



# Department of Electronic Engineering : Programme Specification

## MSc : Communications Engineering



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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 Communications Engineering</b>
Level of qualification: <b>Level 7 (Masters)</b>
Awards available only as interim awards:
Postgraduate Diploma in Communications Engineering (exit point only for 120cu)
Postgraduate Certificate in Electronics (exit point only for 60cu)
<b>Admissions criteria</b>
A good appropriate honours degree at 2.1 standard (or equivalent) from any university recognised by the

University of York, although in exceptional circumstances exceptions might be made for a 2:2. This degree would normally be in electronics or have significant electronics content. As a minimum, students would be expected to be familiar with digital filters, Fourier analysis, and basic communications concepts such as decibels, flow control, multiple access schemes, matched filtering, and simple analogue and digital modulation schemes.

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 Communications Engineering	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 programme aims to provide a broad-based introduction to modern communications suitable for students with a bachelor's degree in electronics (or similar previous experience in electronics); and to provide a solid grounding in theory and techniques suitable for students wishing to pursue a career or higher research degree in electronic communications.

**Additionally for the Masters:**

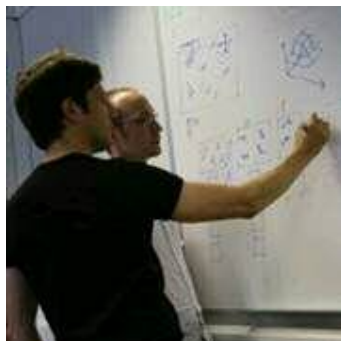
There is a major Independent Study Module in the form of a Group Project, enabling students to obtain realistic technical experience, and develop interpersonal skills, much in the way that this development is undertaken in industry.

**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
<b>Introduction to Signal Processing</b> [ELE00028M] 10 CU, Level 7	<b>Information Theory and Error Control Coding</b> [ELE00005M] 10 CU, Level 7	<b>Research Methods</b> [ELE00082M] 20 CU, Level 7	
<b>Introduction to Project Management</b> [ELE00029M] 5 CU, Level 7	<b>Advanced Wireless Transmission</b> [ELE00056M] 10 CU, Level 7		

<b>Introduction to MATLAB</b> [ELE00031M] 5 CU, Level 7	<b>Signal Processing for Communications</b> [ELE00092M] 20 CU, Level 7
<b>Wireless and Satellite Networks</b> [ELE00035M] 10 CU, Level 7	<b>Option Choice</b> 10 CU, Level 6
<b>Mobile Communications Systems for MSc</b> [ELE00042H] 10 CU, Level 6 P/F	
<b>Internet and LAN Protocols</b> [ELE00060M] 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

At the end of this programme, the students should have a good understanding of the techniques and issues in modern communications systems, with an emphasis on the physical layer. This programme does not aim to produce experts in any one specific field of communications practice, rather to produce students with a good appreciation of a range of techniques, the ability to learn new techniques as they are developed, and

with a balanced picture of modern communications.

After completing the programme, students should be able to critically examine proposed protocols and systems and describe the operation of several common systems (including TCP/IP, Wi-Fi and 3/4G). They should have sufficient background in the basics of optical and radio communication, signal processing, and protocol design and optimisation, including experience of the use of industry-standard tools, to make them attractive candidates for employers throughout the field of modern communications. They should have experience of managing and participating in a group project in advanced communication technologies. They should be well placed to either continue with a higher degree in communications, or to make an informed choice about the field for which they are most suited for employment.

Knowledge & Understanding	Module	Delivery & Assessment
Operation of the Internet. Principles and operation of the major protocols in use in the Internet, and an introduction to how these protocols work together.	Internet & LAN Protocols	Lectures, Workshops, Practicals. Closed-

		book examination.
Fundamental concepts in wireless data communications, including link budgeting and multiple-access techniques. Satellite system design and trade-offs.	Wireless and Satellite Networks	Lectures, Workshops. Closed-book examination.
Fundamental concepts of signal processing: analogue and digital signals and systems, Fourier series, sampling, statistical signal processing and parameter estimation.	Introduction to Signal Processing	Lectures, Workshops. Closed-book examination.
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.	Mobile Communication Systems	Lectures, Workshops. Closed-book examination.
Introduction to MATLAB, and its large number of built-in functions. Use of MATLAB to solve engineering problems.	Introduction to MATLAB	Practicals. Continuous assessment.
Types of project. Role of project manager. Project life-cycles. Tools and techniques for project management. Quality Assurance. Engineering Ethics.	Introduction to Project Management	Lectures. Continuous assessment.
Fundamental techniques of digital signal processing relevant to telecommunications. DSP. Estimation theory. Matrix algebra. Filtering and synchronisation.	Signal Processing for Communications	Lectures, Workshops. Closed-book examination.
Information theory and the error-control and coding schemes used in modern, mainly wireless, communication systems. Compression. Coding. Modulation.	Information Theory & Error Control Coding	Lectures, Workshops. Closed-book examination.
Operation of modern wireless transmission systems, including diversity, beam-forming, multiple-input multiple-output (MIMO) and equalisers including pre-equalisation.	Advanced Wireless Transmission	Lectures, Laboratories, Workshops. Closed-book examination.
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	Research Methods	Workshops. Presentation & Report.
<b>OPTION:</b> Choose either <i>Optical Communications</i> (main technical characteristics & performance of major optoelectronic components) or <i>Antennas &amp; Propagation</i> (properties & physics of antennas that describe their use in radio communications systems; modes of radio propagation & their usage).	Optical Communications <i>or</i> Antennas & Propagation	Lectures, Workshops. Closed-book examination.

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

A number of the modules will provide skills specific to Communications Engineering and associated technologies – notable examples being Introduction to MATLAB, Introduction to Project Management & Mobile Communication Systems,. The laboratories will also enable students to develop skills in the underlying technologies.

Most teaching will be undertaken through conventional lectures, laboratory sessions and workshops, and will be assessed through closed-book examinations and continuous assessment.



Discipline-related Skills	Module	Delivery & Assessment
Use of Internet Protocols	Internet & LAN Protocols	Computer Laboratories. Closed-book examination.
Ability to produce and evaluate link-budgets and system designs for satellite communication systems.	Wireless and Satellite Networks	Lectures, Workshops. Closed-book examination.
Analyse continuous and discrete-time signals and systems in the time and frequency domain.	Introduction to Signal Processing	Lectures, Workshops. Closed-book examination.
Comparison & characterisation of different telecoms techniques.	Mobile Communication Systems	Workshops. Closed-book examination.
Use of MATLAB to carry out simulations, write scripts and solve engineering problems.	Introduction to MATLAB	Computer Laboratories. Continuous assessment.
Analyse a project & produce specification. Work breakdowns. Critical path analysis & risk.	Introduction to Project Management	Individual project plan and analysis. Report assessed.
How to design and apply synchronisation techniques, and explain hardware-software trade-offs.	Signal Processing for Communications	Lectures, Workshops. Closed-book examination.
Encode and decode linear block codes, convolutional codes, LDPC & Turbo Codes. Calculate decoded BER for FEC codes. Devise block & trellis coded modulation schemes.	Information Theory & Error Control Coding	Lectures, Workshops. Closed-book examination.
Simulation of a MIMO OFDM transmission scheme operating over a fading multipath physical channel.	Advanced Wireless Transmission	Lectures, Laboratories, Workshops. 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.	Research Methods	Workshops. Presentation & Report.
<b>OPTION:</b> Choose either <i>Optical</i> (describe and calculate the loss and dispersion limits on optical communications) or <i>Antennas</i> (specify system performance in terms of antenna characteristics & models of interference and fading).	Optical Communications or Antennas & Propagation	Lectures, Workshops. Closed-book examination.
Investigation of a specified problem in Communications Engineering.	MSc Project	Tender presentation & 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 MScs 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.

Transferable Skills	Module(s)	Delivery & Assessment
Group working. Interpersonal skills. Time management. Delegation & risk management. Placing individual work in a larger context, as in real-life companies.	MSc Project	Tender presentation & 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.	Introduction to Project Management	Individual project plan and analysis. Report assessed.
Design and implement simple programs. Test software solutions to practical problems against target specifications.	Introduction to MATLAB	Computer Laboratories. Programming Exercises.
Implementing a full simulation model of a communications scheme, using a graphical-based industry standard program.	Advanced Wireless Transmission	Workshops & Laboratories.

## C: Experiences of the MSc in Communications Engineering

Students on the MSc in Communications Engineering benefit from a wide-ranging programme covering the most important subjects in modern communications, focusing on the convergence between the Internet and mobile phone technologies. There is a focus on the physical layer, and the engineering principles and technologies required to achieve high bit-rate communications over wireless, wired and optical channels. Students gain experience with industry-standard software tools in laboratory sessions, and participate in a group project designed to simulate a typical experience in industry. To support this project, they receive training in planning team projects, assigning roles, preparing agendas, chairing meetings and taking minutes, and managing a small team. Modules are taught by internationally leading experts in their fields, with the teaching quality widely praised by students.

### Student Profile 1: Experience of the Course - Sindooja Gunasekar

Sindooja completed her BEng in Electronics & Instrumentation in 2008, then worked for 2 years in the IT industry. She writes here of her experience at York on the MSc in Communications Engineering.



*"My ambition of working in the Electronics industry led me to pursue a Masters degree in Communications engineering. Considering any aspect like the ranking of the University, the faculty members to the standard of study environment provided, the University of York wins it all. It is always nice to have an international learning experience and the University gives you exactly that, in true sense.*

*Having completed half of my course here, I can proudly say that the professors and the lecturers here are very helpful, friendly and flexible to the needs of the students. You could get information or guidance on just about anything with all the facilities in the Department of Electronic Engineering. The course structure I feel is quite broad and that helps you to make the most of what you have. There is a lot of knowledge to gain both theoretically and*

*practically. The high value of a degree from the University of York in the industrial market is completely justified.*

*The facilities like the career services, well equipped library give you the much needed assistance. Needless to say the recreational facilities like the dance classes, the sports centre and the associations for international and graduate students are really good.*

*Last but not the least, York is a very beautiful and calm city and with all the ducks and the lake around I am sure you would very much enjoy your study here as much as I do."*

**Student Profile 2: Research Prospects - Sheng Li**

Sheng Li won the top student award for the MSc in Communication Engineering in 2007, and with it a scholarship to study for a PhD here at York. Since then he has been supervised by Rodrigo de Lamare, working on computationally-efficient signal processing methods. This year his paper "Blind Reduced-Rank Receiver with Column Adaptation for DS-UWB Systems Based on Joint Iterative Optimization and the CCM Criterion" won the best paper award in the area of Signal Processing for Wireless Communications at the Spring IEEE Vehicular Technology Conference; this is one of the top conferences for mobile communications. Sheng has also won the Kathleen M Stott Prize for excellence in research, a prize awarded annually by the University of York.

Every year several students from the Communications MSc decide to stay in York and work towards a PhD, and we are always on the look-out for the most talented students such as Sheng.

**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>
Advanced Wireless Transmission	ELE00056M	7/M	10	SpT	N/A		SpT & SuT Coursework
Information Theory and Error Control Coding	ELE00005M	7/M	10	SpT	Core for UG Communications/Radio Frequency students and optional for UG Electronics, Avionics, Nanotechnology and Business students. Core Signal Processing (on MSc DSP programme) or Mobile Communication Systems (on MSc Comms programme)		SuT week 1 Examinations
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
Introduction to Signal Processing	ELE00028M	7/M	10	AuT	Knowledge of simple probability theory and matrix algebra.		SpT week 1 Examinations
Mobile Communications Systems for MSc	ELE00042H	6/H	10	AuT	None	P/F	SpT week 1 Examinations
Research Methods	ELE00082M	7/M	20	SuT			SuT Coursework
Signal Processing for Communications	ELE00092M	7/M	20	SpT	Knowledge of signal processing at an introduction level (assumed covered in the lecture course "Introduction to Signal Processing", which is a core module for MSc in		SuT week 1 Examinations



					Comms and MSc in DSP).	
Wireless and Satellite Networks	ELE00035M	7/M	10	AuT	Core for MSc in Communication students.	SpT week 1 Examinations

### Option modules

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>
Antennas and Propagation for MSc	ELE00038H	6/H	10	SpT	Equivalent background reading to the UG EM Fields and Waves.	P/F	SuT week 1 Examinations
MSc Communications Engineering Project	ELE00054M	7/M	60	SuT	None.		SuV Coursework
Optical Communications for MSc	ELE00043H	6/H	10	SpT	None.	P/F	SuT week 1 Examinations

<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.

## Transfers out of or into the programme

N/A

## 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/staff/#quality>

Date on which this programme information was updated:	18/08/2017 TH
<b>Departmental web page:</b>	<a href="https://www.elec.york.ac.uk/">https://www.elec.york.ac.uk/</a>

## Please note

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