Programme Title: BSc Mathematics;BSc Mathematics with Year Abroad;BSc Mathematics with Professional Placement

Queen Mary
University of London

Programme Specification (UG)

Awarding body / institution:	Queen Mary University of London
Teaching institution:	Queen Mary University of London
Name of final award and programme title:	BSc Mathematics with Computing;BSc Mathematics with Computing with Year Abroad;BSc Mathematics with Computing with Professional Placement;
Name of interim award(s):	CertHE, DipHE
Duration of study / period of registration:	3/4 years
QMUL programme code / UCAS code(s):	
QAA Benchmark Group:	Mathematics, statistics and operational research
FHEQ Level of Award :	Level 6
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:

Programme outline

The BSc degree in Mathematics with Computing comprises three years of full-time study, possibly augmented with a year-long placement or a year of study abroad. The programme includes the core elements of Mathematics in addition to a grounding into the critical and pertinent elements related to computing and machine learning.

The programme will develop practical skills and experience in the use and applications of mathematics and the theory and practice of programming. The programme develops high levels of competence and demonstrable skills in the core technical areas, with programming in Python, C++ and (optionally) R.

The first two years of the programme comprise 180 credits of theoretical mathematics modules, with 30 credits in year 1 of programming, and 30 credits in year 2 on mathematical underpinnings of computing. The third year allows students to specialise more into mathematics or computing, by taking a compulsory project in one or the other.

The mathematics component aims to offer flexibility while still appropriately complementing and preparing for the computing

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component. In particular, there are compulsory modules in statistics in year 2 to prepare for machine learning in year 3.

Aims of the programme

The programme aims to educate the students in the fundamentals of mathematics and their relation to and application to advanced computing. The first two years cover essential fundamentals of mathematics and statistics, giving students a thorough understanding of the techniques and application of higher mathematics. The third year focuses more strongly on mathematics applicable to computing.

Practically, the programme provides the students with the ability to program in modern computer languages (Python and optionally C++), with the theoretical underpinnings (including the study of algorithms) to support this, and (depending on module choices) to apply this in the area of machine learning. This will equip the students for employment in a variety of sectors where programming and AI are prevalent.

What will you be expected to achieve?

Students who successfully complete this programme will be expected to achieve all of the learning outcomes shown below.

Please note that the following information is only applicable to students who commenced their Level 4 studies in 2017/18, or 2018/19

In each year of undergraduate study, students are required to study modules to the value of at least 10 credits, which align to one or more of the following themes:

- networking
- multi- and inter-disciplinarity
- international perspectives
- enterprising perspectives.

These modules will be identified through the Module Directory, and / or by your School or Institute as your studies progress.

Academic Content:	
A 1	comprehend fundamental concepts and techniques of calculus, probability theory and linear algebra, and at least one additional main mathematical subject;
A 2	understand the mathematical underpinnings of computing, and apply them in practice
A 3	acquire knowledge of programming in Python and C++

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Disciplinary Skills - able to:	
B 1	write and evaluate computer programs for specified tasks
B 2	construct appropriate written mathematical arguments
B 3	analyse a problem within a mathematical context and select appropriate mathematical tools to solve it
B 4	acquire complex knowledge and apply it rigorously

Attributes:	
C 1	connect information and ideas within their field of study
C 2	adapt their understanding to new and unfamiliar settings
C 3	acquire new learning skills in a range of ways, both individually and collaboratively
C 4	use quantitative data confidently and competently
C 5	manage time and work cooperatively with fellow students
C 6	pursue and deliver a substantial independent project
C 7	take notes, write up notes, plan revision, and learn independently

How will you learn?

Teaching in most modules is primarily by formal lectures but may include guided reading. For all except some higher-level modules, teaching is supported by tutorial classes and/or computer laboratories. Teaching of reading and project modules is primarily by guided reading and weekly seminars or supervisions.

Learning in most modules is by attending lectures, reading lecture notes and recommended text books, attempting exercises and asking questions in tutorial classes and/or computer laboratories and staff office hours.

How will you be assessed?

Assessment for more theoretical mathematics modules is normally primarily by written examination, but with a component of in-term assessment. Programming modules are typically assessed in-term through completion of complex programming tasks. Assessment of project modules is normally by a project report, presentation and, at the examiners' discretion, an oral examination.

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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.

For degree awarding purposes (in order to deal with special cases like changes of programme) students will be allowed to choose up to 30 credits of off diet modules in any year (with School approval). At the end of year two, students have the opportunity to take a placement year in industry - Mathematics with Computing with Professional Placement - or a year studying abroad - Mathematics with Computing with year abroad.

Modules are 15 credits except where stated otherwise.

Year 1

Semester A
Two compulsory modules:
MTH4000 Programming in Python I
MTH4213 Numbers, Sets and Functions

Semester B
Two compulsory modules:
MTH4215 Vectors and Matrices
MTH4001 Object-Oriented Programming

Semester A & B
Two compulsory modules
MTH4300 Introduction to Analysis with Calculus (30 credits)
MTH4500 Probability & Statistics (30 credits)

Year 2

Semester A
Four compulsory modules
MTH5112 Linear Algebra I
MTH5123 Differential Equations
MTH5129 Probability and Statistics II
MTH5107 Data structures and algorithms

Semester B
One compulsory module
MTH5108 Foundations of Computing

Choose three from:
MTH5103 Complex Variables
MTH5113 Introduction to Differential Geometry
MTH5115 Linear Optimisation and Game Theory
MTH5120 Statistical Modelling I

Semester A & B
MTH5205 Professional Skills for Mathematicians (0 credits)

Year 3
Semester A & B
One compulsory module:
MTH6159 Mathematics with Computing Project (30 credits)

Semester A
Choose at least one module from:

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MTH6160 Numerical Analysis
MTH6101 Introduction to Machine Learning
ECS610U Computer Graphics

Remaining electives from:
MTH6128 Number Theory
MTH6140 Linear Algebra II
MTH6141 Random Processes

Semester B
One compulsory module:
MTH6150 Numerical Computing with C and C++

Choose two from:
MTH6161 Neural Networks and Deep Learning
MTH6105 Algorithmic Graph Theory
MTH6108 Coding Theory
MTH6142 Complex Networks

Academic Year of Study   FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Programming in Python I	MTH4000	15	4	Compulsory	1	Semester 1
Number, Sets and Functions	MTH4213	15	4	Compulsory	1	Semester 1
Object-Oriented Programming	MTH4001	15	4	Compulsory	1	Semester 2
Vectors and Matrices	MTH4215	15	4	Compulsory	1	Semester 2
Introduction to Analysis with Calculus	MTH4300	30	4	Compulsory	1	Semesters 1 & 2
Probability & Statistics	MTH4500	30	4	Compulsory	1	Semesters 1 & 2

Academic Year of Study   FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Linear Algebra I	MTH5112	15	5	Compulsory	2	Semester 1
Differential Equations	MTH5123	15	5	Compulsory	2	Semester 1
Probability and Statistics II	MTH5129	15	5	Compulsory	2	Semester 1
Professional Skills for Mathematicians	MTH5205	0	5	Compulsory	2	Semesters 1 & 2
Data Stuctures and Algorithms	MTH5107	15	5	Compulsory	2	Semester 1
Foundations of Computing	MTH5108	15	5	Compulsory	2	Semester 2
Complex Variables	MTH5103	15	5	Elective	2	Semester 2
Introduction to Differential Geometry	MTH5113	15	5	Elective	2	Semester 2
Linear Optimisation and Game Theory	MTH5115	15	5	Elective	2	Semester 2
Statistical Modelling I	MTH5120	15	5	Elective	2	Semester 2

Academic Year of Study   FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Algorithmic Graph Theory	MTH6105	15	6	Elective	3	Semester 2
Numerical Analysis	MTH6160	15	6	Elective	3	Semester 1
Linear Algebra II	MTH6140	15	6	Elective	3	Semester 1
Random Processes	MTH6141	15	6	Elective	3	Semester 1
Complex Networks	MTH6142	15	6	Elective	3	Semester 2

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Numerical Computing with C and C++	MTH6150	15	6	Compulsory	3	Semester 2
Introduction to Machine Learning	MTH6101	15	6	Elective	3	Semester 1
Coding Theory	MTH6108	15	6	Elective	3	Semester 2
Number Theory	MTH6128	15	6	Elective	3	Semester 1
Mathematics with Computing Project	MTH6159	30	6	Compulsory	3	Semesters 1 & 2
Neural Networks and Deep Learning	MTH6161	15	6	Elective	3	Semester 2
Computer Graphics	ECS610U	15	6	Elective	3	Semester 1

What are the entry requirements?

For UK applicants, we require 3 GCE A-levels at ABB–including Mathematics at Grade A. Grade C or 4 in GCSE English Language is also required.

International Baccalaureate: Acceptable on its own and combined with other qualifications.
Subjects and grades required: 34–36 points total including Higher Level Mathematics at grade 6.

Non-UK applicants: Equivalent qualifications may be accepted. IELTS: 6.0 (with a minimum of 5.5 in all sections) is required.

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

The programme is over seen by a Programme Director with overall oversight of the programme.

The quality and structure of the programme as a whole is the responsibility of the DoE with support from DDoE, the Programme Director and the School's Education Committee. This includes revising the syllabuses of modules, and refining the module offering.

The quality of individual modules is monitored by DoE and DDoE, and includes evaluation of student feedback through questionnaires, the Student Voice Committee, module registrations, exam performance, as well as direct observations of the lectures.

The School operates an Education Committee which advises the School's Director of Education on all matters relating to the delivery of taught programmes at School level, including monitoring the application of relevant QMUL policies and reviewing all proposals for module and programme approval and amendment before submission for approval to Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, such as through the SSLC and consideration of student surveys.

All Schools operate a periodic Programme Review of their taught undergraduate and postgraduate provision. This is a continuous process of reflection and action planning which is owned by those responsible for programme delivery; the main document of reference for this process is the Student Experience Action Plan (SEAP) which is the summary of the

School's work throughout the year to monitor academic standards and to improve the student experience. The process is organised at a School-level basis with the Director of Education responsible for updating the School's Taught Programmes Action Plan. Students'views are considered in this process through analysis of the NSS and module evaluations.

Every 5-6 years the School undergoes a Periodic Review of its teaching provision, by a panel consisting of experts external to the School. The process is organised at a School-level basis with the Director of Education responsible for updating the School's Taught Programmes Action Plan. Students' views are considered in this process through analysis of student surveys and module evaluations.

The Student Voice Committee provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each year of the programmes, together with appropriate representation from staff within the School. It is designed to respond to both the general needs of students, and subject specific concerns, as well as act as a forum for discussing programme and module developments. Staff-Student Liaison Committees meet regularly throughout the year.

The Director of Education and and Deputy Director of Education both attend the Student Voice Committee and the School's Education Committee and ensure that student feedback is fed into the review of modules and programmes. Student views are also incorporated in the Committee's work in other ways, such as through the National Student Survey (NSS) and student module evaluations.

What academic support is available?

Each student is allocated a personal academic advisor, who acts as a first point of contact for general academic and pastoral support. Personal tuition is provided primarily through tutorial classes and visits to module organisers during their office hours, which are advertised on the web and take place in the Learning Cafe. Programme induction for new students begins during the enrolment period and extends into the first semester; it includes a series of presentations organised by the Education Services Team. Each programme is assigned a Programme Director and all teaching is overseen by the Education Committee, which includes the Programme Directors and is chaired by the Director of Education. Programmes are monitored continuously and reviewed every few years by the Education Committee.

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.

Programme-specific rules and facts

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Links with employers, placement opportunities and transferable skills

Recent graduates in Mathematical Sciences have gone into a wide variety of jobs. Some went into positions in the financial sector ranging from actuarial and accountancy trainees with banks such as Lloyds TSB to a financial analyst with AIG. Teacher training was an option that was taken up by a number of our graduates, as was further study: around one third of our graduates go on to complete a Masters or PhD degree. High-level numeracy and programming are among the most sought-after skills in the workplace and many opportunities are open to a mathematical sciences and/or computing graduate. During this degree programme students learn how to analyse and solve problems, apply mathematical modelling, communicate their ideas and theories effectively, work independently and manage their own time.

Programme Specification Approval

Person completing Programme Specification:

Matthew Fayers (DoE, Mathematical Sciences)

Person responsible for management of programme:

Matthew Fayers (DoE, Mathematical Sciences)

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

Date Programme Specification approved by Taught Programmes Board:

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