



# Department of Electronic Engineering : Programme Specification

## MSc: Embedded Wireless Systems



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**UNIVERSITY OF YORK  
POSTGRADUATE PROGRAMME SPECIFICATION**

This document applies to students who commence the following programme:
Awarding & Teaching institution: <b>University of York</b>
Department: <b>Electronics</b>
Award and programme title: <b>MSc in Embedded Wireless Systems</b>
Level of qualification: <b>Level 7 (Masters)</b>
Awards available only as interim awards:
Postgraduate Diploma in Embedded Wireless Systems (exit point only for 120cu)
Postgraduate Certificate in Embedded Wireless Systems (exit point only for 60cu)
<b>Admissions criteria</b>

In addition to the University's requirements, applicants should be in possession of an upper second-class honours degree (or equivalent, or higher) in the physical sciences, engineering or a related discipline. Graduates of any discipline who can demonstrate an understanding of electronic systems, fundamental mathematical skills, and have a level of experience/aptitude for technical/practical aspects of electronic design will be considered.

A preparation package comprising of core literature, tutorials and example exercises for pre-programme information/study will be made publicly available, and recommended in particular to those students with qualifications in less closely related disciplines, or who have been taken time out between degrees.

For non-English native speakers English language skills at the standard university requirement of at least IELTS 6.0 or the equivalent are expected.

Length and status of the programme and mode of study:

Programme	Length (years) and status (full-time/part-time)	Start dates/months	Mode		
			Face-to-face, campus-based	Distance learning	Other
MSc in Embedded Wireless Systems	1 year full-time	October	Yes	No	N/A

**Language of study:** English

**Programme accreditation by Professional, Statutory or Regulatory Bodies**

IET (Institute of Engineering Technology)

**Educational aims of the programme**

**For the Masters, Diploma and Certificate:**

The MSc in Embedded Wireless Systems integrates electronics, communications and computing from core principles to cutting-edge applications and provides you with valuable skills for future employment in this growth sector. One of the major features of the MSc is the teaching of embedded programming using ARM processors which are included in over 90% of all mobile phones. In addition to learning to program the processor during the group project, you will be involved in interfacing it to wireless nodes and sensors, and building real-world solutions to problems.

**Additionally for the Masters:**

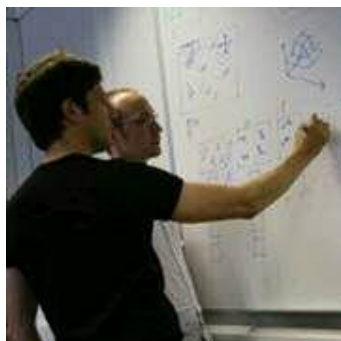
There is a major Independent Study Module in the form of a Group Project, enabling students to develop skills and knowledge that will prepare individuals for working in industry or undertaking further academic study. The project will involve the design and practical implementation of internet and wireless devices using ARM processors.

## Diagrammatic representation of the programme structure by stage, showing the distribution and credit value of core and option modules

Autumn Term	Spring Term	Summer Term	Summer Vacation
Introduction to Project	Enterprise	Research Methods	

<b>Management</b> [ELE00029M] 5 CU, Level 7	[ELE00008M] 10 CU, Level 7	[ELE00082M] 20 CU, Level 7
<b>Introduction to MATLAB</b> [ELE00031M] 5 CU, Level 7	<b>Network Security</b> [ELE00012M] 10 CU, Level 7	<b>MSc in Embedded Wireless Systems Project</b> [ELE00108M] 60 CU, Level 7
<b>Mobile Communications Systems for MSc</b> [ELE00042H] 10 CU, Level 6 P/F	<b>Data Communication Techniques</b> [ELE00040M] 10 CU, Level 7	
<b>Sensors and Instrumentation</b> [ELE00059M] 10 CU, Level 7	<b>Systems Programming for Embedded Devices</b> [ELE00063M] 10 CU, Level 7	
<b>Internet and LAN Protocols</b> [ELE00060M] 10 CU, Level 7	<b>Computer Operating Systems for MSc</b> [ELE00106M] 10 CU, Level 7	
<b>C Programming for MSc</b> [ELE00107M] 10 CU, Level 7		

**Intended learning outcomes for the programme – and how the programme enables students to achieve and demonstrate the intended learning outcomes**



## A: Knowledge and understanding

After having successfully completing this programme, students will have a solid knowledge of, and developed skills in, the theory, design and implementation of Internet and Wireless Computing. This knowledge and related skills will provide students with appropriate grounding for careers in the computing and communications industry and/or research. Most teaching will be undertaken through conventional lectures, laboratory sessions and workshops, and will be assessed through closed-book examinations and a variety of continuous assessments.

<b>Knowledge &amp; Understanding</b>	<b>Module</b>	<b>Delivery &amp; Assessment</b>
Operation of the Internet. Principles and operation of the	<b>Internet &amp; LAN</b>	Lectures,

major protocols in use in the Internet, and an introduction to how these protocols work together.	<b>Protocols</b>	Workshops, Practicals. Closed-book examination.
Concepts of software design and the techniques of computer programming. Study the C programming language to allow for the understanding of basic programming principles.	<b>C Programming for MSc</b>	Lectures, Computer Laboratories. Programming Exercise.
Systems programming and how it differs from application programming. Device drivers and operating systems. Processes, shared memory, semaphores and deadlock.	<b>Systems Programming for Embedded Devices</b>	Lectures, Practicals. Continuous assessment.
History of cellular communications, and the development of first, second, third and fourth generation standards. Network capacity & operation. Multiple access techniques. Traffic modelling. Telecoms standards.	<b>Mobile Communication Systems for MSc</b>	Lectures, Workshops. Closed-book examination.
Introduction to MATLAB, and its large number of built-in functions. Use of MATLAB to solve engineering problems.	<b>Introduction to MATLAB</b>	Practicals. Continuous assessment.
Types of project. Role of project manager. Project life-cycles. Tools and techniques for project management. Quality Assurance. Engineering Ethics.	<b>Introduction to Project Management</b>	Lectures. Continuous assessment.
Characteristics, functioning and limitations of a number of prominent computer operating systems for both conventional and Internet and mobile computing devices.	<b>Computer Operating Systems for MSc</b>	Lectures, Practicals & Workshops. Coursework & Presentation.
Different networks and their security needs. Types of threat. Network security tools and policies.	<b>Network Security</b>	Lectures & Workshops. Critical literature review.
Issues of commercial exploitation, competitive environment including the setting of pricing structures & marketing options.	<b>Enterprise</b>	Seminars. Presentation and Report.
Communication systems and techniques that underpin digital technologies, especially with embedded systems.	<b>Data Communication Techniques</b>	Lectures. Closed-book examination.
Understanding of the operation of various types of sensors including temperature, light, humidity, MEMS, remote sensing. Developing an understanding of the limitations of real sensors and practical design.	<b>Sensors &amp; Instrumentation</b>	Lectures. Continuous assessment.
Research Methods - Develops students ability to undertake a detailed and focussed literature review into relevant aspects of a novel technological idea broadening and deepening the students understanding of a technical topic they already understand from their undergraduate engineering degree.	<b>Research Methods</b>	Workshops, Presentation & Report

## **B: (i) Skills: Discipline-related**

A number of the modules will provide skills specific to the Internet and mobile communications – notable examples are Introduction to MATLAB, Introduction to Project Management and QA and Computer Networks and Operating Systems. These enable students to design and implement software and hardware devices to industry standards, paying special regard to quality assurance and other professional requirements. The laboratories will also enable students to develop skills in the underlying technologies.

<b>Discipline-related Skills</b>	<b>Module</b>	<b>Delivery &amp; Assessment</b>
Use of Internet Protocols	<b>Internet &amp; LAN Protocols</b>	Computer Laboratories. Closed-book examination.
Programming: assignment including design, implementation and testing, carried out during laboratories.	<b>C Programming for MSc</b>	Computer Laboratories. Programming Exercise.
Systems programming and how it differs from application programming. Device drivers and operating systems. Processes, shared memory, semaphores and deadlock.	<b>Systems Programming for Embedded Devices</b>	Practical Exercise and Lab Report, Continuous assessment.
Comparison & characterisation of different telecoms techniques.	<b>Mobile Communication Systems for MSc</b>	Workshops. Closed-book examination.
Use of MATLAB to carry out simulations, write scripts and solve engineering problems.	<b>Introduction to MATLAB</b>	Computer Laboratories. Continuous assessment.
Analyse a project & produce specification. Work breakdowns. Critical path analysis & risk.	<b>Introduction to Project Management</b>	Individual project plan and analysis. Report assessed.
Demonstrate understanding of distributed computing environments and the need for security.	<b>Computer Operating Systems for MSc</b>	Practicals & Workshops. Coursework & Presentation.
Ability to assess threats to a variety of networks, and how to counter them.	<b>Network Security</b>	Lectures & Workshops. Critical literature review.
Explore a real new/novel technology or product and advance it to the point of a genuinely workable business plan.	<b>Enterprise</b>	Seminars. Presentation and Report.
Understand practical digital communications techniques such as clock embedding and recovery, line coding, DC balancing, serialisation and de-serialisation, buffering and buffer control.	<b>Data Communication Techniques</b>	Lectures. Closed-book examination.
Build on existing research methods knowledge or to learn the fundamentals of research to equip students with the knowledge to undertake and evaluate research.	<b>Research Methods</b>	Workshops, Presentation & Report
Demonstrate understanding of the theory and practical operation of sensors.	<b>Sensors &amp; Instrumentation</b>	Lectures. Continuous assessment.
Investigation of a specified problem in Internet or Mobile Computing.	<b>MSc Project</b>	Initial report. Final report. Viva examination. Performance review.

## **B: (ii) Skills: Transferable**



The 60 credit unit Group project provides an excellent opportunity to gain experience working in a group, much in the way development is undertaken in industry. Groups of several students working together in a coordinated environment are often considered an ideal way in which software and hardware integrated systems can be developed. In addition to attaining technical experience, experience in interpersonal skills is also gained. Our experience with students on all our taught MSc's has demonstrated how much students can benefit from this aspect of the programme, especially if they have aspirations to work in multinational

companies.

Transferable skills of project management, presentation and technical writing are taught as part of the Group project. In addition to skills developed through academic programmes, the University's York Award can help students to plan and reflect on their experience and gain certification for many extra-curricular activities.

<b>Transferable Skills</b>	<b>Module(s)</b>	<b>Delivery &amp; Assessment</b>
Group working. Interpersonal skills. Time management. Delegation & risk management. Placing individual work in a larger context, as in real-life companies.	<b>MSc Project</b>	Initial report. Final report. Viva examination. Performance review.
Capturing customer requirements and forming requirement specifications; work breakdown structures; activity matrices; project plan preparation; project charting techniques, Bar Chart, Gantt charts and PERT; critical path analysis; project management techniques, value added; risk management; and ethics.	<b>Introduction to Project Management</b>	Individual project plan and analysis. Report assessed.
Design and implement simple programs. Test software solutions to practical problems against target specifications.	<b>Introduction to MATLAB</b>	Computer Laboratories. Programming Exercises.
Writing technical report on a system-oriented sensor application	<b>Sensors &amp; Instrumentation</b>	Lectures. Continuous assessment.
Propose an organisational form for a new venture based on an analysis of the opportunity. Prepare a full and professional business plan	<b>Enterprise</b>	Seminars. Presentation and Report.

#### **Relevant Quality Assurance Agency benchmark statement and other relevant external reference points**

Here we summarise the main characteristics of MSc students, taken from:

Framework for Higher Education Qualifications in England, Wales and Northern Ireland – August 2008

QAA Subject Benchmark Statements on Engineering (2006)

<http://www.qaa.ac.uk/Publications/InformationandGuidance/Documents/FHEQ08.pdf>

**MSc students** will be able to:

- ▶ deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences
- ▶ demonstrate self-direction and originality in tackling and solving problems, and act autonomously in planning and implementing tasks at a professional or equivalent level
- ▶ continue to advance their knowledge and understanding, and to develop new skills to a high level.

And will have the qualities and transferable skills necessary for employment requiring:

- ▶ the exercise of initiative and personal responsibility
- ▶ decision-making in complex and unpredictable situations
- ▶ the independent learning ability required for continuing professional development.

#### **University award regulations**

To be eligible for an award of the University of York a student must undertake an approved programme of study, obtain a specified number of credits (at a specified level(s)), and meet any other requirements of the award as specified in the award requirements and programme regulations, and other University regulations (e.g. payment of fees). Credit will be awarded upon passing a module's assessment(s) but some credit may be awarded where failure has been compensated by achievement in other modules. The University's award and assessment regulations specify the University's marking scheme, and rules governing progression (including rules for compensation), reassessment and award requirements. The award and assessment regulations apply to all programmes: any exceptions that relate to this programme are approved by University Teaching Committee and are recorded at the end of this document.

## Departmental policies on assessment and feedback

Detailed information on **assessment** (including grade descriptors, marking procedures, word counts etc.) is available in the written statement of assessment which applies to this programme and the relevant module descriptions. These are available in the student handbook and on the Department's website:

[https://www.elec.york.ac.uk/internal\\_web/Docs/Handbooks/MSc/5\\_Statement\\_of\\_Assessment.html](https://www.elec.york.ac.uk/internal_web/Docs/Handbooks/MSc/5_Statement_of_Assessment.html)

Information on formative and summative feedback to students on their work is available in the written statement on feedback to students which applies to this programmes and the relevant module descriptions. These are available in the student handbook and on the Department's website:

[https://www.elec.york.ac.uk/internal\\_web/](https://www.elec.york.ac.uk/internal_web/)

## Overview of modules by stage

### Core module table

Module Title	Module Code	Credit Level <sup>1</sup>	Credit Value <sup>2</sup>	Terms Taught	Pre-requisites	Assessment Rules <sup>3</sup>	Timing and format of main assessment <sup>4</sup>
C Programming for MSc	ELE00107M	7/M	10	AuT	Department of Electronic Engineering standard MSc entrance requirements or equivalent.		SpT Coursework
Computer Operating Systems for MSc	ELE00106M	7/M	10	SpT	Department of Electronic Engineering standard MSc entrance requirements or equivalent		SpT Coursework
Data Communication Techniques	ELE00040M	7/M	10	SpT	N/A		SuT week 1 Examinations
Enterprise	ELE00008M	7/M	10	SpT	N/A		SpT & SuT Coursework
Internet and LAN Protocols	ELE00060M	7/M	10	AuT	None		SpT week 1 Examinations
Introduction to MATLAB	ELE00031M	7/M	5	AuT	None		AuT Coursework
Introduction to Project Management	ELE00029M	7/M	5	AuT	None		AuT Coursework
MSc in Embedded							SuV

Wireless Systems Project	ELE00108M	7/M	60	SuT	None		Coursework
Mobile Communications Systems for MSc	ELE00042H	6/H	10	AuT	None	P/F	SpT week 1 Examinations
Network Security	ELE00012M	7/M	10	SpT	Core for UG Computing students and optional for all other UG MEng students. Core for MSc in IWC students. UG students: none. MSc students: none.		SuT Coursework
Research Methods	ELE00082M	7/M	20	SuT			SuT Coursework
Sensors and Instrumentation	ELE00059M	7/M	10	AuT	None		SpT Coursework
Systems Programming for Embedded Devices	ELE00063M	7/M	10	SpT	Core for MSc DSE, IWC & Autonomous Robotics. MSc students: None.		SuT Coursework

<sup>1</sup> The **Credit Level** is an indication of the module's relative intellectual demand, complexity and depth of learning and of learner autonomy (Level 4/Certificate, Level 5/Intermediate, Level 6/Honours, Level 7/Masters).

<sup>2</sup> The **Credit Value** gives the notional workload for the module, where 1 credit corresponds to a notional workload of 10 hours (including contact hours, private study and assessment).

<sup>3</sup> **Assessment rules**

**P/F** = the module marked on a pass/fail basis (NB pass/fail modules cannot be compensated).

**NC** = the module cannot be compensated.

**NR** = there is no reassessment opportunity for this module. It must be passed at the first attempt.

<sup>4</sup> **Timing and format of main assessment**

**AuT** = Autumn Term.

**SpT** = Spring Term.

**SuT** = Summer Term.

**SuV** = Summer Vacation.

**Relevant Quality Assurance Agency benchmark statement(s) and other relevant external reference points** (e.g. National Occupational Standards, or the requirements of Professional, Statutory or Regulatory Bodies)

Framework for Higher Education Qualifications in England, Wales and Northern Ireland – August 2008  
<http://www.qaa.ac.uk/Publications/InformationAndGuidance/Documents/FHEQ08.pdf>

IET Accreditation – October 2014:

<http://www.theiet.org/academics/accreditation/policy-guidance/>

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award and assessment regulations specify the University's marking scheme, and rules governing progression (including rules for compensation), reassessment and award requirements. The award and assessment regulations apply to all programmes: any exceptions that relate to this programme are approved by University Teaching Committee and are recorded at the end of this document.

## Departmental policies on assessment and feedback

Detailed information on assessment (including grade descriptors, marking procedures, word counts etc.) will be available in the written statement of assessment which applies to this programme and the relevant module descriptions. These will be available in the student handbook and on the Department's website prior to commencement of the programme.

<https://www.elec.york.ac.uk/>

University Regulations:

<https://www.york.ac.uk/about/organisation/governance/corporate-publications/ordinances-and-regulations/regulation-5/#5.7>

Information on formative and summative feedback to students on their work will be available in the written statement on feedback to students which applies to this programme and the relevant module descriptions, which will be published online through the Department's website:

<https://www.elec.york.ac.uk/>

## Transfers out of or into the programme

None.

### Exceptions to University Award Regulations approved by University Teaching Committee

Exception	Date approved

## Quality and Standards

The University has a framework in place to ensure that the standards of its programmes are maintained, and the quality of the learning experience is enhanced.

Quality assurance and enhancement processes include:

- ▶ The academic oversight of programmes within departments by a Board of Studies, which includes student representation
- ▶ The oversight of programmes by external examiners, who ensure that standards at the University of York are comparable with those elsewhere in the sector
- ▶ Annual monitoring and periodic review of programmes
- ▶ The acquisition of feedback from students by departments.

More information can be obtained from the Academic Support Office:

<https://www.york.ac.uk/about/departments/support-and-admin/academic-support/>

<b>Date on which this programme information was updated:</b>	02/08/2017 TH
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<b>Departmental web page:</b>	<a href="https://www.elec.york.ac.uk">https://www.elec.york.ac.uk</a>
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## Please note

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

Detailed information on learning outcomes, content, delivery and assessment of modules can be found in

module descriptions.

The University reserves the right to modify this overview in unforeseen circumstances, or where processes of academic development, based on feedback from staff, students, external examiners or professional bodies, requires a change to be made. Students will be notified of any substantive changes at the first available opportunity.

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