Programme Title: BSc Computer Science and Mathematics

Programme Specification

Awarding Body/Institution	Queen Mary University of London
Teaching Institution	Queen Mary University of London
Name of Final Award and Programme Title	Bachelor of Science (BSc) Computer Science and Mathematics
Name of Interim Award(s)	Cert HE, DipHE,BSc
Duration of Study / Period of Registration	3 years FT
QM Programme Code / UCAS Code(s)	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 which will also be involved in teaching part of the programme
N/A

Institution(s) other than Queen Mary that will provide some teaching for the programme
N/A

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 skills 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

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.

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
A 3	specific operating systems
A 4	the common protocols used in networks
A 5	major application areas in the sciences, medicine, industry and commerce
A 6	the mathematical, scientific and engineering elements of computer science
A 7	the historical, social and professional context of computer science

Disciplinary Skills - able to:	
B 1	recognise and appreciate the presence of risk in engineering practice

B 2	solve problems
B 3	appreciate common protocols used in networks

Attributes:	
C 1	manage projects effectively
C 2	produce well-written technical documentation
C 3	implement parts of an operating system
C 4	work effectively as a member of a design and development team
C 5	apply usability principles

QMUL Model Learning Outcomes - Level 4:	
D 1	Identify and discuss their own career aspirations or enterprise skills and knowledge and how they impact on others
D 2	Identify and discuss what their own role in their programme and/or subject discipline might mean to them for future e
D 3	Consider the role of their discipline in diverse cultural and global contexts

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.

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.

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How is the Programme Structured?

Please specify the full time and part time programme diets (if appropriate).

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)
ECS421U Automata and Formal Languages (15 credits)
MTH4101 Calculus II (15 credits)
MTH4103 Geometry I (15 credits)
Semester 1 and 2
ECS422U Skills for Electronic Engineering and Computer Science (non-credit bearing module)

Year 2 Modules
Semester 3
ECS510U Algorithms and Data Structures in an Object Oriented Framework (15 credits)
MTH4107 Introduction to Probability (15 credits)
MTH5112 Linear Algebra I (15 credits)
Plus one module from:
ECS505U Software Engineering (15 credits) (pre requisite for ECS506U)
ECS524U Internet Protocols and Applications (15 credits)
MTH5102 Calculus III (15 credits)
MTH5121 Probability Models (15 credits)
Semester 4
ECS519U Database Systems (15 credits)
Plus one module from:
MTH4104 Introduction to Algebra (15 credits)
MTH4106 Introduction to Statistics (15 credits)
Plus two modules from:
ECS506U Software Engineering Project (15 credits) (pre requisite ECS505U)
ECS518U Operating Systems (15 credits)
ECS522U Graphical User Interfaces (15 credits)
MTH5100 Algebraic Structures I (15 credits)
MTH5103 Complex Variables (15 credits)

Final Year Modules
Semester 5
ECS635U Project (30 credits)
ECS651U Computability, Complexity and Algorithms (15 credits)
Plus two modules from:
ECS604U Entrepreneurship in Information Technology (15 credits)
ECS610U Computer Graphics (15 credits)
ECS639U Web Programming (15 credits)
ECS640U Big Data Processing (15 credits)
ECS650U Semi-Structured Data and Advanced Data Modelling (15 credits)
MTH5102 Calculus III (15 credits)
MTH6107 Chaos and Fractals (15 credits)
MTH6109 Combinatorics (15 credits)

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MTH6140 Linear Algebra II (15 credits)
Semester 6
ECS635U Project (30 credits cont'd)
Plus three modules from:
ECS612U Interaction Design (15 credits)
ECS624U C++ for Image processing (15 credits)
ECS629U Artificial Intelligence (15 credits)
ECS637U Digital Media and Social Networks (15 credits)
ECS641U Communicating and Teaching Computing (UAS)
ECS647U Bayesian Decision and Risk Analysis (15 credits)
ECS655U Security Engineering (15 credits)
ECS656U Distributed Systems (15 credits)
MTH5100 Algebraic Structures I (15 credits)
MTH5103 Complex Variables (15 credits)
MTH6108 Coding Theory (15 credits)
MTH6128 Number Theory (15 credits)

QMUL Model

Students are required to undertake the equivalent of one module (15 credits in 2017/18) per year of study which has been identified as meeting the requirements of the QMUL Model. Each of these modules has been designed to combine the best of QMUL's academic excellence with your ability to identify and develop your skills, networks and experience. This will help to ensure you become a graduate who can undertake further study or secure graduate employment in areas that interest you, and will support your ability to position yourself to find the right job or opportunity for you. The relevant module for your first year of study in 2017/18 is indicated below.

Where more than one module is specified, this is because pertinent elements from these modules have been identified as being appropriate to the QMUL Model and when studied together, deliver the equivalent content of one 15-credit QMUL Model module.

The QMUL Model modules for future years and associated Learning Outcomes will be identified as your studies continue.

Should Professional, Statutory and Regulatory Body requirements apply to your programme of study, these will be taken into account in the specification of QMUL Model requirements.

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Professional and Research Practice	ECS427U	15	4	Compulsory	1	Semester 1	Yes

What Are the Entry Requirements?

General entry requirements
• A-levels: Our A-level entrance requirements are AAB from 3 A levels. We are delighted to receive applications from students who have studied Computer Science at GCSE or A-Level (often called Computing by the examination boards), and in general we prefer Maths and Science based A-levels, though we will consider other combinations of subjects excl General studies.

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• BTEC Extended Diploma (18 units): The BTEC Extended Diploma is acceptable on its own -D*D*D*. It must be subject-related: ICT or Computing .
• International Baccalaureate: We require a minimum of 34 points overall. SL/HL English 4 or above and HL Maths 5 or above.
• Access to HE Diploma: Overall Pass with Access in Computing. Must incl 45 credits at level 3, of which 30 credits must be distinction and 15 credits at Merit or higher.
• European and international qualifications: The College accepts a wide range international qualifications, for information please contact the School.
• Other qualifications: The College welcomes applications from those holding qualifications not listed above. The School will be happy to advise you as to the acceptability of your qualification.

Specific programme entry requirements
• A level Mathematics grade B or higher required along with GCSE grade C or 4 in English

International students - English Language entry requirements
For international students -The minimum requirement is IELTS 6.0 or equivalent.

How Do We Listen and Act on Your Feedback?

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 Learning and Teaching Committee.

The School's Learning and Teaching Committee advises the 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, 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.

Academic Support

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.

Programme-specific Rules and Facts

See Academic Regulations, www.arcs.qmul.ac.uk

Specific Support for Disabled Students

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 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	
Person responsible for management of programme	
Date Programme Specification produced/amended by School Learning and Teaching Committee	

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Date Programme Specification approved by Taught Programmes Board	

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