Programme Title: BSc Computer Science and Mathematics with Industrial Experience

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 with Industrial Experience
Name of Interim Award(s)	Cert HE, Dip HE
Duration of Study / Period of Registration	4 years FT
QM Programme Code / UCAS Code(s)	IG41
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
School of Mathematical Sciences

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. The programme includes a year in industry between the second and final years of study.

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.

The year in industry supports the students in learning about the application of computer science in an organisational context. The aims of the placement year are to:
Ground the taught components of programme in practical experience at a scale not possible within the College;
Improve career preparation, giving students a better understanding of future career options and enhancing their prospects.

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

Programme Title: BSc Computer Science and Mathematics with Industrial Experience

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

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.

The industrial placement is assessed by a combination of written report, viva, learning journal and 2 employer evaluations. The first employer evaluation takes place a few months into the placement and the second takes places shortly before the end of the placement. Each evaluation involves employer and student jointly setting appropriate objectives within a structured framework of categories; progress is later measured against these objectives using set marking criteria.

Programme Title: BSc Computer Science and Mathematics with Industrial Experience

How is the Programme Structured?

Semester 1
ECS401U Procedural Programming
ECS402U Professional and Research Themes
MTH4100 Calculus I
MTH4110 Mathematical Structures

Semester 2
ECS414U Object Oriented Programming
ECS421U Automata and Formal Languages
MTH4101 Calculus II
MTH4103 Geometry I

Semester 1 and 2
ECS422U Skills for Electronic Engineering and Computer Science (non credit bearing module)

Semester 3
ECS510U Algorithms & Data Structures in an OO Framework
MTH4107 Introduction to Probability
MTH5112 Linear Algebra I
Plus one from:
ECS505U Software Engineering (pre requisite for ECS506U)
ECS524U Internet Protocols and Applications
MTH5102 Calculus III
MTH5121 Probability Models

Semester 4
ECS519U Database Systems
Plus one from:
MTH4104 Introduction to Algebra
MTH4106 Introduction to Statistics
Plus two from:
ECS506U Software Engineering Project (pre requisite ECS505U)
ECS518U Operating Systems
ECS522U Graphical User Interfaces
MTH5100 Algebraic Structures I
MTH5103 Complex Variables

Semester 5 and 6
ECS550U Industrial Placement Project

Semester 7
ECS635U Project (30 credits)
ECS651U Computability, Complexity and Algorithms
Plus two from:
ECS604U Entrepreneurship in IT
ECS610U Computer Graphics
ECS612U Interaction Design
ECS640U Big Data Processing
ECS650U Semi-Structured Data and Advanced Data Modelling
MTH5102 Calculus III
MTH 6107 Chaos and Fractals
MTH6109 Combinatorics
MTH6140 Linear Algebra II

Semester 8

Programme Title: BSc Computer Science and Mathematics with Industrial Experience

ECS635U Project (30 credits)
Plus three from:
ECS608U Distributed Systems and Security
ECS624U C++ for Image Processing
ECS629U Artificial Intelligence
ECS639U Web Programming
ECS641U Communicating and Teaching Computing
ECS647U Bayesian Decision and Risk Analysis
MTH5100 Algebraic Structures I
MTH5103 Complex Variables
MTH6108 Coding Theory
MTH6128 Number Theory

Academic Year of Study

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

What Are the Entry Requirements?

General entry requirements
• A-levels: Our A-level entrance requirements are based on 3 A-levels, or 2 A-levels and 2 AS-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.
• Advanced diplomas: The School warmly welcomes applications from students taking Advanced or Extended (level-3) Diplomas in Information Technology or Engineering. We require 320-360 UCAS Tariff points (320 for BSc Computer Science and Mathematics, 340 for BSc(Eng) and BEng, 360 for BSc, MSci and MEng programmes) and applicants must also have passed GCE A-level Mathematics at grade C or above. Grade B or above for BSc Computer Science and Mathematics.
• Vocational or applied A-levels: Vocational A-levels are acceptable and are subject to the above tariff requirements for A/AS-levels. They should be subject-related: electronic engineering or engineering for MEng and BEng programmes. Grade B GCSE Mathematics minimum.
• Key skills: Results of key skills tests will not normally form part of an offer of a place.
• BTEC National Diploma (18 units): The BTEC National Diploma is acceptable on its own and combined with other qualifications with minimum grade requirements: DDM for BEng, MEng, DDD (with Distinctions in all modules) for BSc(Eng), BSc. Your BTEC National Diploma must be subject-related: engineering, electronic engineering for MEng and BEng programmes, computing or related subject for BSc programmes. The IT practitioners Diploma is only accepted for BSc(Eng) programmes. Additionally, we require a minimum Grade C GCSE in mathematics.
• International Baccalaureate: We require a minimum of 32 points overall for BEng and BSc programmes, 34 points for MEng and BSc(Eng) programmes. Subjects must include mathematics HL at least five points for all MEng and BEng programmes and at least six points for all BSc programmes; physics is required for selected MEng and BEng programmes; see programme details.
• European Baccalaureate: We require 80% including grade eight minimum Mathematics for all MEng and BEng programmes. Physics at grade eight required for selected MEng and BEng programmes as per A-level subject requirements, please see programmes for specific requirements.
• Access to HE Diploma: Applicants will be considered on a case-by-case basis. Please contact the School for guidance.
• European and international qualifications: The College accepts a wide range of EU and 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
• 3 A levels including A level Maths grade B or above.

Programme Title: BSc Computer Science and Mathematics with Industrial Experience

International students - English Language entry requirements
For international students, English Language skills are required to a recognised standard. 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 advisor during induction week. The advisor 's role is to guide their advisees in their academic development including module selection, and to provide first-line pastoral support.

In addition, the School has 2 Senior Tutors for undergraduate students who provide second-line guidance and pastoral support for students, as well as advising staff on related matters.

Every member of teaching staff holds 2 open office hours per week during term-time.

Programme-specific Rules and Facts

N/A

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	Jane Reid
Person responsible for management of programme	Graham White
Date Programme Specification produced/amended by School Learning and Teaching Committee	12 Feb 2016
Date Programme Specification approved by Taught Programmes Board	

Queen Mary University of London