

## Programme Specification

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### MSc Electronic Engineering (2018-19)

This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided.

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of Study	Full-time
Duration in years	1
Accreditation details	
Final award	Master of Science (MSc)
Name of award	Electronic Engineering
Interim Exit awards	Postgraduate Certificate in Higher Education Postgraduate Diploma in Higher Education
FHEQ level of final award	Level 7
UCAS code	N/A
Programme code	7936
QAA Subject Benchmark or other external reference	Engineering 2010
Programme Lead	Maurits de Planque (mrdp1x07)

### Programme Overview

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#### Brief outline of the programme

This programme is a portfolio masters degree, enabling you to further your specialist knowledge of areas such as Microelectronics Systems Design, Embedded Systems, Micro and Nano Technologies, Photonic Technologies, and Wireless Communications. This programme is taken mainly by international students with a first degree in electronic engineering (or in a closely related subject with a significant electronic engineering content) and builds on our successful pre-existing specialist masters. The modules which comprise this masters degree cover state of the art techniques, technologies and industry-standard supporting tools, and their application in solving complex problems to meet emerging economic and social needs.

In the taught element of this programme you can select a range of options across these specialist areas in order to build your own degree in a more flexible way. You will also have the opportunity to prepare yourself for your individual research project with a dedicated project preparation module. The contact hours and the extent of group work will vary depending on your module choices; full information is provided in individual module profiles.

Your contact hours will vary depending on your module/option choices. Full information about contact hours is provided in individual module profiles.

### **Learning and teaching**

The range of teaching and learning methods is explained in the following sections covering programme learning outcomes.

### **Assessment**

The range of assessment methods used to enable students to demonstrate the achievement of intended learning outcomes is explained in the following sections.

## **Special Features of the programme**

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Southampton is recognised to be internationally leading in the areas mentioned above, and specialist modules are taught by staff involved in leading edge research. Students are therefore exposed to the most up to date thinking, current research problems, and state of the art techniques, technologies and tools.

**Please note:** As a research-led University, we undertake a continuous review of our programmes to ensure quality enhancement and to manage our resources. As a result, this programme may be revised during a student's period of registration; however, any revision will be balanced against the requirement that the student should receive the educational service expected. Please read our [Disclaimer](#) to see why, when and how changes may be made to a student's programme.

Programmes and major changes to programmes are approved through the University's [programme validation process](#) which is described in the University's [Quality handbook](#).

## **Educational Aims of the Programme**

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The aims of the programme are to:

- 1) Develop original ideas and solve complex problems in new or unfamiliar environments, based on advanced knowledge of the principles and methodologies of chosen aspects of electronic engineering
- 2) Integrate knowledge and handle complexity selected areas of electronic engineering, formulating sound judgements with incomplete or limited data
- 3) Communicate your conclusions and the underpinning knowledge and rationale clearly and unambiguously to specialist and non-specialist audiences
- 4) Develop your independent learning skills as required for continued professional development

## **Programme Learning Outcomes**

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### **Knowledge and Understanding**

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On successful completion of this programme you will have knowledge and understanding of:

- A1. Key concepts of electronic engineering
- A2. Advanced concepts in specialist areas of electronic engineering such as Microelectronics Systems Design, Embedded Systems, Micro and Nano Technologies, Photonic Technologies, and Wireless Communications
- A3. State of the art techniques, technologies and tools used in these specialist areas
- A4. Methods of design, realisation and testing used in these specialist areas
- A5. Applicable methods of research and enquiry within the discipline

### **Teaching and Learning Methods**

A1-A5: Most modules consist of a combination of lectures, small group teaching, practical work, directed reading and coursework assignments. At the end of the taught part of the programme you will undertake an individual project associated with a research group. Small group teaching, including all practical work, and the individual project accommodate different learning styles. One-on-one tutorials can support full-class lectures, when required.

### **Assessment Methods**

Testing of the knowledge base is through a combination of unseen written examinations and assessed coursework in the form of problem solving exercises, laboratory reports with literature review components, design exercises, and individual and small-group projects.

## **Subject Specific Intellectual and Research Skills**

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On successful completion of this programme you will be able to:

- B1. Specify, design and realise advanced and specialised electronic systems and devices
- B2. Test and evaluate the performance of such systems and devices
- B3. Analyse problems to determine appropriate methods of design, testing and evaluation
- B4. Find, read, understand and explain literature related to advanced and specialised areas of electronic engineering, including scientific publications, industrial documentation, standards, ethical, legal and environmental guidance
- B5. Formulate a research project involving an advanced and specialised electronic engineering system, device or methodology, using appropriate state of the art techniques, technologies and tools

### **Teaching and Learning Methods**

B1-B4: Most modules consist of a combination of lectures, small group teaching, and practical work including advanced design and analysis tools, directed reading and coursework assignments, which can include a literature review. B4, B5: The Project Preparation module and the Individual Project itself concern the formulation of a research project. Small group teaching, including all practical work,

and the individual project accommodate different learning styles. One-on-one tutorials can support full-class lectures, when required.

### **Assessment Methods**

B1-B5: Testing of the subject specific intellectual and research skills is through a combination of unseen written examinations and assessed coursework in the form of problem solving exercises, laboratory reports with literature review components, design exercises, and individual and small-group projects.

B4: The Project Preparation module and the dissertation from the MSc Project include a significant literature survey and peer review, and have assessment criteria related specifically to these skills.

B5: The Project dissertation is centrally focussed on assessing research and development skills.

### **Transferable and Generic Skills**

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On successful completion of this programme you will be able to:

- C1. Use conventional and electronic indexing and search methods to find technical information
- C2. Present technical information concisely in written and verbal forms to a range of audiences
- C3. Work in a pair or in a small group on a given task, managing your own contribution and the overall task
- C4. Work independently on a significant research project, managing time and risk in an effective manner
- C5. Recognise legal and ethical issues of concern to business, professional bodies and society, and follow relevant guidelines to address these issues

### **Teaching and Learning Methods**

A number of modules have a significant coursework element. This can range from design work through to presentations resulting from directed reading. The individual project includes independent research, project management and report writing.

C1-C3: Most modules include small group teaching, practical work with one or more lab partners, directed reading and coursework assignments with a literature review component. The Project Preparation module includes project management and the delivery of a project plan via a presentation. Small group teaching, including all practical work, and the individual project accommodate different learning styles.

C4: The individual project includes independent research and report writing.

C5: Legal, ethical and professional issues are covered in the Project Preparation module.

### **Assessment Methods**

Coursework is generally assessed through written reports. The individual project is assessed by a dissertation of up to 15,000 words. The Project Preparation module is assessed via a literature review, as well as written and presentation versions of the project plan.

## Subject Specific Practical Skills

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On successful completion of this programme you will be able to:

- D1. Use specialist tools for the design, realisation and analysis of electronic systems and devices

### Teaching and Learning Methods

D1: Most modules include practical work, involving use of industry-standard specialised tools for the design, realisation and analysis of electronic systems and devices. These specialised tools are taught within the modules, except for MATLAB. Students without prior experience of MATLAB should not select the wireless communications or signal processing modules, or should participate in MATLAB tutorials of an additional module during the first weeks of semester 1.

### Assessment Methods

Assessment is based on coursework in the form of technical reports, device designs and realisation, software designs and implementation, and also the MSc dissertation.

## Programme Structure

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The programme structure table is below:

Information about pre and co-requisites is included in individual module profiles.

### Part I

Typical course content

This programme consists of eight taught modules, each worth 7.5 ECTS credits points and an individual research project worth 30 ECTS credit points. In the compulsory semester 2 module Project Preparation you will undertake appropriate preparatory study for this research project, and you will also examine ethical and legal issues around professional practice. You can select seven modules (four in semester 1 and three in semester 2) from a wide range of topics covering advanced and specialised aspects of Microelectronics Systems Design, Embedded Systems, Micro and Nano Technologies, Photonic Technologies, Wireless Communications, and related areas, allowing you to tailor the structure to suit your own interests.

By selecting appropriate modules, it is possible to concentrate on a specific stream:

- (A) Micro/nanoelectronics
- (B) Micro/nanotechnology
- (C) Communications
- (D) Optoelectronics

## Programme details

Except for ELEC6211 (Project Preparation) there are no compulsory modules. However, many optional modules have co-requisites or pre-requisites. Most modules are shared with our Master of Engineering programmes in Electronic Engineering and the specialist MSc programmes we run. Most options are at level 7 (masters). Four options are at level 6: ELEC3202, ELEC3203, ELEC3207, and ELEC3221. At most two level-6 options may be taken, thereby giving a maximum of 15 ECTS (30 CATS) below the level of the award.

It should be noted that it may not be possible to run some optional modules if the number of students registered on the module is very small. It should also be noted that optional module choice can be restricted by the University Timetable, which varies from year to year: some optional modules may clash with other optional or compulsory modules. Please be aware that many modules are shared between different cohorts; the class size depends on cohort size, which varies from year to year.

Examinations are held at the end of Semester 1 (January) and at the end of Semester 2 (May/June). Students who have successfully completed 30 ECTS (60 CATS) or 60 ECTS (120 CATS) at the level of the award may exit with a Postgraduate Certificate or Postgraduate Diploma, respectively.

In semester 1, at least one of the following modules should be chosen: ELEC6201, ELEC6217, ELEC6236, OPTO6007. Each of these represent an important module for one of the streams. In semester 2, ELEC6211 (Project Preparation) is compulsory. Some semester 1 modules have co-requisites and most semester 2 modules have pre-requisites.

The following is the normal pattern of study for a full-time student, completing the programme within 12 calendar months:

### Semester 1:

Four modules, including at least one of: ELEC6201, ELEC6217, ELEC6236, OPTO6007. Examinations are held in January.

### Semester 2:

Four modules, including ELEC6211. Examinations are held in May/June.

### Summer:

You will undertake an individual research project lasting up to 14 weeks, which is assessed by a 15,000-word dissertation.

The programme structure, including the compulsory and optional modules for each semester, is summarised below:

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SEMESTER 1 - select four modules, including at least one module marked with [X]

- ELEC6236 - optional [X] (stream A)
- ELEC3221 - optional (stream A)
- ELEC6237 - optional (stream A) - ELEC6236 is co-requisite
- ELEC3207 - optional (stream A)
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- ELEC6201 - optional [X] (stream B)
- ELEC6203 - optional (stream B) - ELEC6201 is co-requisite
- ELEC6204 - optional (stream B) - ELEC6201 is co-requisite
- ELEC6205 - optional (stream B) - ELEC6201 is co-requisite
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- ELEC6217 - optional [X] (stream C)
- ELEC3203 - optional (stream C)
- ELEC6218 - optional (stream C)
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OPTO6007 - optional [X] (stream D)

OPTO6008 - optional (stream D)

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SEMESTER 2 - select three optional modules

ELEC6211 - compulsory

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ELEC6233 - optional (stream A) - ELEC6236 is pre-requisite

ELEC6234 - optional (stream A) - ELEC6236 is pre-requisite

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ELEC3202 - optional (stream B) - ELEC3207 is pre-requisite

ELEC6206 - optional (stream B) - ELEC6201 is pre-requisite

ELEC6208 - optional (stream B) - ELEC6203 is pre-requisite

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ELEC6219 - optional (stream C) - ELEC3203 is pre-requisite

ELEC6229 - optional (stream C) - ELEC6218 is pre-requisite

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OPTO6011 - optional (stream D) - OPTO6008 is pre-requisite

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SUMMER

COMP6200 - core

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### Part I Compulsory

Code	Module Title	ECTS	Type
ELEC6211	Project Preparation	7.5	Compulsory

### Part I Core

Code	Module Title	ECTS	Type
COMP6200	MSc Project	30	Core

### Part I Optional

Select four semester 1 modules (30 ECTS/60 CATS), including at least one of the four modules in the "Optional 1" group. Also select three semester 2 modules (22.5 ECTS/45 CATS).

Four options are at level 6: ELEC3202, ELEC3203, ELEC3207 and ELEC3221. At most two of these may be taken, thereby giving a maximum of 15 ECTS/30 CATS below the level of the Masters award.

As there are a large number of options, students will be given generic and individual advice to help them make an appropriate selection, based on their background and interests. It is possible to concentrate on a specific stream, but this is not required:

Micro/nanoelectronics: ELEC6236, ELEC3207, ELEC3221, ELEC6233, ELEC6234, ELEC6237

Micro/nanotechnology: ELEC6201, ELEC3202, ELEC6203, ELEC6204, ELEC6205, ELEC6206, ELEC6208

Communications: ELEC6217, ELEC3203, ELEC6218, ELEC6219, ELEC6229

Optoelectronics: OPTO6007, OPTO6008, OPTO6011

The communications stream requires experience with MATLAB.

<b>Code</b>	<b>Module Title</b>	<b>ECTS</b>	<b>Type</b>
ELEC6206	Nanofabrication and Microscopy	7.5	Optional
ELEC6229	Advanced Systems and Signal Processing	7.5	Optional
ELEC6208	Bio/Micro/Nano Systems	7.5	Optional
ELEC6205	Bionanotechnology	7.5	Optional
ELEC3203	Digital Coding and Transmission	7.5	Optional
ELEC3221	Digital IC and Systems Design	7.5	Optional
ELEC6233	Digital Systems Synthesis	7.5	Optional
ELEC6234	Embedded Processors	7.5	Optional
ELEC3202	Green Electronics	7.5	Optional
ELEC6204	Microfluidics and Lab-on-a-Chip	7.5	Optional
ELEC6203	Microsensor Technologies	7.5	Optional
ELEC3207	Nanoelectronic Devices	7.5	Optional
OPTO6011	Optical Fibre Sensors	7.5	Optional
OPTO6008	Optical Fibres	7.5	Optional
ELEC6237	Secure Hardware Design	7.5	Optional
ELEC6218	Signal Processing	7.5	Optional
ELEC6219	Wireless and Mobile Networks	7.5	Optional

#### **Part I Optional I**

At least one of these four semester 1 modules should be chosen. Each of these is an important module for one of the four streams.



Code	Module Title	ECTS	Type
OPTO6007	An Introduction to Silicon Photonics	7.5	Optional
ELEC6236	Digital System Design	7.5	Optional
ELEC6201	Microfabrication	7.5	Optional
ELEC6217	Radio Communications Engineering	7.5	Optional

## Progression Requirements

The programme will follow the University's regulations for [Progression, Determination and Classification of Results: Undergraduate and Integrated Masters Programmes](#) or the University's regulations for [Progression, Determination and Classification of Results: Standalone Masters Programmes](#) as set out in the General Academic Regulations in the University Calendar: <http://www.calendar.soton.ac.uk/sectionIV/sectIV-index.html>

## Support for student learning

There are facilities and services to support your learning some of which are accessible to students across the University and some of which will be geared more particularly to students in your particular Faculty or discipline area.

The University provides:

- library resources, including e-books, on-line journals and databases, which are comprehensive and up-to-date; together with assistance from Library staff to enable you to make the best use of these resources
- high speed access to online electronic learning resources on the Internet from dedicated PC Workstations onsite and from your own devices; laptops, smartphones and tablet PCs via the Eduroam wireless network. There is a wide range of application software available from the Student Public Workstations.
- computer accounts which will connect you to a number of learning technologies for example, the Blackboard virtual learning environment (which facilitates online learning and access to specific learning resources)
- standard ICT tools such as Email, secure filestore and calendars.
- access to key information through the MySouthampton Student Mobile Portal which delivers timetables, Module information, Locations, Tutor details, Library account, bus timetables etc. while you are on the move.
- IT support through a comprehensive website, telephone and online ticketed support and a dedicated helpdesk in the Hartley Library.
- Enabling Services offering support services and resources via a triage model to access crisis management, mental health support and counselling. Support includes daily Drop In at Highfield campus at 13.00 – 15.00 (Monday, Wednesday and Friday out of term-time) or via on-line chat on weekdays from 14.00 – 16.00. Arrangements can also be made for meetings via Skype.
- assessment and support (including specialist IT support) facilities if you have a disability, long term health problem or Specific Learning Difficulty (e.g. dyslexia).
- the Student Services Centre (SSC) to assist you with a range of general enquiries including financial matters, accommodation, exams, graduation, student visas, ID cards
- Career and Employability services, advising on job search, applications, interviews, paid work, volunteering and internship opportunities and getting the most out of your extra-curricular activities alongside your degree programme when writing your CV
- Other support that includes health services (GPs), chaplaincy (for all faiths) and 'out of hours' support for students in Halls and in the local community, (18.00-08.00)
- A Centre for Language Study, providing assistance in the development of English language and study skills for non-native speakers.

The Students' Union provides

- an academic student representation system, consisting of Course Representatives, Academic Presidents, Faculty Officers and the Vice-President Education; SUSU provides training and support for all these representatives, whose role is to represent students' views to the University.

- opportunities for extracurricular activities and volunteering
- an Advice Centre offering free and confidential advice including support if you need to make an academic appeal
- Support for student peer-to-peer groups, such as Nightline.

Associated with your programme you will be able to access:

- The tutorial system – you will have a personal tutor whom you can meet on request for advice on your programme and choice of options, or for pastoral support
- The mentor system – you will have a personal mentor whom you can meet regularly for study advice, or for pastoral support
- The ECS Student Advisory Team provides additional pastoral support
- ECS computer workstations, with a range of manuals and books
- Specialist project laboratories
- Post-graduate demonstrators who provide additional support for your practical projects
- Personal email account and web access, including use of on-line collaboration tools
- Helpdesk in ECS (programming advisory)
- A web-site for each taught module, typically with teaching materials

## Methods for evaluating the quality of teaching and learning

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You will have the opportunity to have your say on the quality of the programme in the following ways:

- Completing student evaluation questionnaires for each module of the programme
- Acting as a student representative on various committees, e.g. Staff Student Liaison Committees, Faculty Programmes Committee OR providing comments to your student representative to feed back on your behalf
- Serving as a student representative on Faculty Scrutiny Groups for programme validation
- Taking part in programme validation meetings by joining a panel of students to meet with the Faculty Scrutiny Group

The ways in which the quality of your programme is checked, both inside and outside the University, are:

- Regular module and programme reports which are monitored by the Faculty
- Programme validation, normally every five years
- External examiners, who produce an annual report
- Professional body accreditation/inspection
- A national Research Excellence Framework (our research activity contributes directly to the quality of your learning experience)
- Higher Education Review by the Quality Assurance Agency for Higher Education

Further details on the University's quality assurance processes are given in the [Quality Handbook](#).

## Career Opportunities

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This programme provides an excellent platform for a career in industry or in academia. Examples of industrial sectors are the electronics/semiconductor, telecommunications, photonics, materials and packaging, biotechnology, and car and aerospace industries. Graduates from our MSc programmes are employed worldwide in leading companies at the forefront of technology. As well as for larger multinationals, many students also go on to work for small to medium enterprises, including start-ups. ECS runs a dedicated careers hub which is affiliated with over 100 companies like IBM, ARM, Microsoft Research, Imagination Technologies, Nvidia, Samsung and Google to name a few. Visit our careers hub for more information.

## External Examiner(s) for the programme

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Name: Professor Scott Roy - University of Glasgow

Students must not contact External Examiner(s) directly, and external examiners have been advised to refer any such communications back to the University. Students should raise any general queries about the assessment and examination process for the programme with their Course Representative, for consideration through Staff: Student Liaison Committee in the first instance, and Student representatives on Staff: Student Liaison Committees will have the opportunity to consider external examiners' reports as part of the University's quality assurance process.

External examiners do not have a direct role in determining results for individual students, and students wishing to discuss their own performance in assessment should contact their Personal Academic Tutor in the first instance.

**Please note:** This specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if s/he takes full advantage of the learning opportunities that are provided. More detailed information can be found in the programme handbook.

## Appendix 1:

Students are responsible for meeting the cost of essential textbooks, and of producing such essays, assignments, laboratory reports and dissertations as are required to fulfil the academic requirements for each programme of study. In addition to this, students registered for this programme also have to pay for:

### Additional Costs

Type	Details
Stationery	You will be expected to provide your own day- to-day stationary items, e.g. pens, pencils, notebooks, etc). Any specialist stationery items will be specified under the Additional Costs tab of the relevant module profile.
Textbooks	<p>Where a module specifies core texts these should generally be available on the reserve list in the library. However due to demand, students may prefer to buy their own copies. These can be purchased from any source.</p> <p>Some modules suggest reading texts as optional background reading. The library may hold copies of such texts, or alternatively you may wish to purchase your own copies.</p> <p>Although not essential reading, you may benefit from the additional reading materials for the module.</p>
Approved Calculators	Candidates may use calculators in the examination room only as specified by the University and as permitted by the rubric of individual examination papers. The University approved models are Casio FX-570 and Casio FX-85GT Plus. These may be purchased from any source and no longer need to carry the University logo.
Printing and Photocopying Costs	In the majority of cases, coursework such as essays; projects; dissertations is likely to be submitted on line. However, there are some items where it is not possible to submit online and students will be asked to provide a printed copy.

In some cases you'll be able to choose modules (which may have different costs associated with that module) which will change the overall cost of a programme to you. Details of such costs will be listed in the Module Profile. Please also ensure you read the section on additional costs in the University's Fees, Charges and Expenses Regulations in the University Calendar available at [www.calendar.soton.ac.uk](http://www.calendar.soton.ac.uk).