Python	MTH786P	15	7	Compulsory	2	Semester 1
Programming in C++ for Finance	MTH790P	15	7	Compulsory	2	Semester 1
Advanced Computing in Finance	MTH773P	15	7	Elective	2	Semester 2
Advanced Derivatives Pricing and Risk Management	MTH787P	15	7	Elective	2	Semester 2
Advanced Machine Learning	MTH793P	15	7	Elective	2	Semester 2
Bayesian Statistics	MTH776P	15	7	Elective	2	Semester 2
Bond Market Strategies	ECOM074	15	7	Elective	2	Semester 2
Computational Statistics with R	MTH791P	15	7	Elective	2	Semester 2

Programme Title: MSc Financial Mathematics

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Continuous-time Models in Finance	MTH762P	15	7	Elective	2	Semester 2
Credit Ratings	ECOM091	15	7	Elective	2	Semester 2
Digital and Real Asset Analytics	MTH741P	15	7	Elective	2	Semester 2
Financial Data Analytics	MTH792P	15	7	Elective	2	Semester 2
Neural Networks and Deep Learning	MTH767P	15	7	Elective	2	Semester 2
Private Equity and Venture Capital	ECOM147	15	7	Elective	2	Semester 2
Risk Management for Banking	ECOM055	15	7	Elective	2	Semester 2
Systematic Trading Strategies	ECOM123	15	7	Elective	2	Semester 2
Dissertation	MTHM038	60	7	Compulsory	2	Semester 3

What are the entry requirements?

An upper second class degree is normally required, usually in a STEM related subject (engineering, computer science, mathematics, physics or a related discipline, such as economics). Students with a good lower second class degree may be considered on an individual basis. Applicants with unrelated degrees will be considered if there is evidence of equivalent content in their academic or professional background. For international students we require English language qualifications IELTS 6.5.

How will the quality of the programme be managed and enhanced? How do we listen to and act on your feedback?

The Staff-Student Liaison Committee provides a formal means of communication and discussion between schools/institutes and its students. The committee consists of student representatives from each year in the school/institute together with appropriate representation from staff within the school/institute. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year.

Each school/institute operates a Education Committee, or equivalent, which advises the School/Institute Director of Education on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to the Taught Programmes Board. Student views are incorporated in the committee's work in a number of ways, such as through student membership, or consideration of student surveys.

All schools/institutes operate an Annual Programme Review of their taught undergraduate and postgraduate provision. APR is a continuous process of reflection and action planning which is owned by those responsible for programme delivery. Students' views are considered in this process through analysis of the NSS and module evaluations.

What academic support is available?

Every student is assigned an academic adviser to offer academic guidance throughout their studies, for example guidance on selection of modules at the start of the year. The Student Support teams in SMS and SEF ensure that students feel able to consult staff in either School to resolve any difficulties that may arise. The Programme Director, or a nominated delegate, works with SMS and SEF academic staff to organise project supervision for each student.

The Postgraduate Programme Administrator and Student Support Officer in SMS liaise with the Programme Director and with SEF staff to run a full induction programme for new students.

Programme-specific rules and facts

N/A

How inclusive is the programme for all students, including those with disabilities?

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites. Students can access advice, guidance and support in the following areas:

-- Finding out if you have a specific learning difficulty like dyslexia
-- Applying for funding through the Disabled Students' Allowance (DSA)
-- Arranging DSA assessments of need
-- Special arrangements in examinations
-- Accessing loaned equipment (e.g. digital recorders)
-- Specialist one-to-one "study skills" tuition
-- Ensuring access to course materials in alternative formats (e.g. Braille)
-- Providing educational support workers (e.g. note-takers, readers, library assistants)
-- Mentoring support for students with mental health issues and conditions on the autistic spectrum.

Links with employers, placement opportunities and transferable skills

The MSc Financial Mathematics programme prepares students for a wide range of careers in the banking and finance sector, as well as in marketing, public services, consultancy, industry and commerce. Many graduates of the MSc Mathematical Finance programme (which this programme replaces) have gone on to work for major investment banks in London and overseas, whereas others have undertaken further studies, including undertaking PhD degrees.

Many of the skills taught in this programme are highly transferable. For example, the programming skills (especially in C++) are widely sought by employers in many diverse industries, not least information technology companies, fintech startups and so on.

We organise a number of practitioner seminars every year, where experts from banking and finance explain the work that they do, discuss their own career paths, and give insider hints on how students can maximise their employment prospects. It goes without saying that these events give students excellent opportunities to expand their networks of professional contacts.

Programme Specification Approval

Person completing Programme Specification: Simon Rawstron (ESM-Education Services Manager), Shabn

Person responsible for management of programme:	Shabnam Beheshti, DoE for School of Mathematical Scienc
Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:	
Date Programme Specification approved by Taught Programmes Board:	