Programme Title: BEng Electronic Engineering and Telecommunications

# Programme Specification (UG)

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| 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) Electronic Engineering and Telecommunications |
| Name of interim award(s): | Cert HE, Dip HE, BSc(Eng), BEng |
| Duration of study / period of registration: | 3 years FT |
| QMUL programme code / UCAS code(s): | H691 |
| QAA Benchmark Group: | Engineering |
| FHEQ Level of Award : | Level 6 |
| Programme accredited by: | 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

This programme covers the most rapidly growing areas of electronic engineering and all aspects of communications. You will learn about microwave and optical systems as well as the design, operation, and management of large-scale communication networks for computers and voice and video signals. A range of technical and business modules provides a strong engineering foundation to this specialised degree.

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

he accredited degrees form a group of programmes with the same broad aims and objectives; the difference being that they address different technical flavours of 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 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 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 provide a wide coverage of telecommunications systems from physical layer, through network layer to applications.
• To emphasise Electromagnetics as the key underlying theoretical base for wireless communications.
• To provide practical skills in Electromagnetics.
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• 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;
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• To emphasise electromagnetics as the key underlying theoretical base for wireless communications.
• To provide practical skills in electromagnetics.

## 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 | Theory, principles, concepts and methodologies fundamental to electronic and telecommunications engineering. |
| A 2 | Role of business processes in engineering, including the commercial, societal and legal processes; moral and ethical issues including professional conduct and intellectual property. |

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| Disciplinary Skills - able to: | |
|---|---|
| B 1 | Demonstrate the comprehension and higher level cognitive skills necessary to solve practical problems of constrained complexity using the fundamental concepts and physical principles that underpin electronic and telecommunications engineering in the key areas of circuits, systems, networks and algorithms. |
| B 2 | Demonstrate a level of software engineering and programming skills that are appropriate to electronic and telecommunications engineering. |
| B 3 | Demonstrate the ability to analyse and evaluate using the appropriate mathematical principles and techniques that underpin the analysis of electronic and telecommunications engineering systems. |

| Attributes: | |
|---|---|
| C 1 | Engage critically with knowledge, taking responsibility for own learning and personal and professional development. |
| C 2 | Demonstrate an appropriate level of expertise in the use of information technology. |
| C 3 | Manage time and prioritize tasks by working to strict deadlines while achieving clarity of communication, both with peers and with academic staff. |

| 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 | |

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| | |
|---|---|
| F2 | |
| F3 | |

| QMUL Model Learning Outcomes - Level 7: | |
|---|---|
| G1 | |
| G2 | |
| G3 | |

## 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 take the form of problem-solving exercise classes, or programming or hands-on laboratory sessions that use instruments and hardware and software tools. They allow the students to learn-by-doing, and thus complement the lectures.
Practical sessions provide students with guidance and help while solving a problem.

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.

## 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)
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)

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ECS423U Electronic Engineering Mathematics 2 (15 credits)
Semester 1 and 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 Communication Systems (15 credits)
Semester 4
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)

Year 3 Modules
Semester 5
ECS626U Team Project (30 credits)
ECS644U Microwave and Millimetrewave 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)
ECS643U Power Electronics (15 credits)
Semester 6
ECS626U Team Project (cont) (30 credits)
ECS619U Network Planning, Finance and Management 15 credits)
Plus two modules from:
ECS617U Integrated Circuit Design (15 credits) (pre-requisite ECS527U)
ECS622U Product Development (15 credits)
ECS637U Digital Media and Social Networks (15 credits)
ECS645U Microwave and Millimetrewave Communications Systems (15 credits)
ECS649U Electrical Machines and Systems (15 credits)
ECS654U Advanced Control Systems (15 credits)

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 | |

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| Module Title | Module Code | Credits | Level | Module Selection Status | Academic Year of Study | Semester | QMUL Model |
|---|---|---|---|---|---|---|---|
| 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 2 | ECS423U | 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 | 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 | |
| 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

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| 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 | |
| Microwave and Millimetrewave Electronics | ECS644U | 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 | |
| Power Electronics | ECS643U | 15 | 6 | Elective | 3 | Semester 1 | |
| Network Planning, Finance and Management | ECS619U | 15 | 6 | Compulsory | 3 | Semester 2 | |
| Integrated Circuit Design | ECS617U | 15 | 6 | Elective | 3 | Semester 2 | |
| Product Development | ECS622U | 15 | 6 | Elective | 3 | Semester 2 | |
| Microwave and Millimetrewave Communications Systems | ECS645U | 15 | 6 | Elective | 3 | Semester 2 | |
| Electrical Machines and Systems | ECS649U | 15 | 6 | Elective | 3 | Semester 2 | |
| Advanced Control Systems | ECS654 | 15 | 6 | Elective | 3 | 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/

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## 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?

ll 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.

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:** | |

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