

## 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 Computing
Name of interim award(s):	PG Cert and PG Dip
Duration of study / period of registration:	1 year [full-time], 2 years [part-time]
Queen Mary programme code(s):	G1SA / G1SB
QAA Benchmark Group:	N/A
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 Electronic Engineering & Computer Science

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

N/A

### Programme outline

The MSc in Financial Computing is ideally suited to individuals planning a career in the more technological areas of banking and financial markets.

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 computing, including a range of numerical and computational techniques (many state-of-the-art) that form an important part of the toolkit of a typical practitioner. Students will gain experience of a variety of software development environments, languages and tools, suitable for rapid application development (in the front office), the development of analytics libraries (in 'quant' teams), and large-scale software systems engineering (in the back office).

The modules studied at the beginning 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, and introductory computer programming in C++. The modules studied later in the programme cover, amongst other things, advanced C++ programming and computational finance, rapid application development with Excel/VBA, and the analysis of financial data with a variety of software tools. Students also take two elective modules in computer science, in areas such as machine learning, which can be applied to finance and other domains.

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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 computational finance 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:

- Students can choose from a range of interesting, applied modules in computer science.
- A number of staff members involved with the programme have considerable commercial experience in investment banking, financial markets and software development.
- 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, e.g. on 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.
- We also host a series of practitioner seminars each year.

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 and computing, both at undergraduate and postgraduate level. However, students will also take up to two modules taught by the School of Electronic Engineering and Computer Science (EECS) which is one of the oldest departments of its kind in the UK, and has excellent links with industry.

### 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 development, software engineering, risk management, data science, 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.

No prior knowledge of finance is expected, although some previous experience of computer programming may be beneficial.

Graduates will be well-equipped to apply for entry-level roles in investment banks, hedge funds, fund managers and consultancy firms, amongst others.

### What will you be expected to achieve?

Students who successfully complete the programme will be able to write advanced computer programs in order to calculate the prices and risk measures of complex financial derivatives and other instruments, using various numerical and analytical methods.

#### Academic Content:

A1	The structure of the principal types of financial instruments, and the markets in which they are traded.
A2	Mathematical models for the behaviour of asset prices, such as geometric Brownian motion and stochastic volatility.

A3	Techniques for calculating the prices of derivative securities using the principle of no-arbitrage.
A4	Programming in C++ to an intermediate/advanced level, with a range of finance-related applications including binomial trees, Monte Carlo, and finite difference methods.
A5	Understanding a project pipeline, including inception, planning, execution, and presentation of results

Disciplinary Skills - able to:	
B1	Understand the practical uses of various financial instruments and their risk/return characteristics.
B2	Identify the appropriate technology (programming language, environment, etc.) for solving a particular problem in financial computing.
B3	Implement various mathematical models for pricing financial derivatives.
B4	Extract and assimilate key concepts from published academic research papers in financial mathematics.
B5	Work independently to undertake research on a topic of interest, at an appropriate level.
B6	Write a detailed report on work undertaken.

Attributes:	
C1	Gain a wide and deep understanding of the importance of the financial markets in the wider economy.
C2	Understand the importance of information technology in the finance sector and beyond.
C3	Be familiar with the latest developments in computational finance, and in information technology more generally, 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).

The industrial placement module is assessed as a pass / fail through a combination of report, viva, learning journal and structured employer evaluations.

### 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 six compulsory taught modules and two elective modules, with an even split between semesters, as well as a summer dissertation project.

Full-time students are expected to complete eight taught modules and the project dissertation in one academic year. 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

Three compulsory modules

MTH761P [7] Financial Instruments and Markets

MTH771P [7] Foundations of Mathematical Modelling in Finance

MTH790P [7] Programming in C++ for Finance

Choose one from

MTH786P [7] Machine Learning with Python

ECS713P [7] Functional Programming

ECS759P [7] Artificial Intelligence

#### Semester B

Three compulsory modules

MTH773P [7] Advanced Computing in Finance

MTH792P [7] Financial Data Analytics

MTH789P [7] Trading and Risk Systems Development

Choose one from

MTH793P [7] Advanced Machine Learning

ECS769P [7] Advanced Object-oriented Programming

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ECS781P [7] Cloud Computing  
ECS796P [7] Distributed Systems

Semester C  
MTHM038 [7] Dissertation

Academic Year of Study

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
Programming in C++ for Finance	MTH790P	15	7	Compulsory	1	Semester 1
Machine Learning with Python	MTH786P	15	7	Elective	1	Semester 1
Functional Programming	ECS713P	15	7	Elective	1	Semester 1
Artificial Intelligence	ECS759P	15	7	Elective	1	Semester 1
Advanced Computing in Finance	MTH773P	15	7	Compulsory	1	Semester 2
Financial Data Analytics	MTH792P	15	7	Compulsory	1	Semester 2
Trading and Risk Systems Development	MTH789P	15	7	Compulsory	1	Semester 2
Advanced Machine Learning	MTH793P	15	7	Elective	1	Semester 2
Advanced Object-oriented Programming	ECS769P	15	7	Elective	1	Semester 2
Cloud Computing	ECS781P	15	7	Elective	1	Semester 2
Distributed Systems	ECS796P	15	7	Elective	1	Semester 2
Dissertation	MTHM038	60	7	Compulsory	1	Semester 3

### What are the entry requirements?

Entrants must usually have the equivalent of a British first or good second class degree in a subject with a substantial mathematical component (mathematics, statistics, physics, engineering, economics, or computer science). Students should also have some experience in computer programming. The Admissions Tutor assesses applicant suitability for the programme individually, and will liaise with the EECS MSc admissions tutor to ensure consistency of intake.

Entrants for whom English is a second language must meet the minimum IELTS requirement of 6.5 (or equivalent).

### 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 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 operates a Learning and Teaching Committee, or equivalent, which advises the School/Institute Director of Taught Programmes 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 Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, such as through student membership, or consideration of student surveys.

All schools operate an Annual Programme Review of their taught undergraduate and postgraduate provision. The process is normally organised at a School-level basis with the Head of School, or equivalent, responsible for the completion of the school's Annual Programme Reviews. Schools/institutes are required to produce a separate Annual Programme Review for undergraduate programmes and for postgraduate taught programmes using the relevant Undergraduate or Postgraduate Annual Programme Review pro-forma. Students' views are considered in this process through analysis of the NSS and module evaluations.

### What academic support is available?

All students will be assigned a tutor, with whom they will have regular meetings. In addition the students will have all the standard induction, advice and supervisory arrangements normally offered to students within SMS and EECS.

The school handbook will be provided (and made accessible at all times) to students, where all the channels of support will be outlined. These include the support channels within the school and also those available at College level.

### 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 Computing 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. Graduates of this programme can go on to work for major investment banks in London and overseas, or to undertake further academic studies.

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:**

Dr Mark Walters, DoE

**Person responsible for management of programme:**

**Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:**

05 August 2021

**Date Programme Specification approved by Taught Programmes Board:**