# Programme Specification

# MEng 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.

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|---|---|
| Awarding Institution | University of Southampton |
| Teaching Institution | University of Southampton |
| Mode of Study | Full-time |
| Duration in years | 4 |
| Accreditation details | Institution of Engineering and Technology (IET) |
| Final award | Master of Engineering (MEng) |
| Name of Award | Electronic Engineering<br>Electronic Engineering with Artificial Intelligence<br>Electronic Engineering with Computer Systems<br>Electronic Engineering with Mobile and Secure Systems<br>Electronic Engineering with Nanotechnology<br>Electronic Engineering with Photonics<br>Electronic Engineering with Wireless Communications |
| Interim Exit awards | Bachelor of Engineering with Honours (BEng (Hons))<br>Bachelor of Engineering (BEng)<br>Certificate of Higher Education (CertHE)<br>Diploma of Higher Education (DipHE) |
| FHEQ level of final award | Level 7 |
| UCAS code | H603 Electronic Engineering<br>H6G7 Electronic Engineering with Artificial Intelligence<br>H6G4 Electronic Engineering with Computer Systems<br>H691 Electronic Engineering with Mobile and Secure Systems<br>H611 Electronic Engineering with Nanotechnology<br>H680 Electronic Engineering with Photonics<br>H641 Electronic Engineering with Wireless Communications |
| Programme Code | 4436 Electronic Engineering<br>4439 Electronic Engineering with Artificial Intelligence<br>4438 Electronic Engineering with Computer Systems<br>4476 Electronic Engineering with Mobile and Secure Systems<br>4440 Electronic Engineering with Nanotechnology<br>6043 Electronic Engineering with Photonics<br>4441 Electronic Engineering with Wireless Communications |
| QAA Subject Benchmark or other external reference | Engineering (Meng) 2010 |
| Programme Lead | Rob Maunder (rgm1y07) |
| Pathway Lead | Rob Maunder (rgm1y07) |

## Programme Overview

**Brief outline of the programme**

Electronic engineering drives the fundamental technologies of today's connected world. Every area of our lives, from medicine and healthcare to industrial applications, global trade, transport, communications, entertainment and security, is dependent on electronic technology. As a result, electronic engineering is now one of the fastest growing job fields in the world and skilled electronic engineers are very much in demand.

At Southampton, we will ensure that you have a thorough grounding in a wide range of technologies. Our project work will enable you to acquire valuable skills in teamwork, project planning, time-management and presentation, applying your learning to design and build problems, and working to a brief. All of these will stand you in good stead as you move into your career. We offer outstanding facilities in our labs and teaching is based on the latest research, ensuring that, at the end of your programme, your skills will be highly regarded by leading employers. All of our programmes have a wide range of courses and modules to choose from, enabling you to specialise in what really interests you and also to work in depth. Our "MEng Electronic Engineering with Industrial Studies" variant includes a year in industry, giving you additional experience and the opportunity to relate your academic skills and knowledge to contemporary industrial practice. Our "MEng Electronic Engineering with X" specialist variants allow you to develop a greater depth of knowledge and understanding in Mobile and Secure Systems, Nanotechnology, Wireless Communications, Photonics, Computer Systems or Artificial Intelligence, granting you a significant advantage when seeking employment or further studies in the corresponding area of electronic engineering.

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**
A range of learning and teaching methods are used on this programme, including:

- Staff-led lectures, demonstrations, laboratories and seminars
- Directed reading
- Student-led seminars and presentations
- Specification, design, analysis, implementation and verification exercises
- Revision for written examinations
- Staff and post-graduate supervision of your research dissertation
- Industrial placements

**Assessment**
A range of assessment methods are used on this programme to enable students to demonstrate their achievement of the intended learning outcomes, including:

- Written examinations
- In-class tests
- Design exercises
- Programming exercises
- Oral presentations
- Written assessments, including technical reports, literature searches and surveys
- Assessed laboratories and logbook checks
- Group work exercises, presentations and reports

A range of feedback methods are used on this programme to enable students to gauge their progress in meeting the intended learning outcomes, including:

- Feedback from personal tutor
- Written feedback for large courseworks
- Instant oral feedback on presentations, tutorials and practical laboratories
- Feedback on the overall class performance in particular modules
- Marked courseworks

## Special Features of the programme

N/A

**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

The aims of the programme are to:

· Provide you with a sound foundation and to develop the skills, knowledge, and application required for a wide range of professional engineering careers as a high quality practitioner and leader in business, engineering, research and development, and industry,
· Provide coherent and well balanced coverage of theory, design and practical subjects based on mathematics, science and engineering, integrated with business and management,
· Have a flexible academic structure, which is relevant and attractive not only to you, but also to staff and industry and which is responsive to progress and development in technology and the needs of the industrial and academic communities,
· Be at the leading edge of scholarship in electronic engineering,
· Maximise the benefit of an environment in which staff are carrying out internationally competitive and leading research across all aspects of electronics and computer science,
· Provide an environment which contributes towards your personal and professional development and provides a foundation for a wide range of subsequent study and lifelong learning,
· Provide a well-found learning environment with sufficient laboratories containing appropriate equipment and facilities, up-to date CAD tools, and a first class web-site, motivating you towards the practice of engineering,
· Provide a supportive pastoral environment with opportunities for you to participate in social and recreational activities, and
· (For the "MEng Electronic Engineering with Industrial Studies" variant) Provide you with industrial experience, to enable you to relate your academic skills and knowledge to contemporary industrial practice.
· (For each “MEng Electronic Engineering with X” specialist variant) Provide you with specialist knowledge and understanding within your specialisation X, in order to give you a significant advantage when seeking employment or further study within that specialisation.

## Programme Learning Outcomes

### Knowledge and Understanding

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

A1. Underpinning key mathematics and science skills appropriate to electronic and digital systems engineering, both as a method for communicating results, concepts and ideas and as a tool for solving complex problems,
A2. Underpinning principles, methodologies and concepts applicable to electronic and digital systems engineering, as well as their role in historical, current, and future developments and technologies,
A3. Practical, computational and programming skills relating to engineering, and compatible with current industrial practice,
A4. The development and evaluation of possible solutions to engineering problems,
A5. Major issues at the frontiers of engineering research and development, and their possible exploitation to enhance current practices,

A6. Financial, economic, and social factors of significance to engineering, including the broader obligations of engineers to society.
A7. How established techniques of research and enquiry are used to create and interpret knowledge in electronic and digital systems engineering,
A8. How to make critical evaluations of current research and advanced scholarship in electronics and computing, to evaluate methodologies and to develop critiques of them.
A9. *(For Mobile and Secure Systems only)* The design and implementation of secure electronic systems that maintain the confidentiality, integrity and authenticity of information, while allowing mobility and interoperability with external wireless networks.
A10. *(For Nanotechnology only)* The underpinning physics of state-of-the-art nanoscale electronic, photonic, fluidic, bio-electronic and electro-mechanical materials and devices, as well as their design and fabrication.
A11. *(For Wireless Communications only)* The characteristics of electromagnetic wave propagation in radio channels, as well as the design and implementation of signal processing techniques, circuits and systems for efficiently and reliably modulating information onto the channel, for the purpose of wireless communication networking.
A12. *(For Photonics only)* The design and fabrication of optical fibres, as well as semiconductor light sources and detectors, and the design and implementation of signal processing techniques, circuits and systems for efficiently modulating information onto the optical fibre, for the purpose of optical communication and other applications of photonics.
A13. *(For Computer Systems only)* The design, synthesis, fabrication and efficient programming of computer systems at a fundamental architectural level.
A14. *(For Artificial Intelligence only)* The design and implementation of state-of-the-art artificial intelligence techniques, with consideration of image processing and computer vision, machine learning, robotic systems, computational biology and finance, as well as complexity.

**Teaching and Learning Methods**

Programmes are taught mainly through Lectures and Directed Reading. Learning is reinforced through tutorials (in the first two parts), design exercises (in the first two parts), coursework assignments, and project work (both individual and in groups). Outcome A1 is largely taught by self-paced methods (worksheets and in-class tests) in parts 1 and 2, and a satisfactory knowledge and understanding is implicit in your ability to complete the second and third part modules. Outcomes A2, A5-A8 are largely taught through lectured modules with understanding developed through coursework and Laboratories. A substantial body of coursework in part 2 develops outcome A3, and outcome A4 is developed through project supervisions in parts 3 and 4. Outcomes A9 and A10 are reached during the year in industry of the "with Industrial Studies" variant. Outcomes A11-A14 are largely taught in specialist modules in parts 3 and 4, as well as in the part 3 Individual Project. Additionally, some fundamental aspects of some specialisms are introduced in particular modules in parts 1 and 2.

**Assessment Methods**

Knowledge and understanding of each subject (outcomes A1-A3) are assessed mainly through written examinations. Additional forms of assessment include technical reports (outcomes A4-A6), seminar presentations (A7-A8), and project reports (A4-A8). Outcomes A9 and A10 are assessed by a report, which is written during the year in industry of the "with Industrial Studies" variant. Outcomes A11-A14 are assessed within the corresponding specialist modules, as well as with the part 3 individual project.

## Subject Specific Intellectual and Research Skills

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

B1. Integrate knowledge of mathematics, science, information technology, businesses context and wider engineering practice, to develop analytical and innovative solutions to engineering problems,

B2. Apply mathematical and computer-based models to critically analyse and evaluate the extent to which designs, products and systems meet the criteria defined for their current use and future developments, taking account of the impact of new and advancing technology to enhance current practice,
B3. Apply in an appropriate manner computer-aided tools in the design process so as to aid understanding of design trade-offs, and recognise capabilities and limitations of computer-based methods for engineering problem solving,
B4. Recognise the professional, legal, moral, ethical, cost, aesthetic, environmental, sustainability, health and safety issues involved in the exploitation of technology and science and be guided by the adoption of appropriate professional, ethical and legal practices,
B5. Assess technical and commercial risks, and take appropriate steps to manage those risks in the context of engineering design and solutions,
B6. Investigate, define, characterise and solve problems through use of literature, systematic analysis and design methods and to tackle non-routine problems in creative and innovative ways,
B7. Exercise awareness of quality systems and management in engineering; (MEng only) requirements and responsibilities of leadership; business and management practices relevant to electronic engineering enterprises.

**Teaching and Learning Methods**

These intellectual skills are taught mainly through Course- and Project-work, and design exercises. Relevant material is also covered in Lectures, Guest Lectures and (for part four MEng students) Seminars. Skill B1 is developed through Group Project Work in parts 2 and 4. Skill B2 is a consistent theme in the taught technical modules in part 3. Advanced CAD tools (skill B3) are used in laboratory and project work in every part of the degree. Skills B4, B5 and B7 are covered through Professional Issues in part 1 and developed further in parts 3 and 4. Skill B6 is developed through the Individual and Group Project work in parts 2-4.

**Assessment Methods**

In-class tests and Written Examinations (skill B1), Technical Reports (skills B2, B4 and B7), Design Exercises (skill B3), Logbook Checks (skill B4), Design Project Reports and Presentations (skills B4-B7).

## Transferable and Generic Skills

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

C1. Use IT facilities including word processing, spreadsheets, browsers and search engines to find technical information,
C2. Effectively present to audiences (orally, electronically or in writing) rational and reasoned arguments that address a given engineering problem or opportunity, including assessment of the impact of new technologies,
C3. Work on a significant technical project both independently and as a member of a design team, managing both the overall task and your contribution to that task, particularly in the MEng programmes,
C4. Understand the need for continuing professional development in recognition of lifelong learning,
C5. Competently manage projects, people, resources and time.

**Teaching and Learning Methods**

General proficiency with IT (skill C1) pervades the degree, and is not specifically taught. Presentations and report-writing (skill C2) are covered in part 1 lectures and practiced throughout the programme. Independent, and group working, and organisational skills (skills C3 and C5) are taught for, and

developed by, the Individual and Group Projects. Professional development (skill C4) is covered in lectures.

**Assessment Methods**

Design Exercises and Projects (both Individual and Group), Technical Reports, Project and Seminar Presentations.

### Subject Specific Practical Skills

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

D1. Specify, design, and construct electronic circuits, systems and computer software, taking account of commercial and industrial constraints,
D2. Use CAD, simulation, design, and verification tools to aid in the design of systems, and to report and comment on results,
D3. Use test and measurement instrumentation appropriate to the discipline including awareness of measurements accuracy and coverage,
D4. Recognise any risks or safety aspects that may be involved in the operation of systems within a given context,
D5. Search for information related to a design solution and present it for discussion.

**Teaching and Learning Methods**

Skill D1 is taught and developed through Design Modules and Projects in parts 2-4. Advanced CAD tools (skill D2) are used in laboratory and project work in every part of the degree. Skills D3-D4 are covered in Lectures and Laboratory Sessions in parts 1 and 2. Skill D5 is taught through Lectures and Project Supervisions.

**Assessment Methods**

Design Exercises (skills D1,D2 and D5), Supervised Laboratories (skills D3-D4), Design Projects (skills D4-D5), Technical Reports and Seminar Presentations (skill D5).

## Programme Structure

The programme structure table is below:

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

## Artificial Intelligence Pathway

Part I

Typical course content

You will study 60 European Credit Transfer and Accumulation System (ECTS) credit points (equivalent to 120 CATS), in parts 1, 2, 3 and 4. These credits are mainly at level 4 in the Framework for Higher Education Qualifications (FHEQ) in part 1, level 5 in part 2, level 6 in part 3, and level 7 in part 4.

The main areas addressed in the first two parts are mathematics, physics and semiconductor devices, analogue and digital circuit design, signals and systems, communications and control, programming, software design, development and verification, CAD tools and practical laboratory work. In parts three and four, the core material covers professional practice, with major individual and group projects, and taught modules covering industrial practice and engineering management. You will also choose from a range of technical options. Many of these are in the specialist areas of Artificial Intelligence, Mobile & Secure Systems, Computer Systems, Nanotechnology, Photonics, and Wireless Communications.

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.

Part I Core
All modules are core and so are not eligible for compensation.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC1204 | Advanced Programming | 7.5 | Core |
| ELEC1202 | Digital Systems and Microprocessors | 7.5 | Core |
| ELEC1206 | Electrical Materials and Fields | 7.5 | Core |
| ELEC1200 | Electronic Circuits | 7.5 | Core |
| ELEC1207 | Electronic Systems | 7.5 | Core |
| MATH1055 | Mathematics for Electronic and Electrical Engineering | 7.5 | Core |
| ELEC1201 | Programming | 7.5 | Core |
| ELEC1205 | Solid State Devices | 7.5 | Core |

Part II

Part II Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2220 | Control and Communications | 7.5 | Compulsory |
| ELEC2221 | Digital Systems and Signal Processing | 7.5 | Compulsory |
| ELEC2212 | Electromagnetism for Communications | 7.5 | Compulsory |
| ELEC2205 | Electronic Design | 7.5 | Compulsory |
| MATH2047 | Mathematics for Electronics & Electrical Engineering Part II | 7.5 | Compulsory |

Part II Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |

Part III
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS credits), which is core and is weighted 7.5 ECTS/ 15 CATS in Semester I and 15 ECTS/30 CATS in Semester II. In addition, students must take certain specified modules, as given in the tables below.

Finally, students should select optional modules to make up the total to 60 ECTS/120 CATS. Besides COMP3200, COMP3219 and specialised modules, a maximum of 2 other "externally taught" modules (COMPxxxx, OPTOxxxx, UOSMxxxx, FRENxxxx, GERMxxxx, LANGxxxx and MATHxxxx ) may be chosen. Students must select a 30 ECTS:30 ECTS credit balance between semesters. Students studying for a specialised "(...)" degree must take at least 15 ECTS credits of specialised modules (listed below) in Pt III and must undertake a project within their specialty.

Electronic Engineering with Artificial Intelligence: COMP3212, COMP3223, ELEC3201, ELEC3218.

Electronic Engineering with Computer Systems: COMP3215, ELEC3219, ELEC3221, ELEC3222.

Electronic Engineering with Mobile and Secure Systems: COMP3201, COMP3215, COMP3217, ELEC3222.

Electronic Engineering with Nanotechnology: ELEC3202, ELEC3207, ELEC3217, ELEC3223.

Electronic Engineering with Photonics: ELEC3203, ELEC3204, ELEC3207, ELEC3217.

Electronic Engineering with Wireless Communications: ELEC3203, ELEC3204, ELEC3218.

Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3219 | Engineering Management and Law | 7.5 | Compulsory |
| COMP3223 | Foundations of Machine Learning | 7.5 | Compulsory |

Part III Core
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS), which is core and is weighted 7.5 ECTS in Semester I and 15 ECTS in Semester II.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3200 | Part III Individual Project | 22.5 | Core |

Part III Optional
Additional optional modules include:
- LANGxxxx: A language module scheduled in the Broadening Horizons slot. The appropriate stage will be selected after assessment by the language school
- UOSMxxxx: Any other module from the University's Broadening Horizons programme

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |
| ELEC3219 | Advanced Computer Architecture | 7.5 | Optional |
| MATH3083 | Advanced Partial Differential Equations | 7.5 | Optional |
| ELEC3208 | Analogue and Mixed Signal Electronics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| ELEC3222 | Computer Networks | 7.5 | Optional |
| ELEC3205 | Control System Design | 7.5 | Optional |
| COMP3201 | Cyber Security | 7.5 | Optional |
| ELEC3203 | Digital Coding and Transmission | 7.5 | Optional |
| ELEC3206 | Digital Control System Design | 7.5 | Optional |
| ELEC3221 | Digital IC and Systems Design | 7.5 | Optional |
| ELEC3202 | Green Electronics | 7.5 | Optional |
| MATH3084 | Integral Transform Methods | 7.5 | Optional |
| ELEC3223 | Introduction to Bionanotechnology | 7.5 | Optional |
| ELEC3207 | Nanoelectronic Devices | 7.5 | Optional |
| MATH3081 | Operational Research | 7.5 | Optional |

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|---|---|---|---|
| MATH3082 | Optimisation | 7.5 | Optional |
| ELEC3217 | Photonics II | 7.5 | Optional |
| COMP3215 | Real-Time Computing and Embedded Systems | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| COMP3217 | Security of Cyber Physical Systems | 7.5 | Optional |
| ELEC3218 | Signal and Image Processing | 7.5 | Optional |
| ELEC3204 | Wireless and Optical Communications | 7.5 | Optional |

Part IV
All students must take the ELEC6200 Group Design Project (22.5 ECTS/45 CATS) which is core and is weighted 15 ECTS in Semester I and 7.5 ECTS in semester II. In addition, students must take certain specified modules, as given in the tables below.

Students should note that there are a number of prerequisites for the optional modules which are listed in the module specifications; decisions they made for Pt III may affect their choice. 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.

Finally, students should select optional modules to make up the total to 60 credits. Besides COMP6228 and specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx and MATHxxxx ) may be chosen. Students must select a 30:30 credit balance between semesters. Students studying for a specialised “with” degree must take at least 15 ECTS of specialised modules (listed below) in Pt IV.

Electronic Engineering with Artificial Intelligence: COMP6202, COMP6208, COMP6212, COMP6223, COMP6237, COMP6247, COMP6248, ELEC6212, ELEC6213, ELEC6253.

Electronic Engineering with Computer Systems: ELEC6230, ELEC6231, ELEC6233, ELEC6234, ELEC6235, ELEC6237.

Electronic Engineering with Mobile and Secure Systems: ELEC6214, ELEC6242, ELEC6245.

Electronic Engineering with Nanotechnology: ELEC6201, ELEC6202, ELEC6203, ELEC6204, ELEC6206, ELEC6207, ELEC6208.

Electronic Engineering with Photonics: ELEC6201, ELEC6206, ELEC6207, OPTO6007, OPTO6008, OPTO6010, OPTO6011.

Electronic Engineering with Wireless Communications: ELEC6217, ELEC6214, ELEC6245, ELEC6252, ELEC6253.

Alternatively, semester II of Pt IV may be taken at a partner institution overseas, which has been approved by the Erasmus coordinator. In this case, ELEC6247 Group Design Project (Overseas Placement) should be taken instead of ELEC6200 Group Design Project during semester I. In this case, ELEC6247 is core and carries 15 ECTS credits. The modules selected at the overseas institution must be approved by the programme leader. The module selection must include at least 30 ECTS (or equivalent) at masters level, that is relevant to the degree title. In 'with X' programmes, the requirement to take 15 ECTS credits specific to the specialisation must be met across the two semesters. The marks awarded by the overseas institution will be converted to equivalent UK marks by the Erasmus coordinator.

Part IV Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC6200 | Group Design Project | 22.5 | Core |

Part IV Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |
| ELEC6252 | Future Wireless Techniques | 7.5 | Optional |
| ELEC6253 | Machine Learning for Wireless Communications | 7.5 | Optional |
| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6202 | Advanced Memory and Storage | 7.5 | Optional |
| ELEC6214 | Advanced Wireless Communications Networks and Systems | 7.5 | Optional |
| OPTO6007 | An Introduction to Silicon Photonics | 7.5 | Optional |
| ELEC6232 | Analogue and Mixed Signal CMOS Design | 7.5 | Optional |
| ELEC6228 | Applied Control Systems | 7.5 | Optional |
| ELEC6208 | Bio/Micro/Nano Systems | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| ELEC6242 | Cryptography | 7.5 | Optional |
| ELEC6233 | Digital Systems Synthesis | 7.5 | Optional |
| ELEC6234 | Embedded Processors | 7.5 | Optional |
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| COMP6228 | Individual Research Project | 7.5 | Optional |
| ELEC6227 | Medical Electrical and Electronic Technologies | 7.5 | Optional |
| ELEC6201 | Microfabrication | 7.5 | Optional |
| ELEC6204 | Microfluidics and Lab-on-a-Chip | 7.5 | Optional |
| ELEC6203 | Microsensor Technologies | 7.5 | Optional |
| MATH6149 | Modelling with Differential Equations | 7.5 | Optional |
| ELEC6206 | Nanofabrication and Microscopy | 7.5 | Optional |
| MATH6141 | Numerical Methods | 7.5 | Optional |
| OPTO6008 | Optical Fibres | 7.5 | Optional |
| ELEC6207 | Quantum Devices and Technology | 7.5 | Optional |
| ELEC6217 | Radio Communications Engineering | 7.5 | Optional |
| ELEC6237 | Secure Hardware Design | 7.5 | Optional |
| ELEC6235 | SOC Design Project | 7.5 | Optional |
| COMP6204 | Software Project Management and Development | 7.5 | Optional |
| ELEC6231 | VLSI Design Project | 7.5 | Optional |
| ELEC6230 | VLSI Systems Design | 7.5 | Optional |
| ELEC6245 | Wireless Networks | 7.5 | Optional |

The programme structure table is below:

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

## Computer Systems Pathway

Part I
Typical course content

You will study 60 European Credit Transfer and Accumulation System (ECTS) credit points (equivalent to 120 CATS), in parts 1, 2, 3 and 4. These credits are mainly at level 4 in the Framework for Higher Education Qualifications (FHEQ) in part 1, level 5 in part 2, level 6 in part 3, and level 7 in part 4.

The main areas addressed in the first two parts are mathematics, physics and semiconductor devices,

analogue and digital circuit design, signals and systems, communications and control, programming, software design, development and verification, CAD tools and practical laboratory work. In parts three and four, the core material covers professional practice, with major individual and group projects, and taught modules covering industrial practice and engineering management. You will also choose from a range of technical options. Many of these are in the specialist areas of Artificial Intelligence, Mobile & Secure Systems, Computer Systems, Nanotechnology, Photonics, and Wireless Communications.

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.

Part I Core
All modules are core and so are not eligible for compensation.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC1204 | Advanced Programming | 7.5 | Core |
| ELEC1202 | Digital Systems and Microprocessors | 7.5 | Core |
| ELEC1206 | Electrical Materials and Fields | 7.5 | Core |
| ELEC1200 | Electronic Circuits | 7.5 | Core |
| ELEC1207 | Electronic Systems | 7.5 | Core |
| MATH1055 | Mathematics for Electronic and Electrical Engineering | 7.5 | Core |
| ELEC1201 | Programming | 7.5 | Core |
| ELEC1205 | Solid State Devices | 7.5 | Core |

Part II

Part II Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2204 | Computer Engineering | 7.5 | Compulsory |
| ELEC2220 | Control and Communications | 7.5 | Compulsory |
| ELEC2221 | Digital Systems and Signal Processing | 7.5 | Compulsory |
| ELEC2212 | Electromagnetism for Communications | 7.5 | Compulsory |
| ELEC2205 | Electronic Design | 7.5 | Compulsory |
| MATH2047 | Mathematics for Electronics & Electrical Engineering Part II | 7.5 | Compulsory |

Part II Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |

Part III
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS credits), which is core and is weighted 7.5 ECTS/ 15 CATS in Semester I and 15 ECTS/30 CATS in Semester II. In addition, students must take certain specified modules, as given in the tables below.

Finally, students should select optional modules to make up the total to 60 ECTS/120 CATS. Besides COMP3200, COMP3219 and specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx, UOSMxxxx, FRENxxxx, GERMxxxx, LANGxxxx and MATHxxxx ) may be chosen. Students must select a 30 ECTS:30 ECTS credit balance between semesters. Students studying for a specialised “(...)” degree must take at least 15 ECTS credits of specialised modules (listed below) in Pt III and must undertake a project within their specialty.

Electronic Engineering with Artificial Intelligence: COMP3212, COMP3223, ELEC3201, ELEC3218.

Electronic Engineering with Computer Systems: COMP3215, ELEC3219, ELEC3221, ELEC3222.

Electronic Engineering with Mobile and Secure Systems: COMP3201, COMP3215, COMP3217, ELEC3222.

Electronic Engineering with Nanotechnology: ELEC3202, ELEC3207, ELEC3217, ELEC3223.

Electronic Engineering with Photonics: ELEC3203, ELEC3204, ELEC3207, ELEC3217.

Electronic Engineering with Wireless Communications: ELEC3203, ELEC3204, ELEC3218.

Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC3221 | Digital IC and Systems Design | 7.5 | Compulsory |
| COMP3219 | Engineering Management and Law | 7.5 | Compulsory |

Part III Core
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS), which is core and is weighted 7.5 ECTS in Semester I and 15 ECTS in Semester II.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3200 | Part III Individual Project | 22.5 | Core |

Part III Optional
Additional optional modules include:
- LANGxxxx: A language module scheduled in the Broadening Horizons slot. The appropriate stage will be selected after assessment by the language school
- UOSMxxxx: Any other module from the University's Broadening Horizons programme

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| COMP3223 | Foundations of Machine Learning | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |
| ELEC3219 | Advanced Computer Architecture | 7.5 | Optional |
| MATH3083 | Advanced Partial Differential Equations | 7.5 | Optional |
| ELEC3208 | Analogue and Mixed Signal Electronics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| ELEC3222 | Computer Networks | 7.5 | Optional |
| ELEC3205 | Control System Design | 7.5 | Optional |
| COMP3201 | Cyber Security | 7.5 | Optional |
| ELEC3203 | Digital Coding and Transmission | 7.5 | Optional |
| ELEC3206 | Digital Control System Design | 7.5 | Optional |
| ELEC3202 | Green Electronics | 7.5 | Optional |
| MATH3084 | Integral Transform Methods | 7.5 | Optional |
| ELEC3223 | Introduction to Bionanotechnology | 7.5 | Optional |
| ELEC3207 | Nanoelectronic Devices | 7.5 | Optional |
| MATH3081 | Operational Research | 7.5 | Optional |
| MATH3082 | Optimisation | 7.5 | Optional |
| ELEC3217 | Photonics II | 7.5 | Optional |
| COMP3215 | Real-Time Computing and Embedded Systems | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| COMP3217 | Security of Cyber Physical Systems | 7.5 | Optional |
| ELEC3218 | Signal and Image Processing | 7.5 | Optional |
| ELEC3204 | Wireless and Optical Communications | 7.5 | Optional |

Part IV
All students must take the ELEC6200 Group Design Project (22.5 ECTS/45 CATS) which is core and is weighted 15 ECTS in Semester I and 7.5 ECTS in semester II. In addition, students must take certain specified modules, as given in the tables below.

Students should note that there are a number of prerequisites for the optional modules which are listed in the module specifications; decisions they made for Pt III may affect their choice. 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.

Finally, students should select optional modules to make up the total to 60 credits. Besides COMP6228 and specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx and MATHxxxx ) may be chosen. Students must select a 30:30 credit balance between semesters. Students studying for a specialised “with” degree must take at least 15 ECTS of specialised modules (listed below) in Pt IV.

Electronic Engineering with Artificial Intelligence: COMP6202, COMP6208, COMP6212, COMP6223, COMP6237, COMP6247, COMP6248, ELEC6212, ELEC6213, ELEC6253.

Electronic Engineering with Computer Systems: ELEC6230, ELEC6231, ELEC6233, ELEC6234, ELEC6235, ELEC6237.

Electronic Engineering with Mobile and Secure Systems: ELEC6214, ELEC6242, ELEC6245.

Electronic Engineering with Nanotechnology: ELEC6201, ELEC6202, ELEC6203, ELEC6204, ELEC6206, ELEC6207, ELEC6208.

Electronic Engineering with Photonics: ELEC6201, ELEC6206, ELEC6207, OPTO6007, OPTO6008, OPTO6010, OPTO6011.

Electronic Engineering with Wireless Communications: ELEC6217, ELEC6214, ELEC6245, ELEC6252, ELEC6253.

Alternatively, semester II of Pt IV may be taken at a partner institution overseas, which has been approved by the Erasmus coordinator. In this case, ELEC6247 Group Design Project (Overseas Placement) should be taken instead of ELEC6200 Group Design Project during semester I. In this case, ELEC6247 is core and carries 15 ECTS credits. The modules selected at the overseas institution must be approved by the programme leader. The module selection must include at least 30 ECTS (or equivalent) at masters level, that is relevant to the degree title. In 'with X' programmes, the requirement to take 15 ECTS credits specific to the specialisation must be met across the two semesters. The marks awarded by the overseas institution will be converted to equivalent UK marks by the Erasmus coordinator.

Part IV Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC6200 | Group Design Project | 22.5 | Core |

Part IV Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |
| ELEC6252 | Future Wireless Techniques | 7.5 | Optional |
| ELEC6253 | Machine Learning for Wireless Communications | 7.5 | Optional |
| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |

| | | | |
|---|---|---|---|
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6202 | Advanced Memory and Storage | 7.5 | Optional |
| ELEC6214 | Advanced Wireless Communications Networks and Systems | 7.5 | Optional |
| OPTO6007 | An Introduction to Silicon Photonics | 7.5 | Optional |
| ELEC6232 | Analogue and Mixed Signal CMOS Design | 7.5 | Optional |
| ELEC6228 | Applied Control Systems | 7.5 | Optional |
| ELEC6208 | Bio/Micro/Nano Systems | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| ELEC6242 | Cryptography | 7.5 | Optional |
| ELEC6233 | Digital Systems Synthesis | 7.5 | Optional |
| ELEC6234 | Embedded Processors | 7.5 | Optional |
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| COMP6228 | Individual Research Project | 7.5 | Optional |
| ELEC6227 | Medical Electrical and Electronic Technologies | 7.5 | Optional |
| ELEC6201 | Microfabrication | 7.5 | Optional |
| ELEC6204 | Microfluidics and Lab-on-a-Chip | 7.5 | Optional |
| ELEC6203 | Microsensor Technologies | 7.5 | Optional |
| MATH6149 | Modelling with Differential Equations | 7.5 | Optional |
| ELEC6206 | Nanofabrication and Microscopy | 7.5 | Optional |
| MATH6141 | Numerical Methods | 7.5 | Optional |
| OPTO6008 | Optical Fibres | 7.5 | Optional |
| ELEC6207 | Quantum Devices and Technology | 7.5 | Optional |
| ELEC6217 | Radio Communications Engineering | 7.5 | Optional |
| ELEC6237 | Secure Hardware Design | 7.5 | Optional |
| ELEC6235 | SOC Design Project | 7.5 | Optional |
| COMP6204 | Software Project Management and Development | 7.5 | Optional |
| ELEC6231 | VLSI Design Project | 7.5 | Optional |
| ELEC6230 | VLSI Systems Design | 7.5 | Optional |
| ELEC6245 | Wireless Networks | 7.5 | Optional |

The programme structure table is below:

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

## Electronic Engineering Pathway

Part I
Typical course content

You will study 60 European Credit Transfer and Accumulation System (ECTS) credit points (equivalent to 120 CATS), in parts 1, 2, 3 and 4. These credits are mainly at level 4 in the Framework for Higher Education Qualifications (FHEQ) in part 1, level 5 in part 2, level 6 in part 3, and level 7 in part 4.

The main areas addressed in the first two parts are mathematics, physics and semiconductor devices, analogue and digital circuit design, signals and systems, communications and control, programming, software design, development and verification, CAD tools and practical laboratory work. In parts three and four, the core material covers professional practice, with major individual and group projects, and taught modules covering industrial practice and engineering management. You will also choose from a range of technical options. Many of these are in the specialist areas of Artificial Intelligence, Mobile & Secure Systems, Computer Systems, Nanotechnology, Photonics, and Wireless Communications.

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.

Part I Core
All modules are core and so are not eligible for compensation.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC1204 | Advanced Programming | 7.5 | Core |
| ELEC1202 | Digital Systems and Microprocessors | 7.5 | Core |
| ELEC1206 | Electrical Materials and Fields | 7.5 | Core |
| ELEC1200 | Electronic Circuits | 7.5 | Core |
| ELEC1207 | Electronic Systems | 7.5 | Core |
| MATH1055 | Mathematics for Electronic and Electrical Engineering | 7.5 | Core |
| ELEC1201 | Programming | 7.5 | Core |
| ELEC1205 | Solid State Devices | 7.5 | Core |

Part II

Part II Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2220 | Control and Communications | 7.5 | Compulsory |
| ELEC2221 | Digital Systems and Signal Processing | 7.5 | Compulsory |
| ELEC2212 | Electromagnetism for Communications | 7.5 | Compulsory |
| ELEC2205 | Electronic Design | 7.5 | Compulsory |
| MATH2047 | Mathematics for Electronics & Electrical Engineering Part II | 7.5 | Compulsory |

Part II Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |

Part III
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS credits), which is core and is weighted 7.5 ECTS/ 15 CATS in Semester I and 15 ECTS/30 CATS in Semester II. In addition, students must take certain specified modules, as given in the tables below.

Finally, students should select optional modules to make up the total to 60 ECTS/120 CATS. Besides COMP3200, COMP3219 and specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx, UOSMxxxx, FRENxxxx, GERMxxxx, LANGxxxx and MATHxxxx ) may be chosen. Students must select a 30 ECTS:30 ECTS credit balance between semesters. Students studying for a specialised “(...)” degree must take at least 15 ECTS credits of specialised modules (listed below) in Pt III and must undertake a project within their specialty.

Electronic Engineering with Artificial Intelligence: COMP3212, COMP3223, ELEC3201, ELEC3218.

Electronic Engineering with Computer Systems: COMP3215, ELEC3219, ELEC3221, ELEC3222.

Electronic Engineering with Mobile and Secure Systems: COMP3201, COMP3215, COMP3217, ELEC3222.

Electronic Engineering with Nanotechnology: ELEC3202, ELEC3207, ELEC3217, ELEC3223.

Electronic Engineering with Photonics: ELEC3203, ELEC3204, ELEC3207, ELEC3217.

Electronic Engineering with Wireless Communications: ELEC3203, ELEC3204, ELEC3218.

Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3219 | Engineering Management and Law | 7.5 | Compulsory |

Part III Optional
Additional optional modules include:
- LANGxxxx: A language module scheduled in the Broadening Horizons slot. The appropriate stage will be selected after assessment by the language school
- UOSMxxxx: Any other module from the University's Broadening Horizons programme

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| COMP3223 | Foundations of Machine Learning | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |
| ELEC3219 | Advanced Computer Architecture | 7.5 | Optional |
| MATH3083 | Advanced Partial Differential Equations | 7.5 | Optional |
| ELEC3208 | Analogue and Mixed Signal Electronics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| ELEC3222 | Computer Networks | 7.5 | Optional |
| ELEC3205 | Control System Design | 7.5 | Optional |
| COMP3201 | Cyber Security | 7.5 | Optional |
| ELEC3203 | Digital Coding and Transmission | 7.5 | Optional |
| ELEC3206 | Digital Control System Design | 7.5 | Optional |
| ELEC3221 | Digital IC and Systems Design | 7.5 | Optional |
| ELEC3202 | Green Electronics | 7.5 | Optional |
| MATH3084 | Integral Transform Methods | 7.5 | Optional |
| ELEC3223 | Introduction to Bionanotechnology | 7.5 | Optional |
| ELEC3207 | Nanoelectronic Devices | 7.5 | Optional |
| MATH3081 | Operational Research | 7.5 | Optional |
| MATH3082 | Optimisation | 7.5 | Optional |
| ELEC3217 | Photonics II | 7.5 | Optional |
| COMP3215 | Real-Time Computing and Embedded Systems | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| COMP3217 | Security of Cyber Physical Systems | 7.5 | Optional |
| ELEC3218 | Signal and Image Processing | 7.5 | Optional |
| ELEC3204 | Wireless and Optical Communications | 7.5 | Optional |

Part IV
All students must take the ELEC6200 Group Design Project (22.5 ECTS/45 CATS) which is core and is weighted 15 ECTS in Semester I and 7.5 ECTS in semester II. In addition, students must take certain specified modules, as given in the tables below.

Students should note that there are a number of prerequisites for the optional modules which are listed in the module specifications; decisions they made for Pt III may affect their choice. 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.

Finally, students should select optional modules to make up the total to 60 credits. Besides COMP6228 and

specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx and MATHxxxx ) may be chosen. Students must select a 30:30 credit balance between semesters. Students studying for a specialised “with” degree must take at least 15 ECTS of specialised modules (listed below) in Pt IV.

Electronic Engineering with Artificial Intelligence: COMP6202, COMP6208, COMP6212, COMP6223, COMP6237, COMP6247, COMP6248, ELEC6212, ELEC6213, ELEC6253.

Electronic Engineering with Computer Systems: ELEC6230, ELEC6231, ELEC6233, ELEC6234, ELEC6235, ELEC6237.

Electronic Engineering with Mobile and Secure Systems: ELEC6214, ELEC6242, ELEC6245.

Electronic Engineering with Nanotechnology: ELEC6201, ELEC6202, ELEC6203, ELEC6204, ELEC6206, ELEC6207, ELEC6208.

Electronic Engineering with Photonics: ELEC6201, ELEC6206, ELEC6207, OPTO6007, OPTO6008, OPTO6010, OPTO6011.

Electronic Engineering with Wireless Communications: ELEC6217, ELEC6214, ELEC6245, ELEC6252, ELEC6253.

Alternatively, semester II of Pt IV may be taken at a partner institution overseas, which has been approved by the Erasmus coordinator. In this case, ELEC6247 Group Design Project (Overseas Placement) should be taken instead of ELEC6200 Group Design Project during semester I. In this case, ELEC6247 is core and carries 15 ECTS credits. The modules selected at the overseas institution must be approved by the programme leader. The module selection must include at least 30 ECTS (or equivalent) at masters level, that is relevant to the degree title. In 'with X' programmes, the requirement to take 15 ECTS credits specific to the specialisation must be met across the two semesters. The marks awarded by the overseas institution will be converted to equivalent UK marks by the Erasmus coordinator.

Part IV Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC6200 | Group Design Project | 22.5 | Core |

Part IV Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |
| ELEC6252 | Future Wireless Techniques | 7.5 | Optional |
| ELEC6253 | Machine Learning for Wireless Communications | 7.5 | Optional |
| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6202 | Advanced Memory and Storage | 7.5 | Optional |
| ELEC6214 | Advanced Wireless Communications Networks and Systems | 7.5 | Optional |
| OPTO6007 | An Introduction to Silicon Photonics | 7.5 | Optional |
| ELEC6232 | Analogue and Mixed Signal CMOS Design | 7.5 | Optional |
| ELEC6228 | Applied Control Systems | 7.5 | Optional |
| ELEC6208 | Bio/Micro/Nano Systems | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| ELEC6242 | Cryptography | 7.5 | Optional |
| ELEC6233 | Digital Systems Synthesis | 7.5 | Optional |
| ELEC6234 | Embedded Processors | 7.5 | Optional |

| | | | |
|---|---|---|---|
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| COMP6228 | Individual Research Project | 7.5 | Optional |
| ELEC6227 | Medical Electrical and Electronic Technologies | 7.5 | Optional |
| ELEC6201 | Microfabrication | 7.5 | Optional |
| ELEC6204 | Microfluidics and Lab-on-a-Chip | 7.5 | Optional |
| ELEC6203 | Microsensor Technologies | 7.5 | Optional |
| MATH6149 | Modelling with Differential Equations | 7.5 | Optional |
| ELEC6206 | Nanofabrication and Microscopy | 7.5 | Optional |
| MATH6141 | Numerical Methods | 7.5 | Optional |
| OPTO6008 | Optical Fibres | 7.5 | Optional |
| ELEC6207 | Quantum Devices and Technology | 7.5 | Optional |
| ELEC6217 | Radio Communications Engineering | 7.5 | Optional |
| ELEC6237 | Secure Hardware Design | 7.5 | Optional |
| ELEC6235 | SOC Design Project | 7.5 | Optional |
| COMP6204 | Software Project Management and Development | 7.5 | Optional |
| ELEC6231 | VLSI Design Project | 7.5 | Optional |
| ELEC6230 | VLSI Systems Design | 7.5 | Optional |
| ELEC6245 | Wireless Networks | 7.5 | Optional |

The programme structure table is below:

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

## Mobile and Secure Systems Pathway

Part I
Typical course content

You will study 60 European Credit Transfer and Accumulation System (ECTS) credit points (equivalent to 120 CATS), in parts 1, 2, 3 and 4. These credits are mainly at level 4 in the Framework for Higher Education Qualifications (FHEQ) in part 1, level 5 in part 2, level 6 in part 3, and level 7 in part 4.

The main areas addressed in the first two parts are mathematics, physics and semiconductor devices, analogue and digital circuit design, signals and systems, communications and control, programming, software design, development and verification, CAD tools and practical laboratory work. In parts three and four, the core material covers professional practice, with major individual and group projects, and taught modules covering industrial practice and engineering management. You will also choose from a range of technical options. Many of these are in the specialist areas of Artificial Intelligence, Mobile & Secure Systems, Computer Systems, Nanotechnology, Photonics, and Wireless Communications.

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.

Part I Core
All modules are core and so are not eligible for compensation.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC1204 | Advanced Programming | 7.5 | Core |
| ELEC1202 | Digital Systems and Microprocessors | 7.5 | Core |
| ELEC1206 | Electrical Materials and Fields | 7.5 | Core |
| ELEC1200 | Electronic Circuits | 7.5 | Core |
| ELEC1207 | Electronic Systems | 7.5 | Core |

| | | | |
|---|---|---|---|
| MATH1055 | Mathematics for Electronic and Electrical Engineering | 7.5 | Core |
| ELEC1201 | Programming | 7.5 | Core |
| ELEC1205 | Solid State Devices | 7.5 | Core |

Part II

Part II Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2220 | Control and Communications | 7.5 | Compulsory |
| ELEC2221 | Digital Systems and Signal Processing | 7.5 | Compulsory |
| ELEC2212 | Electromagnetism for Communications | 7.5 | Compulsory |
| ELEC2205 | Electronic Design | 7.5 | Compulsory |
| MATH2047 | Mathematics for Electronics & Electrical Engineering Part II | 7.5 | Compulsory |

Part II Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |

Part III
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS credits), which is core and is weighted 7.5 ECTS/ 15 CATS in Semester I and 15 ECTS/30 CATS in Semester II. In addition, students must take certain specified modules, as given in the tables below.

Finally, students should select optional modules to make up the total to 60 ECTS/120 CATS. Besides COMP3200, COMP3219 and specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx, UOSMxxxx, FRENxxxx, GERMxxxx, LANGxxxx and MATHxxxx ) may be chosen. Students must select a 30 ECTS:30 ECTS credit balance between semesters. Students studying for a specialised “(...)” degree must take at least 15 ECTS credits of specialised modules (listed below) in Pt III and must undertake a project within their specialty.

Electronic Engineering with Artificial Intelligence: COMP3212, COMP3223, ELEC3201, ELEC3218.

Electronic Engineering with Computer Systems: COMP3215, ELEC3219, ELEC3221, ELEC3222.

Electronic Engineering with Mobile and Secure Systems: COMP3201, COMP3215, COMP3217, ELEC3222.

Electronic Engineering with Nanotechnology: ELEC3202, ELEC3207, ELEC3217, ELEC3223.

Electronic Engineering with Photonics: ELEC3203, ELEC3204, ELEC3207, ELEC3217.

Electronic Engineering with Wireless Communications: ELEC3203, ELEC3204, ELEC3218.

Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3219 | Engineering Management and Law | 7.5 | Compulsory |
| COMP3217 | Security of Cyber Physical Systems | 7.5 | Compulsory |

Part III Core
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS), which is core and is weighted 7.5 ECTS in Semester I and 15 ECTS in Semester II.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3200 | Part III Individual Project | 22.5 | Core |

Part III Optional
Additional optional modules include:
- LANGxxxx: A language module scheduled in the Broadening Horizons slot. The appropriate stage will be selected after assessment by the language school
- UOSMxxxx: Any other module from the University's Broadening Horizons programme

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| COMP3223 | Foundations of Machine Learning | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |
| ELEC3219 | Advanced Computer Architecture | 7.5 | Optional |
| MATH3083 | Advanced Partial Differential Equations | 7.5 | Optional |
| ELEC3208 | Analogue and Mixed Signal Electronics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| ELEC3222 | Computer Networks | 7.5 | Optional |
| ELEC3205 | Control System Design | 7.5 | Optional |
| COMP3201 | Cyber Security | 7.5 | Optional |
| ELEC3203 | Digital Coding and Transmission | 7.5 | Optional |
| ELEC3206 | Digital Control System Design | 7.5 | Optional |
| ELEC3221 | Digital IC and Systems Design | 7.5 | Optional |
| ELEC3202 | Green Electronics | 7.5 | Optional |
| MATH3084 | Integral Transform Methods | 7.5 | Optional |
| ELEC3223 | Introduction to Bionanotechnology | 7.5 | Optional |
| ELEC3207 | Nanoelectronic Devices | 7.5 | Optional |
| MATH3081 | Operational Research | 7.5 | Optional |
| MATH3082 | Optimisation | 7.5 | Optional |
| ELEC3217 | Photonics II | 7.5 | Optional |
| COMP3215 | Real-Time Computing and Embedded Systems | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| ELEC3218 | Signal and Image Processing | 7.5 | Optional |
| ELEC3204 | Wireless and Optical Communications | 7.5 | Optional |

Part IV
All students must take the ELEC6200 Group Design Project (22.5 ECTS/45 CATS) which is core and is weighted 15 ECTS in Semester I and 7.5 ECTS in semester II. In addition, students must take certain specified modules, as given in the tables below.

Students should note that there are a number of prerequisites for the optional modules which are listed in the module specifications; decisions they made for Pt III may affect their choice. 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.

Finally, students should select optional modules to make up the total to 60 credits. Besides COMP6228 and specialised modules, a maximum of 2 other "externally taught" modules (COMPxxxx, OPTOxxxx and MATHxxxx ) may be chosen. Students must select a 30:30 credit balance between semesters. Students studying for a specialised "with" degree must take at least 15 ECTS of specialised modules (listed below) in Pt IV.

Electronic Engineering with Artificial Intelligence: COMP6202, COMP6208, COMP6212, COMP6223, COMP6237, COMP6247, COMP6248, ELEC6212, ELEC6213, ELEC6253.

Electronic Engineering with Computer Systems: ELEC6230, ELEC6231, ELEC6233, ELEC6234, ELEC6235, ELEC6237.

Electronic Engineering with Mobile and Secure Systems: ELEC6214, ELEC6242, ELEC6245.

Electronic Engineering with Nanotechnology: ELEC6201, ELEC6202, ELEC6203, ELEC6204, ELEC6206, ELEC6207, ELEC6208.

Electronic Engineering with Photonics: ELEC6201, ELEC6206, ELEC6207, OPTO6007, OPTO6008, OPTO6010, OPTO6011.

Electronic Engineering with Wireless Communications: ELEC6217, ELEC6214, ELEC6245, ELEC6252, ELEC6253.

Alternatively, semester II of Pt IV may be taken at a partner institution overseas, which has been approved by the Erasmus coordinator. In this case, ELEC6247 Group Design Project (Overseas Placement) should be taken instead of ELEC6200 Group Design Project during semester I. In this case, ELEC6247 is core and carries 15 ECTS credits. The modules selected at the overseas institution must be approved by the programme leader. The module selection must include at least 30 ECTS (or equivalent) at masters level, that is relevant to the degree title. In 'with X' programmes, the requirement to take 15 ECTS credits specific to the specialisation must be met across the two semesters. The marks awarded by the overseas institution will be converted to equivalent UK marks by the Erasmus coordinator.

Part IV Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC6200 | Group Design Project | 22.5 | Core |

Part IV Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |
| ELEC6252 | Future Wireless Techniques | 7.5 | Optional |
| ELEC6253 | Machine Learning for Wireless Communications | 7.5 | Optional |
| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6202 | Advanced Memory and Storage | 7.5 | Optional |
| ELEC6214 | Advanced Wireless Communications Networks and Systems | 7.5 | Optional |
| OPTO6007 | An Introduction to Silicon Photonics | 7.5 | Optional |
| ELEC6232 | Analogue and Mixed Signal CMOS Design | 7.5 | Optional |
| ELEC6228 | Applied Control Systems | 7.5 | Optional |
| ELEC6208 | Bio/Micro/Nano Systems | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| ELEC6242 | Cryptography | 7.5 | Optional |
| ELEC6233 | Digital Systems Synthesis | 7.5 | Optional |
| ELEC6234 | Embedded Processors | 7.5 | Optional |
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| COMP6228 | Individual Research Project | 7.5 | Optional |
| ELEC6227 | Medical Electrical and Electronic Technologies | 7.5 | Optional |
| ELEC6201 | Microfabrication | 7.5 | Optional |
| ELEC6204 | Microfluidics and Lab-on-a-Chip | 7.5 | Optional |

| | | | |
|---|---|---|---|
| ELEC6203 | Microsensor Technologies | 7.5 | Optional |
| MATH6149 | Modelling with Differential Equations | 7.5 | Optional |
| ELEC6206 | Nanofabrication and Microscopy | 7.5 | Optional |
| MATH6141 | Numerical Methods | 7.5 | Optional |
| OPTO6008 | Optical Fibres | 7.5 | Optional |
| ELEC6207 | Quantum Devices and Technology | 7.5 | Optional |
| ELEC6217 | Radio Communications Engineering | 7.5 | Optional |
| ELEC6237 | Secure Hardware Design | 7.5 | Optional |
| ELEC6235 | SOC Design Project | 7.5 | Optional |
| COMP6204 | Software Project Management and Development | 7.5 | Optional |
| ELEC6231 | VLSI Design Project | 7.5 | Optional |
| ELEC6230 | VLSI Systems Design | 7.5 | Optional |
| ELEC6245 | Wireless Networks | 7.5 | Optional |

The programme structure table is below:

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

## Nanotechnology Pathway

Part I
Typical course content

You will study 60 European Credit Transfer and Accumulation System (ECTS) credit points (equivalent to 120 CATS), in parts 1, 2, 3 and 4. These credits are mainly at level 4 in the Framework for Higher Education Qualifications (FHEQ) in part 1, level 5 in part 2, level 6 in part 3, and level 7 in part 4.

The main areas addressed in the first two parts are mathematics, physics and semiconductor devices, analogue and digital circuit design, signals and systems, communications and control, programming, software design, development and verification, CAD tools and practical laboratory work. In parts three and four, the core material covers professional practice, with major individual and group projects, and taught modules covering industrial practice and engineering management. You will also choose from a range of technical options. Many of these are in the specialist areas of Artificial Intelligence, Mobile & Secure Systems, Computer Systems, Nanotechnology, Photonics, and Wireless Communications.

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.

Part I Core
All modules are core and so are not eligible for compensation.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC1204 | Advanced Programming | 7.5 | Core |
| ELEC1202 | Digital Systems and Microprocessors | 7.5 | Core |
| ELEC1206 | Electrical Materials and Fields | 7.5 | Core |
| ELEC1200 | Electronic Circuits | 7.5 | Core |
| ELEC1207 | Electronic Systems | 7.5 | Core |
| MATH1055 | Mathematics for Electronic and Electrical Engineering | 7.5 | Core |
| ELEC1201 | Programming | 7.5 | Core |
| ELEC1205 | Solid State Devices | 7.5 | Core |

Part II

Part II Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2220 | Control and Communications | 7.5 | Compulsory |
| ELEC2201 | Devices | 7.5 | Compulsory |
| ELEC2221 | Digital Systems and Signal Processing | 7.5 | Compulsory |
| ELEC2212 | Electromagnetism for Communications | 7.5 | Compulsory |
| ELEC2205 | Electronic Design | 7.5 | Compulsory |
| MATH2047 | Mathematics for Electronics & Electrical Engineering Part II | 7.5 | Compulsory |

Part II Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |

Part III
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS credits), which is core and is weighted 7.5 ECTS/ 15 CATS in Semester I and 15 ECTS/30 CATS in Semester II. In addition, students must take certain specified modules, as given in the tables below.

Finally, students should select optional modules to make up the total to 60 ECTS/120 CATS. Besides COMP3200, COMP3219 and specialised modules, a maximum of 2 other "externally taught" modules (COMPxxxx, OPTOxxxx, UOSMxxxx, FRENxxxx, GERMxxxx, LANGxxxx and MATHxxxx ) may be chosen. Students must select a 30 ECTS:30 ECTS credit balance between semesters. Students studying for a specialised "(...)" degree must take at least 15 ECTS credits of specialised modules (listed below) in Pt III and must undertake a project within their specialty.

Electronic Engineering with Artificial Intelligence: COMP3212, COMP3223, ELEC3201, ELEC3218.

Electronic Engineering with Computer Systems: COMP3215, ELEC3219, ELEC3221, ELEC3222.

Electronic Engineering with Mobile and Secure Systems: COMP3201, COMP3215, COMP3217, ELEC3222.

Electronic Engineering with Nanotechnology: ELEC3202, ELEC3207, ELEC3217, ELEC3223.

Electronic Engineering with Photonics: ELEC3203, ELEC3204, ELEC3207, ELEC3217.

Electronic Engineering with Wireless Communications: ELEC3203, ELEC3204, ELEC3218.

Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3219 | Engineering Management and Law | 7.5 | Compulsory |
| ELEC3207 | Nanoelectronic Devices | 7.5 | Compulsory |

Part III Core
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS), which is core and is weighted 7.5 ECTS in Semester I and 15 ECTS in Semester II.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3200 | Part III Individual Project | 22.5 | Core |

Part III Optional
Additional optional modules include:
- LANGxxxx: A language module scheduled in the Broadening Horizons slot. The appropriate stage will be

selected after assessment by the language school
- UOSMxxxx: Any other module from the University's Broadening Horizons programme

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| COMP3223 | Foundations of Machine Learning | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |
| ELEC3219 | Advanced Computer Architecture | 7.5 | Optional |
| MATH3083 | Advanced Partial Differential Equations | 7.5 | Optional |
| ELEC3208 | Analogue and Mixed Signal Electronics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| ELEC3222 | Computer Networks | 7.5 | Optional |
| ELEC3205 | Control System Design | 7.5 | Optional |
| COMP3201 | Cyber Security | 7.5 | Optional |
| ELEC3203 | Digital Coding and Transmission | 7.5 | Optional |
| ELEC3206 | Digital Control System Design | 7.5 | Optional |
| ELEC3221 | Digital IC and Systems Design | 7.5 | Optional |
| ELEC3202 | Green Electronics | 7.5 | Optional |
| MATH3084 | Integral Transform Methods | 7.5 | Optional |
| ELEC3223 | Introduction to Bionanotechnology | 7.5 | Optional |
| ELEC3207 | Nanoelectronic Devices | 7.5 | Optional |
| MATH3081 | Operational Research | 7.5 | Optional |
| MATH3082 | Optimisation | 7.5 | Optional |
| ELEC3217 | Photonics II | 7.5 | Optional |
| COMP3215 | Real-Time Computing and Embedded Systems | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| COMP3217 | Security of Cyber Physical Systems | 7.5 | Optional |
| ELEC3218 | Signal and Image Processing | 7.5 | Optional |
| ELEC3204 | Wireless and Optical Communications | 7.5 | Optional |

Part IV
All students must take the ELEC6200 Group Design Project (22.5 ECTS/45 CATS) which is core and is weighted 15 ECTS in Semester I and 7.5 ECTS in semester II. In addition, students must take certain specified modules, as given in the tables below.

Students should note that there are a number of prerequisites for the optional modules which are listed in the module specifications; decisions they made for Pt III may affect their choice. 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.

Finally, students should select optional modules to make up the total to 60 credits. Besides COMP6228 and specialised modules, a maximum of 2 other "externally taught" modules (COMPxxxx, OPTOxxxx and MATHxxxx ) may be chosen. Students must select a 30:30 credit balance between semesters. Students studying for a specialised "with" degree must take at least 15 ECTS of specialised modules (listed below) in Pt IV.

Electronic Engineering with Artificial Intelligence: COMP6202, COMP6208, COMP6212, COMP6223, COMP6237, COMP6247, COMP6248, ELEC6212, ELEC6213, ELEC6253.

Electronic Engineering with Computer Systems: ELEC6230, ELEC6231, ELEC6233, ELEC6234, ELEC6235, ELEC6237.

Electronic Engineering with Mobile and Secure Systems: ELEC6214, ELEC6242, ELEC6245.

Electronic Engineering with Nanotechnology: ELEC6201, ELEC6202, ELEC6203, ELEC6204, ELEC6206,

ELEC6207, ELEC6208.

Electronic Engineering with Photonics: ELEC6201, ELEC6206, ELEC6207, OPTO6007, OPTO6008, OPTO6010, OPTO6011.

Electronic Engineering with Wireless Communications: ELEC6217, ELEC6214, ELEC6245, ELEC6252, ELEC6253.

Alternatively, semester II of Pt IV may be taken at a partner institution overseas, which has been approved by the Erasmus coordinator. In this case, ELEC6247 Group Design Project (Overseas Placement) should be taken instead of ELEC6200 Group Design Project during semester I. In this case, ELEC6247 is core and carries 15 ECTS credits. The modules selected at the overseas institution must be approved by the programme leader. The module selection must include at least 30 ECTS (or equivalent) at masters level, that is relevant to the degree title. In 'with X' programmes, the requirement to take 15 ECTS credits specific to the specialisation must be met across the two semesters. The marks awarded by the overseas institution will be converted to equivalent UK marks by the Erasmus coordinator.

Part IV Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC6200 | Group Design Project | 22.5 | Core |

Part IV Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |
| ELEC6252 | Future Wireless Techniques | 7.5 | Optional |
| ELEC6253 | Machine Learning for Wireless Communications | 7.5 | Optional |
| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6202 | Advanced Memory and Storage | 7.5 | Optional |
| ELEC6214 | Advanced Wireless Communications Networks and Systems | 7.5 | Optional |
| OPTO6007 | An Introduction to Silicon Photonics | 7.5 | Optional |
| ELEC6232 | Analogue and Mixed Signal CMOS Design | 7.5 | Optional |
| ELEC6228 | Applied Control Systems | 7.5 | Optional |
| ELEC6208 | Bio/Micro/Nano Systems | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| ELEC6242 | Cryptography | 7.5 | Optional |
| ELEC6233 | Digital Systems Synthesis | 7.5 | Optional |
| ELEC6234 | Embedded Processors | 7.5 | Optional |
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| COMP6228 | Individual Research Project | 7.5 | Optional |
| ELEC6227 | Medical Electrical and Electronic Technologies | 7.5 | Optional |
| ELEC6201 | Microfabrication | 7.5 | Optional |
| ELEC6204 | Microfluidics and Lab-on-a-Chip | 7.5 | Optional |
| ELEC6203 | Microsensor Technologies | 7.5 | Optional |
| MATH6149 | Modelling with Differential Equations | 7.5 | Optional |
| ELEC6206 | Nanofabrication and Microscopy | 7.5 | Optional |
| MATH6141 | Numerical Methods | 7.5 | Optional |
| OPTO6008 | Optical Fibres | 7.5 | Optional |
| ELEC6207 | Quantum Devices and Technology | 7.5 | Optional |
| ELEC6217 | Radio Communications Engineering | 7.5 | Optional |

| | | | |
|---|---|---|---|
| ELEC6237 | Secure Hardware Design | 7.5 | Optional |
| ELEC6235 | SOC Design Project | 7.5 | Optional |
| COMP6204 | Software Project Management and Development | 7.5 | Optional |
| ELEC6231 | VLSI Design Project | 7.5 | Optional |
| ELEC6230 | VLSI Systems Design | 7.5 | Optional |
| ELEC6245 | Wireless Networks | 7.5 | Optional |

The programme structure table is below:

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

## Photonics Pathway

Part I
Typical course content

You will study 60 European Credit Transfer and Accumulation System (ECTS) credit points (equivalent to 120 CATS), in parts 1, 2, 3 and 4. These credits are mainly at level 4 in the Framework for Higher Education Qualifications (FHEQ) in part 1, level 5 in part 2, level 6 in part 3, and level 7 in part 4.

The main areas addressed in the first two parts are mathematics, physics and semiconductor devices, analogue and digital circuit design, signals and systems, communications and control, programming, software design, development and verification, CAD tools and practical laboratory work. In parts three and four, the core material covers professional practice, with major individual and group projects, and taught modules covering industrial practice and engineering management. You will also choose from a range of technical options. Many of these are in the specialist areas of Artificial Intelligence, Mobile & Secure Systems, Computer Systems, Nanotechnology, Photonics, and Wireless Communications.

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.

Part I Core
All modules are core and so are not eligible for compensation.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC1204 | Advanced Programming | 7.5 | Core |
| ELEC1202 | Digital Systems and Microprocessors | 7.5 | Core |
| ELEC1206 | Electrical Materials and Fields | 7.5 | Core |
| ELEC1200 | Electronic Circuits | 7.5 | Core |
| ELEC1207 | Electronic Systems | 7.5 | Core |
| MATH1055 | Mathematics for Electronic and Electrical Engineering | 7.5 | Core |
| ELEC1201 | Programming | 7.5 | Core |
| ELEC1205 | Solid State Devices | 7.5 | Core |

Part II

Part II Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2220 | Control and Communications | 7.5 | Compulsory |
| ELEC2221 | Digital Systems and Signal Processing | 7.5 | Compulsory |
| ELEC2212 | Electromagnetism for Communications | 7.5 | Compulsory |

| | | | |
|---|---|---|---|
| ELEC2205 | Electronic Design | 7.5 | Compulsory |
| MATH2047 | Mathematics for Electronics & Electrical Engineering Part II | 7.5 | Compulsory |
| ELEC2228 | Photonics I | 7.5 | Compulsory |

Part II Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |

Part III
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS credits), which is core and is weighted 7.5 ECTS/ 15 CATS in Semester I and 15 ECTS/30 CATS in Semester II. In addition, students must take certain specified modules, as given in the tables below.

Finally, students should select optional modules to make up the total to 60 ECTS/120 CATS. Besides COMP3200, COMP3219 and specialised modules, a maximum of 2 other "externally taught" modules (COMPxxxx, OPTOxxxx, UOSMxxxx, FRENxxxx, GERMxxxx, LANGxxxx and MATHxxxx ) may be chosen. Students must select a 30 ECTS:30 ECTS credit balance between semesters. Students studying for a specialised "(...)" degree must take at least 15 ECTS credits of specialised modules (listed below) in Pt III and must undertake a project within their specialty.

Electronic Engineering with Artificial Intelligence: COMP3212, COMP3223, ELEC3201, ELEC3218.

Electronic Engineering with Computer Systems: COMP3215, ELEC3219, ELEC3221, ELEC3222.

Electronic Engineering with Mobile and Secure Systems: COMP3201, COMP3215, COMP3217, ELEC3222.

Electronic Engineering with Nanotechnology: ELEC3202, ELEC3207, ELEC3217, ELEC3223.

Electronic Engineering with Photonics: ELEC3203, ELEC3204, ELEC3207, ELEC3217.

Electronic Engineering with Wireless Communications: ELEC3203, ELEC3204, ELEC3218.

Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3219 | Engineering Management and Law | 7.5 | Compulsory |

Part III Core
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS), which is core and is weighted 7.5 ECTS in Semester I and 15 ECTS in Semester II.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3200 | Part III Individual Project | 22.5 | Core |

Part III Optional
Additional optional modules include:
- LANGxxxx: A language module scheduled in the Broadening Horizons slot. The appropriate stage will be selected after assessment by the language school
- UOSMxxxx: Any other module from the University's Broadening Horizons programme

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| COMP3223 | Foundations of Machine Learning | 7.5 | Optional |

| | | | |
|---|---|---|---|
| ELEC2228 | Photonics I | 7.5 | Optional |
| ELEC3219 | Advanced Computer Architecture | 7.5 | Optional |
| MATH3083 | Advanced Partial Differential Equations | 7.5 | Optional |
| ELEC3208 | Analogue and Mixed Signal Electronics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| ELEC3222 | Computer Networks | 7.5 | Optional |
| ELEC3205 | Control System Design | 7.5 | Optional |
| COMP3201 | Cyber Security | 7.5 | Optional |
| ELEC3206 | Digital Control System Design | 7.5 | Optional |
| ELEC3221 | Digital IC and Systems Design | 7.5 | Optional |
| ELEC3202 | Green Electronics | 7.5 | Optional |
| MATH3084 | Integral Transform Methods | 7.5 | Optional |
| ELEC3223 | Introduction to Bionanotechnology | 7.5 | Optional |
| MATH3081 | Operational Research | 7.5 | Optional |
| MATH3082 | Optimisation | 7.5 | Optional |
| ELEC3217 | Photonics II | 7.5 | Optional |
| COMP3215 | Real-Time Computing and Embedded Systems | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| COMP3217 | Security of Cyber Physical Systems | 7.5 | Optional |
| ELEC3218 | Signal and Image Processing | 7.5 | Optional |
| ELEC3204 | Wireless and Optical Communications | 7.5 | Optional |

Part IV
All students must take the ELEC6200 Group Design Project (22.5 ECTS/45 CATS) which is core and is weighted 15 ECTS in Semester I and 7.5 ECTS in semester II. In addition, students must take certain specified modules, as given in the tables below.

Students should note that there are a number of prerequisites for the optional modules which are listed in the module specifications; decisions they made for Pt III may affect their choice. 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.

Finally, students should select optional modules to make up the total to 60 credits. Besides COMP6228 and specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx and MATHxxxx ) may be chosen. Students must select a 30:30 credit balance between semesters. Students studying for a specialised “with” degree must take at least 15 ECTS of specialised modules (listed below) in Pt IV.

Electronic Engineering with Artificial Intelligence: COMP6202, COMP6208, COMP6212, COMP6223, COMP6237, COMP6247, COMP6248, ELEC6212, ELEC6213, ELEC6253.

Electronic Engineering with Computer Systems: ELEC6230, ELEC6231, ELEC6233, ELEC6234, ELEC6235, ELEC6237.

Electronic Engineering with Mobile and Secure Systems: ELEC6214, ELEC6242, ELEC6245.

Electronic Engineering with Nanotechnology: ELEC6201, ELEC6202, ELEC6203, ELEC6204, ELEC6206, ELEC6207, ELEC6208.

Electronic Engineering with Photonics: ELEC6201, ELEC6206, ELEC6207, OPTO6007, OPTO6008, OPTO6010, OPTO6011.

Electronic Engineering with Wireless Communications: ELEC6217, ELEC6214, ELEC6245, ELEC6252, ELEC6253.

Alternatively, semester II of Pt IV may be taken at a partner institution overseas, which has been approved by the Erasmus coordinator. In this case, ELEC6247 Group Design Project (Overseas Placement) should be taken instead of ELEC6200 Group Design Project during semester I. In this case, ELEC6247 is core and carries 15

ECTS credits. The modules selected at the overseas institution must be approved by the programme leader. The module selection must include at least 30 ECTS (or equivalent) at masters level, that is relevant to the degree title. In 'with X' programmes, the requirement to take 15 ECTS credits specific to the specialisation must be met across the two semesters. The marks awarded by the overseas institution will be converted to equivalent UK marks by the Erasmus coordinator.

Part IV Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC6200 | Group Design Project | 22.5 | Core |

Part IV Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |
| ELEC6252 | Future Wireless Techniques | 7.5 | Optional |
| ELEC6253 | Machine Learning for Wireless Communications | 7.5 | Optional |
| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |
| OPTO6010 | Advanced Fibre Telecommunication | 7.5 | Optional |
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6202 | Advanced Memory and Storage | 7.5 | Optional |
| ELEC6214 | Advanced Wireless Communications Networks and Systems | 7.5 | Optional |
| OPTO6007 | An Introduction to Silicon Photonics | 7.5 | Optional |
| ELEC6232 | Analogue and Mixed Signal CMOS Design | 7.5 | Optional |
| ELEC6228 | Applied Control Systems | 7.5 | Optional |
| ELEC6208 | Bio/Micro/Nano Systems | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| ELEC6242 | Cryptography | 7.5 | Optional |
| ELEC6233 | Digital Systems Synthesis | 7.5 | Optional |
| ELEC6234 | Embedded Processors | 7.5 | Optional |
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| COMP6228 | Individual Research Project | 7.5 | Optional |
| ELEC6227 | Medical Electrical and Electronic Technologies | 7.5 | Optional |
| ELEC6201 | Microfabrication | 7.5 | Optional |
| ELEC6204 | Microfluidics and Lab-on-a-Chip | 7.5 | Optional |
| ELEC6203 | Microsensor Technologies | 7.5 | Optional |
| MATH6149 | Modelling with Differential Equations | 7.5 | Optional |
| ELEC6206 | Nanofabrication and Microscopy | 7.5 | Optional |
| MATH6141 | Numerical Methods | 7.5 | Optional |
| OPTO6011 | Optical Fibre Sensors | 7.5 | Optional |
| OPTO6008 | Optical Fibres | 7.5 | Optional |
| ELEC6207 | Quantum Devices and Technology | 7.5 | Optional |
| ELEC6217 | Radio Communications Engineering | 7.5 | Optional |
| ELEC6237 | Secure Hardware Design | 7.5 | Optional |
| ELEC6235 | SOC Design Project | 7.5 | Optional |
| COMP6204 | Software Project Management and Development | 7.5 | Optional |
| ELEC6231 | VLSI Design Project | 7.5 | Optional |
| ELEC6230 | VLSI Systems Design | 7.5 | Optional |
| ELEC6245 | Wireless Networks | 7.5 | Optional |

The programme structure table is below:

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

## Wireless Communications Pathway

Part I
Typical course content

You will study 60 European Credit Transfer and Accumulation System (ECTS) credit points (equivalent to 120 CATS), in parts 1, 2, 3 and 4. These credits are mainly at level 4 in the Framework for Higher Education Qualifications (FHEQ) in part 1, level 5 in part 2, level 6 in part 3, and level 7 in part 4.

The main areas addressed in the first two parts are mathematics, physics and semiconductor devices, analogue and digital circuit design, signals and systems, communications and control, programming, software design, development and verification, CAD tools and practical laboratory work. In parts three and four, the core material covers professional practice, with major individual and group projects, and taught modules covering industrial practice and engineering management. You will also choose from a range of technical options. Many of these are in the specialist areas of Artificial Intelligence, Mobile & Secure Systems, Computer Systems, Nanotechnology, Photonics, and Wireless Communications.

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.

Part I Core
All modules are core and so are not eligible for compensation.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC1204 | Advanced Programming | 7.5 | Core |
| ELEC1202 | Digital Systems and Microprocessors | 7.5 | Core |
| ELEC1206 | Electrical Materials and Fields | 7.5 | Core |
| ELEC1200 | Electronic Circuits | 7.5 | Core |
| ELEC1207 | Electronic Systems | 7.5 | Core |
| MATH1055 | Mathematics for Electronic and Electrical Engineering | 7.5 | Core |
| ELEC1201 | Programming | 7.5 | Core |
| ELEC1205 | Solid State Devices | 7.5 | Core |

Part II

Part II Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2220 | Control and Communications | 7.5 | Compulsory |
| ELEC2221 | Digital Systems and Signal Processing | 7.5 | Compulsory |
| ELEC2212 | Electromagnetism for Communications | 7.5 | Compulsory |
| ELEC2205 | Electronic Design | 7.5 | Compulsory |
| MATH2047 | Mathematics for Electronics & Electrical Engineering Part II | 7.5 | Compulsory |

Part II Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|

| | | | |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |

Part III
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS credits), which is core and is weighted 7.5 ECTS/ 15 CATS in Semester I and 15 ECTS/30 CATS in Semester II. In addition, students must take certain specified modules, as given in the tables below.

Finally, students should select optional modules to make up the total to 60 ECTS/120 CATS. Besides COMP3200, COMP3219 and specialised modules, a maximum of 2 other "externally taught" modules (COMPxxxx, OPTOxxxx, UOSMxxxx, FRENxxxx, GERMxxxx, LANGxxxx and MATHxxxx ) may be chosen. Students must select a 30 ECTS:30 ECTS credit balance between semesters. Students studying for a specialised "(...)" degree must take at least 15 ECTS credits of specialised modules (listed below) in Pt III and must undertake a project within their specialty.

Electronic Engineering with Artificial Intelligence: COMP3212, COMP3223, ELEC3201, ELEC3218.

Electronic Engineering with Computer Systems: COMP3215, ELEC3219, ELEC3221, ELEC3222.

Electronic Engineering with Mobile and Secure Systems: COMP3201, COMP3215, COMP3217, ELEC3222.

Electronic Engineering with Nanotechnology: ELEC3202, ELEC3207, ELEC3217, ELEC3223.

Electronic Engineering with Photonics: ELEC3203, ELEC3204, ELEC3207, ELEC3217.

Electronic Engineering with Wireless Communications: ELEC3203, ELEC3204, ELEC3218.

Part III Compulsory

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC3203 | Digital Coding and Transmission | 7.5 | Compulsory |
| COMP3219 | Engineering Management and Law | 7.5 | Compulsory |

Part III Core
All students must take the COMP3200 Individual Project (22.5 ECTS/45 CATS), which is core and is weighted 7.5 ECTS in Semester I and 15 ECTS in Semester II.

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP3200 | Part III Individual Project | 22.5 | Core |

Part III Optional
Additional optional modules include:
- LANGxxxx: A language module scheduled in the Broadening Horizons slot. The appropriate stage will be selected after assessment by the language school
- UOSMxxxx: Any other module from the University's Broadening Horizons programme

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC2216 | Advanced Electronic Systems | 7.5 | Optional |
| ELEC2204 | Computer Engineering | 7.5 | Optional |
| ELEC2201 | Devices | 7.5 | Optional |
| COMP3223 | Foundations of Machine Learning | 7.5 | Optional |
| ELEC2228 | Photonics I | 7.5 | Optional |
| ELEC3219 | Advanced Computer Architecture | 7.5 | Optional |
| MATH3083 | Advanced Partial Differential Equations | 7.5 | Optional |
| ELEC3208 | Analogue and Mixed Signal Electronics | 7.5 | Optional |
| COMP3212 | Computational Biology | 7.5 | Optional |
| ELEC3222 | Computer Networks | 7.5 | Optional |

| | | | |
|---|---|---|---|
| ELEC3205 | Control System Design | 7.5 | Optional |
| COMP3201 | Cyber Security | 7.5 | Optional |
| ELEC3206 | Digital Control System Design | 7.5 | Optional |
| ELEC3221 | Digital IC and Systems Design | 7.5 | Optional |
| ELEC3202 | Green Electronics | 7.5 | Optional |
| MATH3084 | Integral Transform Methods | 7.5 | Optional |
| ELEC3223 | Introduction to Bionanotechnology | 7.5 | Optional |
| ELEC3207 | Nanoelectronic Devices | 7.5 | Optional |
| MATH3081 | Operational Research | 7.5 | Optional |
| MATH3082 | Optimisation | 7.5 | Optional |
| ELEC3217 | Photonics II | 7.5 | Optional |
| COMP3215 | Real-Time Computing and Embedded Systems | 7.5 | Optional |
| ELEC3201 | Robotic Systems | 7.5 | Optional |
| COMP3217 | Security of Cyber Physical Systems | 7.5 | Optional |
| ELEC3218 | Signal and Image Processing | 7.5 | Optional |
| ELEC3204 | Wireless and Optical Communications | 7.5 | Optional |

Part IV
All students must take the ELEC6200 Group Design Project (22.5 ECTS/45 CATS) which is core and is weighted 15 ECTS in Semester I and 7.5 ECTS in semester II. In addition, students must take certain specified modules, as given in the tables below.

Students should note that there are a number of prerequisites for the optional modules which are listed in the module specifications; decisions they made for Pt III may affect their choice. 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.

Finally, students should select optional modules to make up the total to 60 credits. Besides COMP6228 and specialised modules, a maximum of 2 other “externally taught” modules (COMPxxxx, OPTOxxxx and MATHxxxx ) may be chosen. Students must select a 30:30 credit balance between semesters. Students studying for a specialised “with” degree must take at least 15 ECTS of specialised modules (listed below) in Pt IV.

Electronic Engineering with Artificial Intelligence: COMP6202, COMP6208, COMP6212, COMP6223, COMP6237, COMP6247, COMP6248, ELEC6212, ELEC6213, ELEC6253.

Electronic Engineering with Computer Systems: ELEC6230, ELEC6231, ELEC6233, ELEC6234, ELEC6235, ELEC6237.

Electronic Engineering with Mobile and Secure Systems: ELEC6214, ELEC6242, ELEC6245.

Electronic Engineering with Nanotechnology: ELEC6201, ELEC6202, ELEC6203, ELEC6204, ELEC6206, ELEC6207, ELEC6208.

Electronic Engineering with Photonics: ELEC6201, ELEC6206, ELEC6207, OPTO6007, OPTO6008, OPTO6010, OPTO6011.

Electronic Engineering with Wireless Communications: ELEC6217, ELEC6214, ELEC6245, ELEC6252, ELEC6253.

Alternatively, semester II of Pt IV may be taken at a partner institution overseas, which has been approved by the Erasmus coordinator. In this case, ELEC6247 Group Design Project (Overseas Placement) should be taken instead of ELEC6200 Group Design Project during semester I. In this case, ELEC6247 is core and carries 15 ECTS credits. The modules selected at the overseas institution must be approved by the programme leader. The module selection must include at least 30 ECTS (or equivalent) at masters level, that is relevant to the degree title. In 'with X' programmes, the requirement to take 15 ECTS credits specific to the specialisation must be met across the two semesters. The marks awarded by the overseas institution will be converted to equivalent UK marks by the Erasmus coordinator.

Part IV Core

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| ELEC6200 | Group Design Project | 22.5 | Core |

Part IV Optional

| Code | Module Title | ECTS | Type |
|---|---|---|---|
| COMP6223 | Computer Vision (MSc) | 7.5 | Optional |
| COMP6237 | Data Mining | 7.5 | Optional |
| COMP6248 | Deep Learning | 7.5 | Optional |
| ELEC6252 | Future Wireless Techniques | 7.5 | Optional |
| ELEC6253 | Machine Learning for Wireless Communications | 7.5 | Optional |
| COMP6247 | Reinforcement and Online Learning | 7.5 | Optional |
| COMP6208 | Advanced Machine Learning | 7.5 | Optional |
| ELEC6202 | Advanced Memory and Storage | 7.5 | Optional |
| ELEC6214 | Advanced Wireless Communications Networks and Systems | 7.5 | Optional |
| OPTO6007 | An Introduction to Silicon Photonics | 7.5 | Optional |
| ELEC6232 | Analogue and Mixed Signal CMOS Design | 7.5 | Optional |
| ELEC6228 | Applied Control Systems | 7.5 | Optional |
| ELEC6208 | Bio/Micro/Nano Systems | 7.5 | Optional |
| ELEC6212 | Biologically Inspired Robotics | 7.5 | Optional |
| COMP6212 | Computational Finance | 7.5 | Optional |
| ELEC6242 | Cryptography | 7.5 | Optional |
| ELEC6233 | Digital Systems Synthesis | 7.5 | Optional |
| ELEC6234 | Embedded Processors | 7.5 | Optional |
| COMP6202 | Evolution of Complexity | 7.5 | Optional |
| ELEC6213 | Image Processing | 7.5 | Optional |
| COMP6228 | Individual Research Project | 7.5 | Optional |
| ELEC6227 | Medical Electrical and Electronic Technologies | 7.5 | Optional |
| ELEC6201 | Microfabrication | 7.5 | Optional |
| ELEC6204 | Microfluidics and Lab-on-a-Chip | 7.5 | Optional |
| ELEC6203 | Microsensor Technologies | 7.5 | Optional |
| MATH6149 | Modelling with Differential Equations | 7.5 | Optional |
| ELEC6206 | Nanofabrication and Microscopy | 7.5 | Optional |
| MATH6141 | Numerical Methods | 7.5 | Optional |
| OPTO6008 | Optical Fibres | 7.5 | Optional |
| ELEC6207 | Quantum Devices and Technology | 7.5 | Optional |
| ELEC6217 | Radio Communications Engineering | 7.5 | Optional |
| ELEC6237 | Secure Hardware Design | 7.5 | Optional |
| ELEC6235 | SOC Design Project | 7.5 | Optional |
| COMP6204 | Software Project Management and Development | 7.5 | Optional |
| ELEC6231 | VLSI Design Project | 7.5 | Optional |
| ELEC6230 | VLSI Systems Design | 7.5 | Optional |
| ELEC6245 | Wireless Networks | 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:

· Induction – You will have an induction programme at the start of your programme. Besides covering the usual routine matters, it is especially important for you to be properly registered and to have your computer account set up, since the modules you study are supported by on-line systems. Assessment is also managed on-line, so any delay in registration could be detrimental to your studies. In addition, a diagnostic exercise helps us to assess your strengths and offer advice on how best to focus your efforts in the early stages of your studies.
· Personal tutoring – At the start of your studies, you are allocated a Personal Tutor who you will see regularly. Also there is Senior Tutoring team if your personal tutor is not available.
· Computer workstations, with a range of software, manuals and books, with early to late access through a card-lock mechanism.
· Traditional and wireless local area networks.
· Helpdesk for computer support and programming advice.
· Postgraduate demonstrators, who support programming intensive modules.
· A website with notes for every module.

- The Student Handbook.

## Methods for evaluating the quality of teaching and learning

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
- Accreditation/inspection by the Institution of Engineering and Technology
- A national Research Assessment Exercise (our research activity contributes directly to the quality of your learning experience)
- Institutional Review by the Quality Assurance Agency

Further details on the University's quality assurance processes are given in the *Quality handbook*.

## Career Opportunities

Major employers worldwide are keen to employ our graduates – in system development, information technology and communications in the IT sector, and in the finance, service, communications and entertainment industries. We have strong relationships with employers, run our own Careers Hub website (www.ecs.soton.ac.uk/careers) and hold our own annual careers fair.

## External Examiner(s) for the programme

| | | |
|---|---|---|
| Artificial Intelligence | Name: | Professor Jan Maciejowski - University of Cambridge |
| Artificial Intelligence | Name: | Professor Chris Baber - University of Birmingham |

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 | 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.<br><br>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.<br>Although not essential reading, you may benefit from the additional reading materials for the module. |
| 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 on line 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.