

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:	Master of Science (MSci) Computer Science
Name of interim award(s):	Cert HE, Dip HE, BSc
Duration of study / period of registration:	4 years FT
QMUL programme code / UCAS code(s):	G401
QAA Benchmark Group:	Computing
FHEQ Level of Award :	Level 7
Programme accredited by:	Chartered Institute for IT (BCS), Institution of Engineering and Technology (IET)
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:

N/A

Institution(s) other than QMUL that will provide some teaching for the programme:

N/A

Programme outline

The overall aims of this programme are to produce graduates with a sound understanding of the discipline of computer science, good software engineering knowledge and skills and a range of advanced skills and knowledge in selected advanced areas.

The programme has three main themes: software engineering, computer systems and applications. The aim is to provide a good coverage of the foundations of these areas along with the opportunity for students to develop a deeper knowledge of the topics that particularly interest them.

The programme has a strong practical character and students gain experience in building a variety of computer systems in a range of progressively demanding situations.

Alongside this the programme pays attention to the wider context of 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.

This programme is accredited by the Institution of Engineering and Technology on behalf of the Engineering Council for the

purposes of fully meeting the academic requirement for registration as a Chartered Engineer.

Aims of the programme

The overall aims of this programme are to produce graduates with a sound understanding of the discipline of computer science and the knowledge and skills that will enable them to develop rapidly into professional software designers and engineers.

The programme has three main themes: software engineering, computer systems and applications. The aim is to provide a good coverage of the foundations of these areas along with the opportunity for students to develop a deeper knowledge of the topics that particularly interest them.

The programme has a strong practical character and students gain experience in building a variety of computer systems in a range of progressively demanding situations.

Alongside this, the programme pays attention to the wider context of 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, understanding and skills in the following areas. The outcomes are informed by the QAA subject benchmark statement in Computing, the requirements of the BCS and IEE for CEng accreditation and the ACM Computing Curricula 2001.

Software Engineering

- knowledge of the basic theory of programming languages and of the main classes of languages
- experience in using several programming languages
- appreciate the importance of simplicity, robustness and systematic organization in program design
- knowledge of fundamental algorithms and the notion of complexity
- experience in applying a range of methods in the development of large-scale software systems
- knowledge of the software life-cycle, software design methodologies and software development tools
- understanding of database principles and techniques and they role they play in information management

Computer Systems

- knowledge of computer system components and architecture
- understanding of the principles of operating systems and networks and the techniques required for their implementation
- knowledge of specific operating systems including experience in implementing parts of an operating system
- knowledge of the common protocols used in networks

Applications

- knowledge and understanding of some major application areas in the sciences, medicine, industry and commerce
- knowledge of some advanced application techniques and experience with using them in practice
- knowledge of usability principles and the ability to apply them in practice

Generic Knowledge and Transferable Skills

- experience in problem-solving
- work effectively as a member of a design team
- knowledge of project management skills
- appreciate the presence of risk in engineering practice
- produce well-written technical reports
- understanding of the mathematical, scientific and engineering elements of computer science
- understanding of the historical, social and professional context of computer science

QMUL Model

The QMUL Model is an innovative teaching and learning initiative that will broaden opportunities for Queen Mary undergraduates within and beyond higher education, supporting them to plan and manage their ongoing professional development. The Model is firmly grounded in the core QMUL values of respect for, and engagement with, the local area and communities, with a distinctive focus on enabling students to make a positive societal impact through leadership in their chosen field. The Model is organised around the key themes of:

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

Students are required to study QMUL Model modules to the value of at least 10 credits at each year of undergraduate study. Model modules may be 5, 10 or 15 credits. Model modules are indicated within this programme specification.

In your first year of study, the Model module will be core or compulsory and will be situated within your home School or Institute. In subsequent years, students will be strongly encouraged to study at least one Model module beyond their home discipline(s), which could, for example, be in another School / Institute or area of QMUL or undertaken as a module outside of QMUL.

If Model module information is not provided on this programme specification for all subsequent years of study, this will be identified as your studies continue.

Where a Model module elective can be selected from an approved group of Model modules, no guarantee can be provided that your first choice of Model module will be available.

Academic Content:

A 1	Knowledge and skills related to the key field of software engineering, including the ability to design, implement and test algorithms and larger programmes in a rigorous and principled way, and detailed understanding of the software development life-cycle, relevant methodologies and tools.
A 2	Knowledge and skills related to the key field of computer systems, including understanding of the principles of computer architecture, operating systems and networks, and the ability to use specific techniques for small-scale implementations.
A 3	Knowledge and skills related to the key field of applications, including understanding of some of the major application areas in the sciences, medicine, industry and commerce, and the ability to grasp and apply appropriate usability principles and techniques for these areas.

Disciplinary Skills - able to:

B 1	Analyse and solve technical problems effectively, both individually and as part of a design team
B 2	Understand and apply technical project management techniques and skills

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B 3	Demonstrate awareness and understanding of the mathematical, scientific and engineering foundations of the discipline of computer science
B 4	Demonstrate awareness and understanding of the historical, social, professional, industrial and ethical context of the discipline of computer science
B 5	Communicate technical detail effectively to a variety of audiences, both through production of well-written technical reports and through oral presentation / demonstration
B 6	Work with a high degree of independence to define a problem area; perform appropriate research; understand and work within the broader context including client / user needs, constraints and resources; manage the project effectively and efficiently; justify and evaluate the outcomes

Attributes:	
C 1	Connect information and ideas within the broader context of the discipline of computer science
C 2	Acquire and apply knowledge in a critical way, evaluating its reliability and relevance, in order to investigate and solve unfamiliar problems
C 3	Explain complex technical concepts clearly in a variety of settings, to a variety of audiences, using a variety of media
C 4	Develop a strong sense of intellectual and professional integrity
C 5	Think and work creatively, using information and experience as the basis for decision-making
C 6	Identify, select, apply and evaluate appropriate scientific and engineering principles, techniques and tools in the development, usage, maintenance and modification of information systems

QMUL Model Learning Outcomes - Level 4:	
D 1	(Networking) Identify and discuss their own career aspirations or relevant skills and knowledge and how they i
D 2	(Networking) Identify and discuss what their own role in their programme and/or subject discipline might mea
D 3	(International Perspectives) Consider the role of their discipline in diverse cultural and global contexts
D 4	

QMUL Model Learning Outcomes - Level 5:	
E 1	(Enterprising Perspectives) Demonstrate and evaluate how they have enhanced their own learning through engaging
E 2	(Networking) Evaluate and demonstrate their own attitudes, values and skills in the workplace and/or in the wider wo
E 3	(Networking) Evaluate and demonstrate evidence of their skills to support networking and how these have influenced

QMUL Model Learning Outcomes - Level 6:

F 1	
F 2	
F 3	

QMUL Model Learning Outcomes - Level 7:

G 1	
G 2	
G 3	

How will you learn?

All taught courses involve lectures, problem-solving coursework and practical sessions. Lectures are used to introduce principles, methods and techniques and, through the use of examples, to illustrate how they can be applied in practice. Coursework allows students to develop their own skills in design and problem-solving and gain extensive practical experience of building computer systems using a wide range of tools and techniques. Practical sessions provide students with the guidance and help required to achieve this. These sessions take the form of programming laboratories, design studios, exercise classes and project consultancy meetings run by academic staff with the assistance of postgraduate students. On all our courses, students mostly 'learn through doing' and can expect to spend far longer in the teaching laboratory than in lectures. Some core units include short essay writing coursework to develop the skills that are vital for effective presentation of project work.

How will you be assessed?

The assessment of the taught course units takes place through a written examination and coursework.

The final year project is examined on the basis of a written report, a formal oral presentation, and a demonstration of the piece of software developed by the student. Students can also put in some business flavour into their final year projects. In addition to the final year project, other modules introduce project and group working skills.

How is the programme structured?

Please specify the full time and part time programme diets (if applicable). Please also outline the QMUL Model arrangements for each year of study. The description should be sufficiently detailed to fully define the structure of the diet.

Year 1 Modules

Semester 1

ECS401U Procedural Programming (15 credits)

ECS404U Computer Systems and Networks (15 credits)

ECS407U Logic and Discrete Structures (15 credits)

ECS427U Professional and Research Practice (15 credits)

Semester 2

ECS414U Object Oriented Programming (15 credits) 9pre requisite for ECS639U)

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ECS417U Fundamentals of Web Technology (15 credits)
ECS419U Information Systems Analysis (15 credits)
ECS421U Automata and Formal Languages (15 credits)

Year 2 Modules

Semester 3

ECS505U Software Engineering (15 credits)
ECS509U Probability and Matrices (15 credits)
ECS519U Database Systems (15 credits) (pre requisite for ECS650U)
ECS529U Algorithms and Data Structures (15credits)

Semester 4

ECS506U Software Engineering Project (15 credits)
ECS518U Operating Systems (15 credits)
ECS522U Graphical User Interfaces (15 credits)
ECS524U Internet Protocols and Applications (15 credits)

Year 3 Modules

Semester 5

ECS636U Team Project (30 credits)
Plus three modules from:
ECS607U Data Mining (15 credits)
ECS610U Computer Graphics (15 credits)
ECS639U Web Programming (15 credits) (pre requisite ECS414U)
ECS640U Big Data Processing (15 credits)
ECS642U Embedded Systems (15 credits)
ECS650U Semi-Structured Data and Advanced Data Modelling (15 credits) (pre requisite ECS519U)
ECS651U Computability, Complexity and Algorithms 15 credits)

Semester 6

ECS636U Team 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) (15 credits)
ECS647U Bayesian Decision and Risk Analysis (15 credits)
ECS652U Compilers (15 credits)
ECS655U Security Engineering (15 credits)
ECS656U Distributed Systems (15 credits)
ECS657U Multi-platform Games Development (15 credits)
ECS658U Further Object Oriented Programming (15 credits)

Final Year Modules

Semester 7

ECS771U Project (30 credits)
Plus three modules from:
ECS708U Machine Learning (15 credits)
ECS709U Introduction to Computer Vision (15 credits)
ECS712U Design for Human Interaction (15 credits)
ECS713U Functional Programming (15 credits)
ECS715U Program Specifications (15 credits)
ECS763U Natural Language Processing (15 credits)
IPLM701U Introduction to Law for Science and Engineering (15 credits) (pre requisite for IPLM702U)

Semester 8

ECS771U Project (30 credits cont'd)
Plus three modules from:
ECS726U Security Authentication (15 credits)

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ECS727U Real-Time and Critical Systems (15 credits)
 ECS728U Business Technology Strategy (15 credits)
 ECS733U Interactive Systems Design (15 credits)
 ECS735U The Semantic Web (15 credits)
 ECS736U Information Retrieval (15 credits)
 ECS737U Software Analysis and Verification (15 credits)
 ECS784U Data Analytics (15 credits)
 ECS797U Machine Learning for Visual Data Analysis (15 credits)
 IPLM702U Foundations of Intellectual Property Law and Management (15 credits) (must have taken IPLM701U)

Progression Criteria

To progress from one developmental year to the next, a student must meet any programme and pathway requirements and take and pass modules as detailed below. There shall also be an approved threshold requirement, specifying an average mark higher than the pass mark that is required to progress to the next year of the integrated masters. This mark shall be set as standard at a minimum of 50.0.

Individual programme regulations may specify higher thresholds, and/or that the threshold mark should be calculated across multiple developmental years.

- i. foundation year to developmental year one: take modules to the value of 120 credits, and pass modules to the value of 90 credits;
- ii. developmental year one to developmental year two: take modules to the value of 120 credits, and pass modules (excluding modules at Level 3) to the value of 105 credits from developmental year one;
- iii. developmental year two to developmental year three: take modules to the value of 120 credits, and pass modules (excluding modules at Level 3) to the value of 210 credits from developmental years one and two;
- iv. developmental year three to developmental year four:
 Take modules to the value of 120 credits, pass modules (excluding modules at Level 3) to the value of 300 credits from developmental years one, two, and three, and meet any approved threshold requirement that specifies a higher average level achievement than the pass mark;

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	<input checked="" type="checkbox"/>
Procedural Programming	ECS401U	15	4	Compulsory	1	Semester 1	<input type="checkbox"/>
Computer Systems and Networks	ECS404U	15	4	Compulsory	1	Semester 1	<input type="checkbox"/>
Logic and Discrete Structures	ECS407U	15	4	Compulsory	1	Semester 1	<input type="checkbox"/>

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Object Oriented Programming	ECS414U	15	4	Compulsory	1	Semester 2	<input type="checkbox"/>
Fundamentals of Web Technology	ECS417U	15	4	Compulsory	1	Semester 2	<input type="checkbox"/>
Information Systems Analysis	ECS419U	15	4	Compulsory	1	Semester 2	<input type="checkbox"/>
Automata and Formal Languages	ECS421U	15	4	Compulsory	1	Semester 2	<input type="checkbox"/>

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Software Engineering	ECS505U	15	5	Compulsory	2	Semester 1	<input type="checkbox"/>
Probability and Matrices	ECS509U	15	5	Compulsory	2	Semester 1	<input type="checkbox"/>
Database Systems	ECS519U	15	5	Compulsory	2	Semester 1	<input type="checkbox"/>
Algorithms and Data Structures	ECS529U	15	5	Compulsory	2	Semester 1	<input type="checkbox"/>
Software Engineering Project	ECS506U	15	5	Compulsory	2	Semester 2	Yes
Operating Systems	ECS518U	15	5	Compulsory	2	Semester 2	<input type="checkbox"/>
Graphical User Interfaces	ECS522U	15	5	Compulsory	2	Semester 2	<input type="checkbox"/>
Internet Protocols and Applications	ECS524U	15	5	Compulsory	2	Semester 2	<input type="checkbox"/>

Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Team Project	ECS636U	30	6	Compulsory	3	Semesters 1 & 2	No
Data Mining	ECS607U	15	6	Elective	3	Semester 1	<input type="checkbox"/>
Computer Graphics	ECS610U	15	6	Elective	3	Semester 1	<input type="checkbox"/>
Web Programming	ECS639U	15	6	Elective	3	Semester 1	<input type="checkbox"/>
Big Data Processing	ECS640U	15	6	Elective	3	Semester 1	<input type="checkbox"/>
Embedded Systems	ECS642U	15	6	Elective	3	Semester 1	<input type="checkbox"/>
Semi-Structured Data and Advanced Data Modelling	ECS650U	15	6	Elective	3	Semester 1	<input type="checkbox"/>
Computability, Complexity and Algorithms	ECS651U	15	6	Elective	3	Semester 1	<input type="checkbox"/>
Image Processing	ECS605U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Interaction Design	ECS612U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Artificial Intelligence	ECS629U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Digital Media and Social Networks	ECS637U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Communicating and Teaching Computing (UAS)	ECS641U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Bayesian Decision and Risk Analysis	ECS647U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Compilers	ECS652U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Security Engineering	ECS655U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Distributed Systems	ECS656U	15	6	Elective	3	Semester 2	<input type="checkbox"/>
Multi-platform Games Development	ECS657U	15	6	Elective	3	Semester 2	<input type="checkbox"/>

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Further Object Oriented Programming	EC658U	15	6	Elective	3	Semester 2	<input type="checkbox"/>

Academic Year of Study FT - Year 4

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Project	ECS771U	30	7	Core	4	Semesters 1 & 2	<input type="checkbox"/>
Machine Learning	ECS708U	15	7	Elective	4	Semester 1	<input type="checkbox"/>
Introduction to Computer Vision	ECS709U	15	7	Elective	4	Semester 1	<input type="checkbox"/>
Design for Human Interaction	ECS712U	15	7	Elective	4	Semester 1	<input type="checkbox"/>
Functional Programming	ECS713U	15	7	Elective	4	Semester 1	<input type="checkbox"/>
Program Specifications	ECS715U	15	7	Elective	4	Semester 1	<input type="checkbox"/>
Introduction to Law for Science and Engineering	IPLM701U	15	7	Elective	4	Semester 1	<input type="checkbox"/>
Security Authentication	ECS726U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
Real-Time and Critical Systems	ECS727U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
Business Technology Strategy	ECS728U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
Interactive Systems Design	ECS733U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
The Semantic Web	ECS735U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
Information Retrieval	ECS736U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
Software Analysis and Verification	ECS737U	15	7	Elective	4	Semester 2	<input type="checkbox"/>

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Natural Language Processing	ECS763U	15	7	Elective	4	Semester 1	<input type="checkbox"/>
Data Analytics	ECS784U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
Machine Learning for Visual Data Analytics	ECS797U	15	7	Elective	4	Semester 2	<input type="checkbox"/>
Foundations of Intellectual Property Law and Management	IPLM702U	15	7	Elective	4	Semester 2	<input type="checkbox"/>

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?

EECS has a Student Experience Teaching Learning and Assessment (SELTA) 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 Taught Programmes to ensure each programme is current and can be delivered effectively.

How do we listen to 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 Student Experience Learning Teaching And Assessment (SETLA) Committee.

The School's SETLA 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.

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.

Programme-specific rules and facts

Further information on the Academic Regulations can be found at <http://www.arcs.qmul.ac.uk/media/arcs/policyzone/academic/Academic-Regulations-2017-18.pdf>

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.

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.

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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. Merrill 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 / Institute Learning and Teaching Committee:

Date Programme Specification approved by Taught Programmes Board: