Programme Specification

MSc Mobile Communications and Smart Networking (2019-20)

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

Awarding Institution	University of Southampton
Teaching Institution	University of Southampton
Mode of Study	Full-time
Duration in years	1
Accreditation details	Institution of Engineering and Technology (IET)
Final award	Master of Science (MSc)
Name of award	MSc Mobile Communications and Smart Networking
Interim Exit awards	Postgraduate Certificate in Higher Education
	Postgraduate Diploma in Higher Education
FHEQ level of final award	Level 7
UCAS code	N/A
Programme code	8289
QAA Subject Benchmark or other external reference	
Programme Lead	Mohammed El-Hajjar (meh1r11)

Programme Overview

Brief outline of the programme

The programme of MSc Mobile Communications and Smart Networking has been designed to equip students with both the systematic knowledge and the essential training towards engineering design and independent research in the field of intelligent mobile communications and networking. It has been structured by providing a gradually increasing grade of challenge for all abilities, while also allowing the most talented students to conduct cutting edge research. Following a number of compulsory modules to ensure that you are exposed to the key topics of all the areas in mobile communications and networking, the programme endeavours to maximise your degrees of freedom for learning by allowing you to tailor the structure to suit your own interests.

This one year programme prepares you to become a capable mobile communications and networking engineer, building core areas of expertise, from understanding the fundamentals of wireless transmission, networking and coding as well as signal processing to building wireless transceivers and designing and analysing intelligent wireless networks. The key strength of this programme is that we place an emphasis on fundamental concepts and how they relate to recent advances in mobile communications and network design and we use real-world examples to emphasise the relevance and importance of these concepts.

Having successfully completed this programme you will be able to demonstrate knowledge and understanding of the scientific and technological principles of intelligent mobile communications and networking, employ skills to analyse the techniques for mobile communications and to evaluate and compare the performance of various wireless communication systems, be capable of exploiting knowledge for design and carrying out in-depth research, and be able to acquire new knowledge through critical reading of scientific and technical books and research papers.

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

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Learning and teaching

While some modules in this programme are primarily taught using lectures, some other courses are taught using a combination of lectures, small group teaching, directed reading and assignments. Furthermore, some courses are entirely coursework based. Following the taught part of the course, you will undertake an individual project.

Throughout the programme, there is a heavy emphasis on private study and practice, with the support by tutorials, laboratories, and supervision of individual and group projects.

Assessment

The programme uses both formative and summative assessments. Depending on the specific structures of the individual modules, the assessment methods may include written examinations, coursework and coursework reports, progress reports, oral presentation, and dissertation.

Special Features of the programme

Our modules use a variety of innovative teaching and assessment methods, including written examinations, practical laboratories, coursework, group-based learning, group-work, oral presentation and dissertation. Below are some examples of what you'll be able to do.

Next Generation Network System design and analysis

During the second semester, you will be exposed to advanced topics in wireless systems and network design, including multimedia communications, future wireless techniques as well as machine learning for wireless communications, with focus on the technologies proposed for the next generation mobile standard, namely the 5G.

Group Design Project

Transceiver System Design: System and major component-level (filter, amplifier, mixer) design from a requirement specification of a 2.4GHz superhet transceiver, including Matlab code for modulation, demodulation, bit timing recovery and carrier synchronisation.

Group-Based Learning

Each group with a group leader includes 5-6 students, who work on similar problems from coursework. The group members meet regularly about ones or twice per week to exchange knowledge and to discuss the

problems they meet during their individual study.

Oral Presentation

Each student gives a presentation of about 8-10 minutes to show her/his investigation on a specific studying task. The assessment of a presentation is based on the design of slides, quality of presentation, knowledge and understanding, critical analysis and comparison, results, etc.

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.

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Educational Aims of the Programme

The aims of the programme are to enable you to:

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

Programme Learning Outcomes

Knowledge and Understanding

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

A1.   Demonstrate knowledge and understanding of the scientific and technological principles of mobile communications and networking;

A2.   Demonstrate an ability to analyse the techniques for wireless communications and to evaluate and compare the performance of wireless communication systems;

A3.   Demonstrate knowledge and understanding of the design of intelligent communications networks for the next generation mobile systems;

A4.   Demonstrate the ability to acquire new knowledge and to understand through the critical reading of scientific and technical books and research papers.

Teaching and Learning Methods

The teaching and learning of this programme includes one module from the third year of the MEng in Electronics. The remaining modules are shared with the fourth year of the MEng in Electronics or are unique to the MSc programme and are designated as level 7. Level 6 courses are primarily taught using lectures. Level 7 courses are taught using a combination of lectures, small group teaching, directed reading and assignments. Some courses are entirely coursework based. At the end of the taught part of the course, you will undertake an individual project. Throughout the programme, there is a heavy emphasis on private study and practice, with the support by tutorials, laboratories, and supervision of individual and group projects.

Assessment Methods

A range of assessment strategies is used throughout the programme to allow you to demonstrate the intended outcomes and thereby assess your knowledge and understanding. Your knowledge and understanding of each individual subject is assessed through a combination of written examinations and coursework. The proportion of examinations to coursework varies between modules. Depending on your choice of modules, about 50% of your marks will be derived from coursework. Your final individual MSc project will be assessed by dissertation.
Typically, Outcomes A1 and A2 are primarily taught and assessed using level 6 lectures and examinations, while A3 and A4 are taught through level 7 courses and the individual project, and assessed by coursework and the dissertation.

Subject Specific Intellectual and Research Skills

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

B1.   Specify and design electronic wireless-devices;

B2.   Model and simulate the behaviour of wireless communication channels and parts of wireless-devices at the appropriate level of detail;

B3.   Verify a system design by constructing and applying appropriate tests;

B4.   Critically analyse and compare the performance of various technical options for intelligent mobile networks;

B5.   Find, read, understand and explain scientific publications;

B6.   Undertake research into problems in mobile communications and smart networking.

Teaching and Learning Methods

Design skills are developed through coursework, the group design projects and individual research projects. Modelling, simulation and verification are taught in various modules and applied in coursework and design projects. Critical analysis and comparison are taught in various modules and practiced by the trainings in coursework and individual research projects. Similarly, the ability to assimilate technical and scientific knowledge is developed through assignments and the individual project.

Assessment Methods

Design skills are assessed in examination questions and in coursework. Modelling, simulation, verification as well as critical analysis and comparison form a significant aspect of the coursework in the design projects and are assessed through the delivery of coursework reports, oral presentation and dissertation. The dissertation on the individual research project will normally include a significant literature survey and this is one of the criteria for assessment of the dissertation.

Outcomes B1 to B6 are taught through level 7 courses and the individual project are assessed by the courseworks and dissertation.

Transferable and Generic Skills

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

C1.   Use conventional and electronic indexing and search methods to find technical information;

C2.   Present technical information in written and verbal forms;

C3.   Work as a member of a design team, managing both the overall task and your contribution to that task;

C4.   Work independently on a significant research project;

C5.   Reflect and think critically as a component of practice, independent learning and professional development;

C6.   Explain how established techniques of research and enquiry are used to create and interpret subject knowledge;

C7.   Plan and enjoy lifelong self-learning as an effective personal development strategy for the foundation of on-going professional development.

Teaching and Learning Methods

A number of modules have significant coursework elements. This can range from design work through to presentation resulting from directed reading and practices. The group design projects are intended to develop team working, project and time management skills. The individual project includes independent research, project management and report writing. The reports for coursework assignments and the dissertations for individual research projects include the critical analysis of techniques as well as the discussion for practical applications of techniques.

Assessment Methods

Coursework is generally assessed through written reports. The group design projects are assessed continuously through logbooks and at the end by delivery of a documented design. The individual project is assessed by a dissertation of up to 15,000 words.

Outcomes C1 to C7 are taught through practical work in level 7 courses and the individual project are assessed by coursework and the dissertation.

Subject Specific Practical Skills

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

D1.   Analyse analytical equations and use simulation software to check your models;

D2.   Design experiments to evaluate designs and models;

D3.   Write software programmes to assist and demonstrate your understanding of design concept;

D4.   Provide alternative methods for solving problems and identify advantages and disadvantages of the alternative methods.

Teaching and Learning Methods

These skills are developed through coursework and project work.

Assessment Methods

Machine-readable models and software will form part of the deliverable of a coursework assignment or a design project. The correct execution of these models and software will be part of the overall assessment of the assignment or project.
Outcomes D1 to D4 are taught through practical work in level 7 courses and the individual project and assessed by coursework and the dissertation.

Programme Structure

The programme structure table is below:

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

Where optional modules have been specified, the following is an indicative list of available optional modules, which are subject to change each academic year. Please note in some instances modules have limited spaces available.

Part I

Typical course content

This programme consists of eight taught modules, each worth 7.5 ECTS (15 CATS) credit points and an individual research project worth 30 ECTS (60 CATS) credit points. Four compulsory modules cover core material for Wireless Communications. Another compulsory module prepares you for your individual research project. Three optional modules can be selected to tailor the programme to students' interests.

Programme details

The programme runs over three semesters. The first semester consists of four compulsory modules. The second semester consists of one compulsory module and three optional modules. Following the first two semesters of the taught component of the programme, the students will undertake a research project which will be assessed by a degree dissertation.

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

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

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

Semester 1:
Four compulsory modules. Examinations are held in January.

Semester 2:
Four modules, including one compulsory module (ELEC6211) and three optional modules. Examinations are held in May/June.

Summer/Semester 3:
You will undertake an individual research project lasting up to 14 weeks, which is assessed by a 15,000-word dissertation.

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

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

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SEMESTER 1

ELEC3203 - compulsory
ELEC6217 - compulsory
ELEC6218 - compulsory
ELEC6238 - compulsory

SEMESTER 2 - select three optional modules

ELEC6211 - compulsory
ELEC6214 - optional
ELEC6219 - optional
ELEC6229 - optional
ELEC6242 - optional
ELEC6252 - optional
ELEC6253 - optional

SUMMER

COMP6200 - core
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Part I Compulsory

Code	Module Title	ECTS	Type
ELEC3203	Digital Coding and Transmission	7.5	Compulsory
ELEC6211	Project Preparation	7.5	Compulsory
ELEC6217	Radio Communications Engineering	7.5	Compulsory
ELEC6238	Research Skills and Practice	7.5	Compulsory
ELEC6218	Signal Processing	7.5	Compulsory

Part I Core

Code	Module Title	ECTS	Type
COMP6200	MSc Project	30	Core

Part I Optional

Select three semester 2 modules (22.5 ECTS/45 CATS) from the following:

Code	Module Title	ECTS	Type
ELEC6229	Advanced Systems and Signal Processing	7.5	Optional
ELEC6214	Advanced Wireless Communications Networks and Systems	7.5	Optional
ELEC6242	Cryptography	7.5	Optional

ELEC6252	Future Wireless Techniques	7.5	Optional
ELEC6253	Machine Learning for Wireless Communications	7.5	Optional
ELEC6219	Wireless and Mobile Networks	7.5	Optional

Progression Requirements

The programme follows the University's regulations for *Progression, Determination and Classification of Results : Undergraduate and Integrated Masters Programmes* and *Progression, Determination and Classification of Results: Postgraduate Master's Programmes* as set out 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:
- IEEE Xplore: http://ieeexplore.ieee.org/Xplore/dynhome.jsp?tag=1
- References from the Next Generation Wireless Research Group https://www.wireless.ecs.soton.ac.uk/

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;
- A national Research Evaluation 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

Graduates of the course have employment opportunities in both the industrial and academic sectors, while many of them may continue to PhD research. You may find employment in numerous industrial organisations carrying out research and development for mobile communications, transceiver design as well as network design and optimisation, although you may also find employment in many other types of technology organisations, as they usually have the special need for IT specialists.

Graduates of the course can also find employment in educational organisations, as well as in the specialised research institutes and research labs in universities.

External Examiner(s) for the programme

Name: Professor Matthew Turner - University of Leicester

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. 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. 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.