Programme Title: MEng Electrical and Electronic Engineering

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:	MEng (Hons) Electrical and Electronic Engineering
Name of interim award(s):	Cert HE, Dip HE, BSc(Eng),BEng
Duration of study / period of registration:	4 years FT
QMUL programme code / UCAS code(s):	H608
QAA Benchmark Group:	Engineering
FHEQ Level of Award :	Level 7
Programme accredited by:	IET (pending)
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 Engineering & Materials Science

School of Mathematical Sciences

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

N/A

Programme outline

The programme offers the opportunity to gain in-depth technical knowledge of electrical and electronic engineering, practical and hands-on experience to prepare you for real-world applications, and develop important transferable skills through individual and group project work. This programme will provide both the foundations and specialist knowledge you will need for a wide-range high-quality electrical and electronic engineering careers across a variety of sectors, in industry, business and R&D.

The choice of modules available allows you to get a general grounding in the science and mathematics underlying electrical and electronic engineering, like engineering mathematics, analog and digital electronics, electromagnetism, signals and systems, communications, computing. In later years you will be offered an increasing number of options to choose from to develop your own specialisation in subjects that interest you. By the end of the programme, successful students will have the skills to analyse, develop, design, and build electrical and electronic systems within their own specialisation of choice. In this programme you will develop skills that enable you to be creative, innovative and flexible in devising engineering solutions; knowledge and techniques to break problems into manageable chunks to solve issues in a systematic manner; and you will

learn how to apply your numerical, computational, analytical and technical skills, using appropriate tools, in that process.

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

This is one of our MEng programmes, which is an integrated masters programme that both include technical content beyond normal first degree level and additional content on economic, social and environmental issues. In addition they provide enhanced experience of project management in a group activity.

The programme aims to provide a broad yet deep knowledge and understanding in the area of electrical and electronic engineering that prepare the graduates for the wide range of high-end professional careers in the relevant industries, such as electronics, power and electrical systems, automation and control, mobile and satellite communications, network engineering, embedded systems engineering, where they will be able to take on a variety of roles, for example, in research and development, systems engineering, systems integration, operations, technical consultancy and education. Graduates from the programme will also have an excellent grounding to continue their education at a postgraduate level, should they wish to do so.

The programme addresses the skills gap in the UK industry and responds to the international demand for a broad-based yet thorough high-level education sought after by employers world-wide. Apart from specialised knowledge, great emphasis is given to transferable skills that impact on graduates' employability, such as management of own workload, team working, effective communication, integrated thinking, leadership of projects and teams, and risk management.

What will you be expected to achieve?

Graduates from the programme will be expected to have:

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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 of the scientific and engineering principles necessary to underpin an education and career in electrical and electronic engineering
A 2	Understanding of mathematical principles underpinning electronic and electrical engineering, in addition to the mathematical methods, tools and notations used in the analysis of electrical and electronic engineering problems..
A 3	An understanding of concepts from a range of areas including some outside electrical and electronic engineering, and the ability to apply them effectively in electronic and electrical engineering projects.
A 4	An awareness of developing technologies related to electrical and electronic engineering.
A 5	Knowledge of the regulatory, ethical, economic and environmental issues underpinning engineering professions, especially associated with electrical and electronic engineering, and how an engineer must operate within these.
A 6	Knowledge of the design process and understanding of project management principles and tools.
A 7	Awareness of market drivers within sub-specialisations of electrical and electronic engineering.
A 8	Project management skills.

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A 9	Understanding of engineering principles and the ability to apply them to undertake critical analysis of key engineering processes, esp. as pertaining to electrical and electronic engineering.

Disciplinary Skills - able to:	
B 1	Apply engineering principles to analyse problems in electrical and electronic engineering.
B 2	Extract data pertinent to an unfamiliar problem, analyse it, and interpret results, particularly in relation to the electrical and electronic engineering.
B 3	Apply numerical / quantitative methods and computer software relevant to engineering disciplines, to solve problems in electrical and electronic engineering.
B 4	Learn new theories, concepts, methods etc. in unfamiliar situations.
B 5	Use fundamental knowledge to investigate new and emerging technologies.
B 6	Work effectively with computing tools for data analysis and processing, as well as modelling, simulation and design.
B 7	Plan and perform safe experimental work in laboratory settings.
B 8	Use laboratory instrumentation correctly.
B 9	Develop, monitor and update a plan, to reflect a changing operating environment.
B 10	Exercise professional judgement in electrical and electronic engineering-related problem solving, considering ethical, economic and environmental issues.
B 11	Apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline and the ability to evaluate learnings from other disciplines critically and to apply them effectively.
B 12	Understand and evaluate business, customer and user needs, including considerations such as the wider engineering context and public perception.
B 13	Communicate their work to technical and non-technical audiences.
B 14	Demonstrate the ability to generate an innovative design for products, systems, components or processes to fulfil new needs.

Attributes:	
C 1	Develop the necessary transferable skills to be effective in the workplace.
C 2	Engage critically with knowledge, and apply it in a rigorous way.
C 3	Critically evaluate the reliability of information from different sources.
C 4	Use information for evidence based decision making
C 5	Use quantitative data confidently and competently.

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C 6	Use a range of communication technologies to engage with a range of audiences.
C 7	Develop an awareness of Health and Safety.
C 8	Be able to isolate the key facts from complex, often contradictory information.

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**

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 influencec

QMUL Model Learning Outcomes - Level 6:	
F 1	

QMUL Model Learning Outcomes - Level 7:	
G 1	

How will you learn?

Learning will be realised through a range of techniques and delivery methods. Teaching materials are delivered through a combination of lectures, problem solving classes, and laboratory exercises which will form both formative and summattive assessment across various modules. Coursework will cement knowledge gained, and will take forms of on-line and class tests, laboratory and technical reports, and laboratory notes. Problem-based learning plays a significant role in the first three years.

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Electronics laboratory is a dedicated space that will be heavily utilised throughout the study, for various labs and project work. ITL is EECS-only space dedicated to both teaching and self-directed learning, equipped with the necessary tools and software environments that will be used across a number of modules for teaching and learning.

Students will undertake a group "design and build" project in the second year, a major individual project in the third year, that can be research-based, design and build, service or product integration, or an application development, and a substantive group project (either research or design and build) in the fourth year. The latter could be sponsored by one of our industrial partners. All projects are designed to help students integrate, assimilate and apply knowledge and skills gained throughout the degree, and give them an opportunity to develop and practice transferable employability skills such as group and team working, project planning, time management, written and oral communication of technical content to a mix of audiences. The projects will also help students acquire generic engineering professional skills such as research methods, design and development methods, product or service testing, market assessment and business case presentation.

Associated with each 15-credit module is 150h of study time, one third of which , on average, will be delivered through lectures, tutorials and laboratory exercises, and the rest is expected to be student-driven self-study using library, Internet and other resources. Materials of all modules are provided on QMPlus. In the final year, some of the modules will have invited lectures given by experts from industry. We will also be using our strong base of industrial partners to generate substantial advanced group projects in the final, fourth year.

How will you be assessed?

Assessment is continuous throughout the degree, with written reports, projects, presentations, group work and exams (exams take place in the summer only). The degree programme has eight modules per year split over two semesters, and most are assessed by a combination of coursework and an end of year exam. Some modules will also have an element of in-class tests, that will be form part of assessment for those modules.
Individual research or design projects in the third year counts as two modules and lasts through both semesters. In the third and fourth year, students can select from a range of module options allowing them to tailor their degree to specific areas of interest within their degree programme.
The 3rd and final year projects are examined on the basis of a written report, a formal oral presentation, and a demonstration of the piece of software or hardware developed by the student(s).

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
Semester1
ECS401U Procedural Programming (15 credits)
ECS408U Electronic Engineering Mathematics I (15 credits)
ECS412U Digital Circuit Design (15 credits)
ECS427U Professional and Research Practice (15 credits)
Semester 2
ECS403U Communications and Networks (15 credits)
ECS409U Analogue Electronic Systems (15 credits)
ECS411U Signals and Information (15 credits)
ECS423U Electronic Engineering Mathematics 2 (15 credits)
Semester 1 and Semester 2
ECS4**U Skills for Electronic Engineering (non-credit bearing module)

Year 2 Modules
Semester3
ECS501U C Programming (15 credits)
ECS502U Microprocessor Systems Design (15 credits)
ECS517U Electronic Devices and Applications (15 credits)
ECS528U Communications Systems (15 credits)
Semester 4

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ECS504U Electric and Magnetic Fields (15 credits)
ECS514U Design and Build Project in Electronic Engineering (15 credits)
ECS515U Signals and Systems Theory (15 credits)
ECS527U Digital Systems Design (15 credits) (pre-requisite for ECS617U)

Final Year Modules
Semester 5
ECS625U Project (30 credits)
ECS643U Power Electronics (15 credits)
Plus two modules from:
ECS601U Control Systems (15 credits)
ECS602U Digital Signal Processing (15 credits)
ECS607U Data Mining (15 credits)
ECS639U Web Programming (15 credits)
ECS642U Embedded Systems (15 credits)
ECS644U Microwave and Millimetrewave Electronics (15 credits)
Semester 6
ECS625U Project (cont) (30 credits)
ECS649U Electrical Machines and Systems (15 credits)
Plus two modules from:
ECS617U Integrated Circuit Design (15 credits) (pre-requisite ECS527U)
ECS619U Network Planning, Finance and Management (15 credits)
ECS622U Product Development (15 credits)
ECS637U Digital Media and Social Networks (15 credits)
ECS645U Microwave and Millimetrewave Communications Systems (15 credits)
ECS654U Advanced Control Systems (15 credits)

Year 4 provisional
Semester 7
ECS702U Mobile and WLAN Technologies (15 credits)
ECS703U 21st Century Networks (15 credits)
ECS707U Fundamentals of DSP (15 credits) (if not taken as ECS602U in Semester 5)
ECS709U Introduction to Computer Vision (15 credits)
ECS783U Enabling Communication Technologies for IOT (15 credits)
DEN7001 Advanced Flight Control and Simulation of Aerospace Vehicles (15 credits)
DENM114 Engineering Methods (15 credits)
IPLM701U Introduction to Law for Science and Engineering (15 credits)

Semester 8
ECSXXXU Advanced Group Project (15 credits)
ECS724U Network Modeling and Performance (15 credits)
ECS726U Security and Authentication (15 credits)
ECS728U Business Technology Strategy (15 credits)
ECS732U Real Time DSP (15 credits)
ECS734U Technics for Computer Vision (15 credits)
DEN406 Clinical Measurements (15 credits)
DEN433 Energy Economics and Management of Sustainable Energy (15 credits)
DEN7600 Energy Storage Engineering (15 credits)
DEN7601 Introduction to Solar Energy (15 credits)
IPLM702U Foundations of Intellectual Property Law and Management (15 credits)
MTH739P Topics in Scientific Computing (15 credits)

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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
Procedural Programming	ECS401U	15	4	Compulsory	1	Semester 1	
Electronic Engineering Mathematics I	ECS408U	15	4	Compulsory	1	Semester 1	
Digital Circuit Design	ECS412U	15	4	Compulsory	1	Semester 1	
Communications and Networks	ECS403U	15	4	Compulsory	1	Semester 2	
Analogue Electronic Systems	ECS409U	15	4	Compulsory	1	Semester 2	
Signals and Information	ECS411U	15	4	Compulsory	1	Semester 2	
Electronic Engineering Mathematics	ECS423U	15	4	Compulsory	1	Semester 2	
Skills for Electronic Engineering	ECS4**U	0	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	QMUL Model
C Programming	ECS501U	15	5	Compulsory	2	Semester 1	
Microprocessor Systems Design	ECS502U	15	5	Compulsory	2	Semester 1	
Electronic Devices and Applications	ECS517U	15	5	Compulsory	2	Semester 1	
Communications Systems	ECS528U	15	5	Compulsory	2	Semester 1	
Electric and Magnetic Fields	ECS504U	15	5	Compulsory	2	Semester 2	

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Design and Build Project in Electronic Engineering	ECS514U	15	5	Compulsory	2	Semester 2	Yes
Signals and Systems Theory	ECS515U	15	5	Compulsory	2	Semester 2	
Digital Systems Design	ECS527U	15	5	Compulsory	2	Semester 2	

Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Project	ECS625U	30	6	Core	3	Semesters 1 & 2	
Power Electronics	ECS643U	15	6	Compulsory	3	Semester 1	
Control Systems	ECS601U	15	6	Elective	3	Semester 1	
Digital Signal Processing	ECS602U	15	6	Elective	3	Semester 1	
Data Mining	ECS607U	15	6	Elective	3	Semester 1	
Web Programming	ECS639U	15	6	Elective	3	Semester 1	
Embedded Systems	ECS642U	15	6	Elective	3	Semester 1	
Microwave and Millimetrewave Electronics	ECS644U	15	6	Elective	3	Semester 1	
Electrical Machines and Systems	ECS649U	15	6	Compulsory	3	Semester 2	
Integrated Circuit Design	ECS617U	15	6	Elective	3	Semester 2	
Network Planning, Finance and Management	ECS619U	15	6	Elective	3	Semester 2	
Product Development	ECS622U	15	6	Elective	3	Semester 2	

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Digital Media and Social Networks	ECS637U	15	6	Elective	3	Semester 2	
Microwave and Millimetrewave Communications Systems	ECS645U	15	6	Elective	3	Semester 2	
Advanced Control Systems	ECS654U	15	6	Elective	3	Semester 2	

Academic Year of Study FT - Year 4

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Advanced Group Project	ECS***U	30	7	Core	4	Semester 1	
Mobile and WLAN Technologies	ECS702U	15	7	Elective	4	Semester 1	
21st Century Networks	ECS703U	15	7	Elective	4	Semester 1	
Fundamentals of DSP	ECS707U	15	7	Elective	4	Semester 1	
Introduction to Computer Vision	ECS709U	15	7	Elective	4	Semester 1	
Enabling Communication Technologies for IOT	ECS783U	15	7	Elective	4	Semester 1	
Advanced Flight Control and Simulation of Aerospace Vehicle	DEN7001	15	7	Elective	4	Semester 1	
DENM114 Engineering Methods	DENM114	15	7	Elective	4	Semester 1	
Introduction to Law for Science and Engineering	IPLM701U	15	7	Elective	4	Semester 1	
Security and Authentication	ECS726U	15	7	Elective	4	Semester 2	
Business Technology Strategy	ECS728U	15	7	Elective	4	Semester 2	
Real Time DSP	ECS732U	15	7	Elective	4	Semester 2	

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester	QMUL Model
Machine Learning for Visual Data Analysis	ECS797U	15	7	Elective	4	Semester 2	
Clinical Measurements	DEN406	15	7	Elective	4	Semester 2	
Energy Economics and Management of Sustainable Energy	DEN433	15	7	Elective	4	Semester 2	
Introduction to Solar Energy	DEN7601	15	7	Elective	4	Semester 2	
Topics in Scientific Computing	MTH739U	15	7	Elective	4	Semester 2	
Foundations of Intellectual Property Law and Management	IPLM702U	15	7	Elective	4	Semester 2	

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 Staff-Student Liaison Committee provides a formal means of communication and discussion between the Schools and its students. The committee consists of student representatives from each year of the programme, together with appropriate representation from staff within the Schools. 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 chair of the SSLC sits on the School's SETLA Committee (Student Experience, Teaching and Learning), which advises the School's Director of Taught Programmes on all matters relating to the delivery of taught programmes at School level, and ensures that student feedback is fed into the reviewing 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), student module evaluations and module forums. We also use the forums to listen to student feedback on an individual module basis and develop materials and support classes to address comments or requests suggested in the forum. In addition, the school also has Senior Tutors dedicated for UG students who will be the first point for pastoral and general programme and teaching & learning issues.

All Schools operate an Annual Programme Review (APR) of their taught undergraduate and postgraduate provision. APR 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 Taught Programmes Action Plan (TPAP) which is the summary of the School's work throughout the year to monitor academic standards and to improve the student experience.

What academic support is available?

Academic support for individual modules is the responsibility of the module organiser and co-organiser(s). These are supported by Demonstrators and post-graduate students, many of whom will have studied the modules themselves as undergraduates in the School. In addition there is technician support available for practical sessions in labs.
Academic support for the programme as a whole, including choosing optional modules and possible transfer between programmes is provided in the first instance by the Personal Tutor, with further guidance available from the Senior Tutor and Programme Coordinator, the latter having overall responsibility for the programme structure.

We additionally have a Teaching Services team, with many student-facing staff available to support student learning and one full time Student Support Officer. These staff members will help with coursework submission, time tabling concerns and other general administration as well as providing pastoral support and further guidance on dealing with extenuating circumstances. We also have staff designated to support students in achieving industrial placements and providing careers advice.

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.

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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 / Institute Learning and Teaching Committee:	
Date Programme Specification approved by Taught Programmes Board:	

Queen Mary University of London