Programme Title: Bachelor of Science (BSc) Computer Science and Mathematics (GG41) (2022-2023)

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 Computer Science and Mathematics
Name of interim award(s):	CertHE, DipHE, BSc
Duration of study / period of registration:	3 years
QMUL programme code / UCAS code(s):	UBSF-QMCOMP1/UJCOSMAS (GG41)
QAA Benchmark Group:	Computer Science, Mathematics
FHEQ Level of Award :	Level 6
Programme accredited by:	
Date Programme Specification approved:	
Responsible School / Institute:	School of Electronic Engineering & Computer Science

Schools / Institutes which will also be involved in teaching part of the programme:

School of Mathematical Sciences

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

Programme outline

This programme aims to equip students with a sound, reflective understanding of both computer science and mathematics and of how they are related, together with the skills necessary to apply these disciplines in conjunction to analyse and solve real-world problems and to develop, on the basis of these solutions, effective computer systems

Aims of the programme

Practically, the program equips the students with the ability to use a modern programming language ¬ currently Java ¬ and a modern symbolic computation system -currently Maple. Students will also acquire skills in the construction of computer programs, in calculation (both by hand and aided by computers) and will have a grounding in the analysis and application of algorithms, both numerical and non-numerical. They will also have enough perspective to be able to choose between different

Queen Mary
University of London

programming and analytical paradigms to find an appropriate one for the solution of a given problem.

This program incorporates, on the computing side, a solid grounding in programming, computer systems, and in the formal tools of computer science; on the mathematical side, it has a basis of both discrete and continuous mathematics. There are many possible combinations of this palette of disciplines, and the programme is flexible enough to allow a certain degree of choice: for example, students could specialise in the logic and formal analysis of computer programmes, or in machine learning, or could apply computational techniques to mathematical problems in combinatorics or in dynamical systems. Equally, they could use dynamical systems theory to analyse the computational techniques that are used in modern banking. All of these combinations will give the students a good understanding of the theory and application of both mathematics and computer science in the modern world.

Students will, throughout their development, learn practical skills, both computational and mathematical, in a laboratory environment: students will gain experience of solving problems, and applying their skills, in a series of progressively more demanding applications.

Alongside this, the programme pays attention to the wider context of both mathematics and computing and the development of transferable skills such as writing, presentation and team work. The programme is under continual revision to ensure it matches the needs of both students and their future employers.

What will you be expected to achieve?

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes in the following areas. The programme outcomes are referenced to the relevant QAA benchmark statement(s) (see above) and the Framework for Higher Education Qualifications in England, Wales and Northern Ireland (2008), and relate to the typical student. Additionally, the SEEC Credit Level Descriptors for Further and Higher Education 2003 and Queen Mary Statement of Graduate Attributes have been used as a guiding framework for curriculum design.

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	computer system components and architecture
A 2	the principles of operating systems and networks and the techniques required for their implementation

Queen Mary
University of London

A3	specific operating systems
A4	the common protocols used in networks
A5	major application areas in the sciences, medicine, industry and commerce
A6	the mathematical, scientific and engineering elements of computer science
A7	the historical, social and professional context of computer science

Disciplinary Skills - able to:	
B1	recognise and appreciate the presence of risk in engineering practice
B2	solve problems
B3	appreciate common protocols used in networks

Attributes:	
C1	manage projects effectively
C2	produce well-written technical documentation
C3	implement parts of an operating system
C4	work effectively as a member of a design and development team
C5	apply usability principles

How will you learn?

Each non-project-based module involves lectures, problem solving coursework and practical sessions. Lectures are used to introduce principles and methods and also to illustrate how they can be applied in practice. Coursework allows students to develop their skills in problem solving and to gain practical experience. Practical sessions provide students with guidance and help while solving a problem. These lessons take the form of exercise classes and programming laboratories that allow the students to learn-by-doing in order to complement the lectures.

Individual projects are undertaken throughout the year under the supervision of an academic member of staff with whom there are weekly consultancy meetings. These are used for students to report on their progress, discuss research and design issues and plan their future work. This develops and reinforces students' ability to communicate technical ideas clearly and effectively. GG41 students will be encouraged to choose a project topic which is relevant for their mathematical studies as well as for computer science. The Projects Coordinator also runs a thread of taught sessions to support the project module.

How will you be assessed?

The assessment of taught modules normally consists of a combination of written examination and coursework.

Queen Mary
University of London

Project modules are normally examined on the basis of a written report, a formal oral presentation, and, where applicable, a demonstration of any software and/or hardware developed.

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.

Year 1 Modules
Semester 1
ECS401U Procedural Programming (15 credits)
ECS427U Professional and Research Practice (15 credits)
MTH4100 Calculus I (15 credits)
MTH4113 Numbers, Sets and Functions (15 credits)
Semester 2
ECS414U Object Oriented Programming (15 credits) (pre requisite for ECS639U)
ECS421U Automata and Formal Languages (15 credits)
MTH4101 Calculus II (15 credits)
MTH4115 Vectors and Matrices (15 credits)

Year 2 Modules
Semester 3
ECS505U Software Engineering (15 credits) (pre requisite for ECS506U, ECS647U)
MTH4107 Introduction to Probability (15 credits)
MTH5112 Linear Algebra I (15 credits)
Plus one module from:
ECS519U Database Systems (15 credits) (pre requisite for ECS650U)
ECS529U Algorithms and Data Structures (15 credits)
Semester 4
ECS506U Software Engineering Project (15 credits) (pre requisite ECS505U)
Plus one module from:
MTH4104 Introduction to Algebra (15 credits)
MTH4116 Probability and Statistics I (15 credits) (pre requisite for MTH5129)
Plus one module from:
ECS518U Operating Systems (15 credits)
ECS522U Graphical User Interfaces (15 credits)
ECS524U Internet Protocols and Applications (15 credits)
Plus one module from:
MTH5103 Complex Variables (15 credits)
MTH5114 Linear Programming and Games (15 credits)

ECS620U Summer Internship (15 credits) (offered during the penultimate and final year)* (elective)

Final Year Modules
Semester 5
ECS635U Project (30 credits) (Core)
ECS651U Computability, Complexity and Algorithms (15 credits)
Plus two modules from:
ECS610U Computer Graphics (15 credits)
ECS639U Web Programming (15 credits) (pre requisite ECS414U)
ECS640U Big Data Processing (15 credits)
ECS650U Semi-Structured Data and Advanced Data Modelling (15 credits) (pre requisite ECS519U)
MTH5123 Differential Equations (15 credits)
MTH5129 Probability and Statistics II (15 credits) (pre requisite MTH4116)

Programme Title: Bachelor of Science (BSc) Computer Science and Mathematics (GG41) (2022-2023)

MTH5130 Number Theory (15 credits) (pre requisite MTH4104)
MTH6115 Cryptography (15 credits) (pre requisite MTH4104)

Students may not take both MTH5129 and MTH6115

Semester 6
ECS635U Project (30 credits cont'd) (Core)
Plus three modules from:
ECS605U Image Processing (15 credits)
ECS661U User Experience Design (15 credits) (Replacing ECS612U Interaction Design)
ECS637U Digital Media and Social Networks (15 credits)
ECS647U Bayesian Decision and Risk Analysis (15 credits) (pre requisite ECS505U)
ECS655U Security Engineering (15 credits)
ECS656U Distributed Systems (15 credits)
ECS659U Neural Networks and Deep Learning (15 credits)
MTH6105 Algorithmic Graph Theory (15 credits)
MTH6108 Coding Theory (15 credits)
MTH6142 Complex Networks (15 credits)

**Other MTH modules may exceptionally be allowed with approval from SMS, but students will be informed there may be timetable clashes

---

Academic Year of Study   FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Procedural Programming	ECS401U	15	4	Compulsory	1	Semester 1
Professional and Research Practice	ECS427U	15	4	Compulsory	1	Semester 1
Calculus	MTH4100	15	4	Compulsory	1	Semester 1
Numbers, Sets and Functions	MTH4113	15	4	Compulsory	1	Semester 1
Object Oriented Programming	ECS414U	15	4	Compulsory	1	Semester 2
Automata and Formal Languages	ECS421U	15	4	Compulsory	1	Semester 2
Calculus II	MTH4101	15	4	Compulsory	1	Semester 2
Vectors and Matrices	MTH4115	15	4	Compulsory	1	Semester 2

Queen Mary
University of London

Programme Title: Bachelor of Science (BSc) Computer Science and Mathematics (GG41) (2022-2023)

Academic Year of Study   FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Software Engineering	ECS505U	15	5	Compulsory	2	Semester 1
Introduction to Probability	MTH4107	15	4	Compulsory	2	Semester 1
Linear Algebra	MTH5112	15	5	Compulsory	2	Semester 1
Database Systems	ECS519U	15	5	Elective	2	Semester 1
Algorithms and Data Structures	ECS529U	15	5	Elective	2	Semester 1
Software Engineering Project	ECS506U	15	5	Compulsory	2	Semester 2
Introduction to Algebra	MTH4104	15	4	Elective	2	Semester 2
Probability and Statistics I	MTH4116	15	4	Elective	2	Semester 2
Operating Systems	ECS518U	15	5	Elective	2	Semester 2
Graphical User Interfaces	ECS522U	15	5	Elective	2	Semester 2
Internet Protocols and Applications	ECS524U	15	5	Elective	2	Semester 2
Complex Variables	MTH5103	15	5	Elective	2	Semester 2
Linear Programming and Games	MTH5114	15	4	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
Project	ECS635U	30	6	Core	3	Semesters 1 & 2

Queen Mary
University of London

Programme Title: Bachelor of Science (BSc) Computer Science and Mathematics (GG41) (2022-2023)

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Computability, Complexity and Algorithms	ECS651U	15	6	Compulsory	3	Semester 1
Computer Graphics	ECS610U	15	6	Elective	3	Semester 1
Web Programming	ECS639U	15	6	Elective	3	Semester 1
Big Data Processing	ECS640U	15	6	Elective	3	Semester 1
Semi-Structured Data and Advanced Data Modelling	ECS650U	15	6	Elective	3	Semester 1
Differential Equations	MTH5123	15	5	Elective	3	Semester 1
Probability and Statistics II	MTH5129	15	5	Elective	3	Semester 1
Number Theory	MTH5130	15	5	Elective	3	Semester 1
Cryptography	MTH6115	15	6	Elective	3	Semester 1
Image Processing	ECS605U	15	6	Elective	3	Semester 2
User Experience Design	ECS661U	15	6	Elective	3	Semester 2
Digital Media and Social Networks	ECS637U	15	6	Elective	3	Semester 2
Bayesian Decision and Risk Analysis	ECS647U	15	6	Elective	3	Semester 2
Security Engineering	ECS655U	15	6	Elective	3	Semester 2
Distributed Systems	ECS656U	15	6	Elective	3	Semester 2
Neural Networks and Deep Learning	ECS659U	15	6	Elective	3	Semester 2
Algorithmic Graph Theory	MTH6105	15	6	Elective	3	Semester 2
Coding Theory	MTH6108	15	6	Elective	3	Semester 2

Queen Mary
University of London

Programme Title: Bachelor of Science (BSc) Computer Science and Mathematics (GG41) (2022-2023)

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Complex Networks	MTH6142	15	6	Elective	3	Semester 2
Summer Internship (see note in structure)*	ECS620U	15	6	Elective	3	

What are the entry requirements?

Further information about the entry requirements for this programme can be found at:

http://www.eecs.qmul.ac.uk/undergraduates/entry-requirements/

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

EECS has a Teaching and Learning Committee (TLC) structure which enables programmes to be both managed and enhanced.

The Structure allows for subject level teaching groups and programme coordinators to regularly evaluate the content and delivery of each programme. Feedback from module evaluations and SSLC meetings are fed into these groups and this provides an opportunity for student feedback to be incorporated into the programmes.

Additionally, programme coordinators work with the Director of Education to ensure each programme is current and can be delivered effectively.

The Student-Staff Liaison Committee provides a formal means of communication and discussion between the School and its students. The committee consists of student representatives from each cohort, together with appropriate representation from School staff. It is designed to respond to the needs of students, as well as act as a forum for discussing programme and module developments. Student-Staff Liaison Committees meet four times a year, twice in each teaching semester.

Each semester, students are invited to complete a web-based module questionnaire for each of their taught modules, and the results are fed back through the SSLC meetings. The results are also made available on the student intranet, as are the minutes of the SSLC meetings. Any actions necessary are taken forward by the relevant Senior Tutor, who chairs the SSLC, and general issues are discussed and actioned through the School's Student Experience Learning Teaching And Assessment (SETLA) Committee .

The School's Teaching and Learning Committee (TLC) advises the 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 Taught Programmes Board. Student views are incorporated in this Committee's work in a number of ways, including through student membership and consideration of student surveys and module questionnaires.

The School participates in the College's Annual Programme Review process, which supports strategic planning and operational issues for all undergraduate and taught postgraduate programmes. The APR includes consideration of the School's Taught Programmes Action Plan, which records progress on learning and teaching related actions on a rolling basis. Students' views are considered in the APR process through analysis of the NSS and module questionnaires, among other data.

What academic support is available?

All students are assigned an academic adviser during induction week. The adviser's role is to guide advisees in their academic

development including module selection and to provide first-line pastoral support.

In addition, the School has a Senior Tutor for undergraduate students who provides second-line guidance and pastoral support as well as advising staff on related matters.

The School also has a Student Support Officer who is the first point of contact regarding all matters.

Every member of Teaching Staff holds 2 open office hours per week during term time.

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

Further information on the Academic Regulations can be found at http://www.arcs.qmul.ac.uk/policy

In addition to this the programme does have special regulations (further details are available in the Academic Regulations):
1.   There is a requirement for students to achieve a minimum mark of 30.0 in every module, and to pass the project outright (in addition to the standard award rules) in order to achieve the intended, accredited, award.
2.   The exit award and the field of study of the exit award will be dictated by the specific modules passed and failed by a student.

Links with employers, placement opportunities and transferable skills

The School has a wide range of industrial contacts secured through research projects and consultancy, our Industrial Experience programme and our Industrial Advisory Panel.

The Industrial Advisory Panel works to ensure that our programmes are state-of-the-art and match the changing requirements of this fast-moving industry. The Panel includes representatives from a variety of Computer Science oriented companies ranging from SMEs to major blue-chips. These include: Microsoft Research, IBM, The National Physical Laboratory, National Instruments, PA Consulting, Rohde and Schwarz, O2, Cisco Systems, ARM, Selex and BAE Systems.

Recent graduates have found employment as IT consultants, specialist engineers, web developers, systems analysts, software designers and network engineers in a wide variety of industries and sectors. A number of students also go on to undertake PhDs in electronic engineering and computer science. Merril Lynch, Microsoft, Nokia, Barclays Capital, Logica,, Credit Suisse, KPMG, Transport for London, Sky and Selex ES are among the organizations that have recently employed graduates of EECS programmes.

Transferable skills are developed through a variety of means, including embedding of QM Graduate Attributes in taught modules

and the project, together with the opportunity to participate in extra-curricular activities, e.g. the School's E++ Society, the School's Annual Programming Competition and external competitions with support from the School.

Programme Specification Approval

Person completing Programme Specification:	Joan Hunter
Person responsible for management of programme:	Soren Riis
Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:	1 December 2021
Date Programme Specification approved by Taught Programmes Board:	

Queen Mary
University of London