



## 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:	Bachelor of Engineering (BEng) Computer Systems Engineering with Industrial Experience
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):	H163
QAA Benchmark Group:	Engineering
FHEQ Level of Award :	Level 6
Programme accredited by:	The Institution of Engineering and Technology
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

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

N/A

### Programme outline

This programme integrates electronic engineering and computer science to provide skills across many hardware and software aspects of computing, from the design of individual microprocessors, circuit design, to distributed-computer systems. The course prepares the student for a wide range of careers related to the electronics and computing industry, the Internet operations industry and the manufacturing industry.

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

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 an Incorporated Engineer and partly meeting the academic requirement for registration as a Chartered Engineer.

### Aims of the programme

This programme is one of a group of accredited degrees with the same broad aims and objectives; the difference being that they each emphasise different technical skills and knowledge within the broad spectrum that is now Electronic Engineering. Skill-

based aims and objectives are, therefore, common across the family, but the instantiation of these objectives may make use of different technical aspects within the family.

Context-based aims and objectives describe the differences between the programmes and Level-based aims and objectives between the BEng and MEng degrees.

The Computer Systems Engineering programmes strike a balance between computer science and electronic engineering. Fundamental computer science topics are covered; however, core modules in electronic engineering are also included in the programme. The aim is to provide students with a more practical awareness of engineering concepts, allowing them to apply scientific knowledge in a commercial / industrial context focused on computer control, interfacing and automation, where appreciation of practical requirements and constraints can better inform the design and implementation processes.

The year in industry supports the students in learning about the application of computer science and/or electronic engineering in an organisational context. The aims of the placement year are to:

- Ground the taught components of the 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 career prospects.

### What will you be expected to achieve?

At the end of his/her degree, each student should be able to demonstrate the following abilities:

- The ability to recall factual knowledge and the ability to apply it in familiar and unfamiliar situations;
- The ability to apply scientific, mathematical and software 'tools' to a familiar or unfamiliar situation;
- The ability to use Information Technology as a key tool pervading all aspects of Electronic Engineering;
- The ability to understand practical issues concerning real systems (whether hardware or software);
- The ability to recognise insufficient existing knowledge and the ability to search for the necessary scientific, mathematical and software 'tools' relevant to that particular issue;
- The ability to work as part of a team;
- The ability to manage time effectively;
- The ability to appreciate the financial background against which decisions are made in industry;
- The ability to show a certain level of reflection on the role of engineering in society;

and the following skills:

- The perceptive skills needed to understand information presented in the form of technical circuit-diagrams, flow-charts and high-level languages;
- The practical skills needed to implement a piece of hardware or software and to use laboratory test equipment;
- The analytical skills needed to verify the correct behaviour of a hardware or software system or component and to be able to identify faults;
- The design skills needed to synthesise a design (in hardware and/or software) from a specification (including the choice of the best option from a range of alternatives), to implement the design and to evaluate the design against the original specification;
- The written and oral communication skills needed to present information, in particular written information, effectively;
- The critical reasoning skills needed to appraise a particular topic.

Context-based aims and objectives

- To emphasise computer systems and software
- To focus on the increasingly important areas of microprocessor and microcontroller based systems, digital systems design, and integrated circuit design (with CMOS technology), including the use of field-programmable logic
- To introduce the hardware description language VHDL for digital design, simulation and subsequent synthesis.

**Please note that the following information is only applicable to students who commenced their Level 4 studies in 2017/18, or 2018/19**

In each year of undergraduate study, students are required to study modules to the value of at least 10 credits, which align to one or more of the following themes:

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

These modules will be identified through the Module Directory, and / or by your School or Institute as your studies progress.

Academic Content:	
A 1	[US1] Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current and future developments and technologies.
A 2	[US2] Knowledge and understanding of mathematical principles necessary to underpin their education in engineering discipline and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems.
A 3	[EA1] Understanding of engineering principles and the ability to apply them to analyse key engineering processes.
A 4	[EA3] Ability to apply quantitative methods and computer software relevant to the engineering discipline, in order to solve engineering problems.
A 5	[EA4] Understanding of a systems approach to engineering problems and to work with uncertainty.
A 6	[P7] Awareness of quality issues

Disciplinary Skills - able to:	
B 1	[US3] Ability to apply and integrate knowledge and understand of other engineering disciplines to support study of their own engineering discipline.
B 2	[EA2] Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.
B 3	[D1] Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues.
B 4	[D4] Use creativity to establish innovative solutions.
B 5	[D5] Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal.

B 6	[P8] Ability to work with technical uncertainty.
B 7	... produce a coherent technical presentation in written or oral form;
B 8	... present a coherent argument;
B 9	... acquire and apply knowledge in a rigorous way to new and unfamiliar situations;
B 10	... use quantitative data in analysis and synthesis in engineering problems.

Attributes:	
C 1	[S1] Knowledge and understanding of commercial and economic context of engineering processes.
C 2	[S5] Understanding of the need for a high level of professional and ethical conduct in engineering.

### 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. The Projects Coordinator also runs a thread of taught sessions to support the project module.

### 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 or hardware developed by the student. In addition to the final year project, other modules introduce project and group working skills.

The assessment for the placement year includes an employer evaluation and the production of a reflective learning log, in addition to an oral presentation.

### How is the programme structured?

Please specify the structure of the programme diets for all variants of the programme (e.g. full-time, part-time - if applicable). The description should be sufficiently detailed to fully define the structure of the diet.

Year 1 Modules  
 Semester 1  
 ECS401U Procedural Programming (15 credits)  
 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

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ECS409U Analogue Electronic Systems (15 credits)  
 ECS411U Signals and Information (15 credits)  
 ECS414U Object Oriented Programming (15 credits) (pre requisite for ECS639U)

Year 2 Modules

Semester 3

ECS501U C Programming (15 credits) (pre requisite for ECS642U)  
 ECS502U Microprocessor Systems Design (15 credits)  
 ECS505U Software Engineering (15 credits)  
 ECS528U Communications Systems (15 credits)

Semester 4

ECS506U Software Engineering Project (15 credits) (pre requisite for ECS647U)  
 ECS518U Operating Systems (15 credits)  
 ECS527U Digital Systems Design (15 credits) (pre requisite for ECS617U)

Plus one module from:

ECS515U Signals and Systems Theory (15 credits)  
 ECS522U Graphical User Interfaces (15 credits)

Year 3 Modules

Semester 5 and 6

ECS551U Industrial Placement Project (120 credits) (Core)

Final Year Modules

Semester 7

ECS625U Project (30 credits) (Core)  
 ECS642U Embedded Systems (15 credits) (pre requisite ECS501U/ECS518U)

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) (pre requisite ECS414U)  
 ECS640U Big Data Processing (15 credits)

Semester 8

ECS625U Project (cont. 30 credits) (Core)  
 ECS617U Integrated Circuit Design (15 credits) (pre requisite ECS527U)

Plus two modules from:

ECS612U Interaction Design (15 credits)  
 ECS622U Product Development (15 credits)  
 ECS605U Image Processing (15 credits)  
 ECS637U Digital Media and Social Networks (15 credits)  
 ECS647U Bayesian Decision and Risk Analysis (15 credits) (pre requisite ECS505U)  
 ECS654U Advanced Control Systems (15 credits) pre requisite ECS601U  
 ECS655U Security Engineering (15 credits)  
 ECS656U Distributed Systems (15 credits)

Academic Year of Study FT - Year 1

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Procedural Programming	ECS401U	15	4	Compulsory	1	Semester 1

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Electronic Engineering Mathematics I	ECS408U	15	4	Compulsory	1	Semester 1
Digital Circuit Design	ECS412U	15	4	Compulsory	1	Semester 1
Professional and Research Practice	ECS427U	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
Object Oriented Programming	ECS414U	15	4	Compulsory	1	Semester 2

Academic Year of Study FT - Year 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
C Programming	ECS501U	15	5	Compulsory	2	Semester 1
Microprocessor Systems Design	ECS502U	15	5	Compulsory	2	Semester 1
Software Engineering	ECS505U	15	5	Compulsory	2	Semester 1
Communications Systems	ECS528U	15	5	Compulsory	2	Semester 1
Software Engineering Project	ECS506U	15	5	Compulsory	2	Semester 2
Operating Systems	ECS518U	15	5	Compulsory	2	Semester 2
Digital Systems Design	ECS527U	15	5	Compulsory	2	Semester 2
Signals and Systems Theory	ECS515U	15	5	Elective	2	Semester 2

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Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Graphical User Interfaces	ECS522U	15	5	Elective	2	Semester 2

Academic Year of Study FT - Year 3

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Industrial Placement Project	ECS551U	120	5	Core	3	Semesters 1 & 2

Academic Year of Study FT - Year 4

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Project	ECS625U	30	6	Core	4	Semesters 1 & 2
Embedded Systems	ECS642U	15	6	Compulsory	4	Semester 1
Control Systems	ECS601U	15	6	Elective	4	Semester 1
Digital Signal Processing	ECS602U	15	6	Elective	4	Semester 1
Data Mining	ECS607U	15	6	Elective	4	Semester 1
Web Programming	ECS639U	15	6	Elective	4	Semester 1
Big Data Processing	ECS640U	15	6	Elective	4	Semester 1
Integrated Circuit Design	ECS617U	15	6	Compulsory	4	Semester 2
Image Processing	ECS605U	15	6	Elective	4	Semester 2
Interaction Design	ECs612U	15	6	Elective	4	Semester 2

Module Title	Module Code	Credits	Level	Module Selection Status	Academic Year of Study	Semester
Product Development	ECS622U	15	6	Elective	4	Semester 2
Digital Media and Social Networks	ECS637U	15	6	Elective	4	Semester 2
Bayesian Decision and Risk Analysis	ECS647U	15	6	Elective	4	Semester 2
Advanced Control Systems	ECS654U	15	6	Elective	4	Semester 2
Security Engineering	ECS655U	15	6	Elective	4	Semester 2
Distributed Systems	ECS656U	15	6	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? How do we listen to and act on your feedback?

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

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

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

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

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

The School's Teaching and Learning Committee (TLC) advises the Director of Education on all matters relating to the delivery of taught programmes at school level including monitoring the application of relevant QM policies and reviewing all proposals for module and programme approval and amendment before submission to Taught Programmes Board. Student views are



incorporated in this Committee's work in a number of ways, including through student membership and consideration of student surveys and module questionnaires.

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

### **What academic support is available?**

All students are assigned an academic adviser during induction week. The adviser's role is to guide advisees in their academic development including module selection and to provide first-line pastoral support.

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

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

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

The year in industry is supported by a dedicated Industrial Placements Manager.

### **How inclusive is the programme for all students, including those with disabilities?**

Queen Mary has a central Disability and Dyslexia Service (DDS) that offers support for all students with disabilities, specific learning difficulties and mental health issues. The DDS supports all Queen Mary students: full-time, part-time, undergraduate, postgraduate, UK and international at all campuses and all sites.

Students can access advice, guidance and support in the following areas:

- Finding out if you have a specific learning difficulty like dyslexia
- Applying for funding through the Disabled Students' Allowance (DSA)
- Arranging DSA assessments of need
- Special arrangements in examinations
- Accessing loaned equipment (e.g. digital recorders)
- Specialist one-to-one "study skills" tuition
- Ensuring access to course materials in alternative formats (e.g. Braille)
- Providing educational support workers (e.g. note-takers, readers, library assistants)
- Mentoring support for students with mental health issues and conditions on the autistic spectrum.

Where recommended by DDS or the School Student Support Officer, reasonable adjustment is made across the programme for students with special needs.

### **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-2020-21.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.

### **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. 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.

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## Programme Specification Approval

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**Person completing Programme Specification:**

Joan Hunter

**Person responsible for management of programme:**

Chris Phillips

**Date Programme Specification produced / amended by School / Institute Learning and Teaching Committee:**

27 May 2021

**Date Programme Specification approved by Taught Programmes Board:**