


<b>PROGRAMME SPECIFICATION</b>	
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<b>1</b>	<b>Awarding Institution</b>	Newcastle University
<b>2</b>	<b>Teaching Institution</b>	Newcastle University
<b>3</b>	<b>Final Award</b>	MSc
<b>4</b>	<b>Programme Title</b>	Wireless Embedded Systems
<b>5</b>	<b>UCAS/Programme Code</b>	5134
<b>6</b>	<b>Programme Accreditation</b>	IET
<b>7</b>	<b>QAA Subject Benchmark(s)</b>	
<b>8</b>	<b>FHEQ Level</b>	7
<b>9</b>	<b>Date written/revised</b>	31/01/11

<b>10</b>	<b>Programme Aims</b>
<p>The programme aims to:</p> <ul style="list-style-type: none"> <li>• Provide an understanding of the concept and theories of Wireless Embedded Systems.</li> <li>• Equip graduates with knowledge and experience of Wireless Embedded Systems enabling technologies, including the fundamental techniques required for an engineer, scientist or manager working in this field.</li> <li>• Develop skills in the application of these techniques in the development of Wireless Embedded Systems systems or their constituent parts.</li> <li>• Promote sound scientific and engineering principles in the graduates' approach to professional work, and an understanding of the ethical and social dimensions of such work.</li> <li>• Cover understanding and knowledge in both high-level architectural concepts and low level implementation techniques, and both software and hardware systems. Graduates will have experience of the current state of the art of Wireless Embedded Systems systems and will have demonstrated the ability to apply the principles and practices of Computing Science and Electronic Engineering in tackling a significant technical problem; the solution typically demonstrates a soundly based vision of the direction of developments of Wireless Embedded Systems.</li> <li>• Provide a good knowledge and practical experience of up to date tools and techniques related to the enabling technologies of Wireless Embedded Systems. Graduates will be able to critically evaluate and test Wireless Embedded Systems subsystems. They are expected to go on to employment in technical positions with Wireless Embedded Systems related supplier industries and large-scale users; some graduates will pursue research careers.</li> <li>• The programme aims to meet the descriptors, for a qualification at Masters (M) level, published by the Framework for Higher Education Qualifications in England, Wales and Northern Ireland.</li> </ul>	

## 11 Learning Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the following areas.

### Knowledge and Understanding

A successful student will have gained and be able to demonstrate knowledge and understanding of:

- A1. The basis of Wireless Embedded Systems and its enabling technologies.
- A2. The scientific and engineering principles related to the enabling technologies.
- A3. Embedded computer systems architecture and organization for mobile, real-time and security applications.
- A4. Networking and communication systems theory and practice (inc. important issues such as security).
- A5. Computer programming specific to Wireless Embedded Systems
- A6. Important hardware issues related to Wireless Embedded Systems

### Teaching and Learning Methods

Lectures are the main way of imparting knowledge and understanding (A1-A6). Practical classes feature prominently, which enhance understanding of hardware and programming (A3-A6). Students are expected to contribute to their own learning experience by independent study. They are provided with references to books which are categorised as *essential*, *recommended*, and *background* reading, as well as scientific papers and other learning materials including appropriate web URLs.

### Assessment Strategy

Knowledge and understanding are assessed by means of closed and open book written examinations and coursework, including group and individual project reports (A1-A6).

### Intellectual Skills

- On completing the programme students should be able to:
- B1. Conduct investigations using the technical and professional literature.
  - B2. Use and evaluate appropriate tools and techniques.
  - B3. Undertake critical evaluation (both theoretical and empirical) of alternative solutions.
  - B4. Formulate problems and identify suitable approaches to solving them.
  - B5. Reason abstractly about the structure and behaviour of Wireless Embedded Systems (sub)systems.

### Teaching and Learning Methods

Most modules involve coursework and/or practicals, much of which involves problem solving skills (B4). This is especially so in the group and individual projects where students need to select, evaluate and apply appropriate tools and techniques (B2). Here and elsewhere students will need to investigate possible alternatives in the technical and professional literature (B1, B3), and to reason about computer systems (B5).

### Assessment Strategy

Cognitive skills are assessed by a range of coursework (reports, design documents, etc.) (B1-B5).

<b>Practical Skills</b>
<p>On completing the programme students should be able to:</p> <p>C1. The design of Wireless Embedded Systems systems and subsystems.  C2. The use of hardware and software systems and tools including CAD tools.  C3. The use of continuous and discrete mathematical tools.  C4. The use and provision of network information services.  C5. The use of programming languages.  C6. Analysis of system requirements and the production of system specifications.</p>
<b>Teaching and Learning Methods</b>
<p>C1-C6 feature prominently in all modules. In particular, three group projects (EEE8076, EEE8077, EEE8092) give students experience of working within teams to engineer complex products (C1-C6). An individual project requires students to develop a large product to a customer's requirements (C1-C6). In all other modules, practicals and coursework are used to develop these skills (C1-C6).</p>
<b>Assessment Strategy</b>
<p>Subject-specific and professional skills are assessed by coursework (C1-C6).</p>
<b>Transferable/Key Skills</b>
<p>A successful student will be proficient in:</p> <p>D1. Written communication.  D2. Problem solving.  D3. Interpersonal communication.  D4. Initiative.  D5. Oral presentation.  D6. Adaptability.  D7. Teamwork.  D8. Planning, organisation, and prompt delivery of results.  D9. Computer literacy and information literacy</p> <p>The above covers the generic knowledge and understanding, subject/specific/professional skills, cognitive skills and key (transferable) skills of a 'typical' Masters level graduate, although for each individual student there will be variations depending on the dissertation.</p>
<b>Teaching and Learning Methods</b>
<p>Key skills feature throughout the programme; teamwork in the group projects (D7); oral presentation, interpersonal communication, and planning and organisation in the individual project module, as well as the group projects (D3, D5, D8); written communication in all modules, but especially in the individual project (D1); problem solving, initiative and adaptability are necessarily covered throughout the programme (D2, D4, D6, D9).</p> <p>The strategy of the degree programme is to give a broad coverage of the subject of Wireless Embedded Systems in taught modules, and then to provide specialisation in the individual project.</p>
<b>Assessment Strategy</b>
<p>Key (transferable) skills are assessed by both written and oral presentations (D1-D9). Teamwork in the group projects is assessed both by the module leader at team oral presentations and by group monitors (members of teaching staff) who attends group formal meetings (D5, D7).</p>

## **12 Programme Curriculum, Structure and Features**

### **Basic structure of the programme**

The Programme is aimed at the award of MSc degree upon successful completion of all taught modules and the Individual Project.

This is a one year Programme, which starts in September and the students normally complete the last assignment by the end of August. The taught part of the programme takes place from September to June. The Programme has 180 credits, 150 credits of compulsory modules and 30 credits of optional modules. The optional modules are available in Semester 2; they use the compulsory modules as the baseline and expand either in the direction of embedded RF designs (e.g. mobile phone hardware) or in the field of wireless applications/features (biometrics and multimedia devices).

There are five modules in semester one with 60 total credits and six modules in semester two with 70 total credits. The project (60 credits) takes place in semesters 2 and 3, 10 credits in semester 2 and 50 credits in semester 3.

### **Key features of the programme**

The MPC Degree Programme includes only the full-time mode of studies and is normally completed within one year. This is an advanced programme with a strong emphasis on project work and self-directed learning. None of the material is taught at the undergraduate level.

A unique feature of this Programme is that it combines the subjects normally attributed to electronic design, communications and software engineering. Such a wide coverage reinforced with skills developed in the coursework and the Individual Project creates specialists capable to merge into a commercial design group with reduced in-house training. Relevance of this Degree Programme to the needs of modern industry is extremely high, as according to Frost and Sullivan the market for mobile and embedded systems in 2005 reached \$31B with annual growth of \$1.8B.

The optional modules add flexibility to the Programme, catering to the needs of the engineers either in the field of hardware or software/system-level wireless embedded design.

The Programme combines leading research and teaching expertise in mobile communications and distributed computing from the School of Electrical and Electronic Engineering. The School is equipped with teaching and research facilities to deliver a high quality programme in this new multidisciplinary field. Large, state of the art teaching laboratories provide an opportunity for the next generation of technology and computing specialists to be educated using the latest ideas in interactive instruction. The course is delivered by staff from internationally recognised research groups with active projects in the relevant fields.

### **Programme regulations (link to on-line version)**

<http://www.ncl.ac.uk/regulations/programme/2012-2013/eece.php>

## **13 Criteria for admission**

### *Entry qualifications*

Students should normally have at least a 2.2 honours degree in electrical engineering (or equivalent). A lower qualification may be considered if applicant has a significant period of relevant industrial experience.

### *Level of English Language capability*

6 IELTS or equivalent.

## 14 Support for Student Learning

The Student Services portal provides links to key services and other information and is available at: [www.ncl.ac.uk/students/](http://www.ncl.ac.uk/students/)

### *Induction*

During the first week of the first semester students attend an induction programme. New students will be given a general introduction to University life and the University's principle support services and general information about the School and their programme, as described in the Degree Programme Handbook. New and continuing students will be given detailed programme information and the timetable of lectures/practicals/labs/ tutorials/etc. The International Office offers an additional induction programme for overseas students.

### *Study skills support*

Students will learn a range of Personal Transferable Skills, including Study Skills, as outlined in the Programme Specification. Some of this material, e.g. time management is covered in the appropriate Induction Programme. Students are explicitly tutored on their approach to both group and individual projects.

Numeracy support is available through Maths Aid and help with academic writing is available from the Writing Centre (further information is available from the Robinson Library).

### *Academic support*

The initial point of contact for a student is with a lecturer or module leader, or their tutor (see below) for more generic issues. Thereafter the Degree Programme Director or Head of School may be consulted. Issues relating to the programme may be raised at the Staff-Student Committee, and/or at the Board of Studies.

### *Pastoral support*

All students are assigned a personal tutor whose responsibility is to monitor the academic performance and overall well-being of their tutees. In addition the University offers a range of support services, including one-to-one counselling and guidance or group sessions / workshops on a range of topics, such as emotional issues e.g. Stress and anxiety, student finance and budgeting, disability matters etc. There is specialist support available for students with dyslexia and mental health issues. Furthermore, the Union Society operates a Student Advice Centre, which can provide advocacy and support to students on a range of topics including housing, debt, legal issues etc.

### *Support for students with disabilities*

The University's Disability Support Service provides help and advice for disabled students at the University - and those thinking of coming to Newcastle. It provides individuals with: advice about the University's facilities, services and the accessibility of campus; details about the technical support available; guidance in study skills and advice on financial support arrangements; a resources room with equipment and software to assist students in their studies.

### *Learning resources*

The University's main learning resources are provided by the Robinson and Walton Libraries (for books, journals, online resources), and Information Systems and Services, which supports campus-wide computing facilities.

All new students whose first language is not English are required to take an English Language Proficiency Test. This is administered by INTO Newcastle University Centre on behalf of Newcastle University. Where appropriate, in-session language training can be provided. The INTO Newcastle University Centre houses a range of resources which may be particularly appropriate for those interested in an Erasmus exchange.

**15 Methods for evaluating and improving the quality and standards of teaching and learning**

*Module reviews*

All modules are subject to review by questionnaires which are considered by the Board of Studies. Changes to, or the introduction of new, modules are considered at the Board of Studies and/or the School Teaching and Learning Committee. Student opinion is sought at the Staff-Student Committee and/or the Board of Studies. New modules and major changes to existing modules are subject to approval by the Faculty Learning, Teaching and Student Experience Committee (FLTSEC).

*Programme reviews*

The Board of Studies conducts an Annual Monitoring and Review of the degree programme and reports to FLTSEC. FLTSEC takes an overview of all programmes within the Faculty and reports any Faculty or institutional issues to the University Learning, Teaching and Student Experience Committee (ULTSEC).

*External Examiner reports*

External Examiner reports are considered by the Board of Studies. The Board responds to these reports through FLTSEC. External Examiner reports are shared with institutional student representatives, through the Staff-Student Committee.

*Student evaluations*

All modules, and the degree programme, are subject to review by student questionnaires. Informal student evaluation is also obtained at the Staff-Student Committee, and the Board of Studies. The results from student surveys are considered as part of the Annual Monitoring and Review of the programme and any arising actions are captured at programme and School / institutional level and reported to the appropriate body.

*Mechanisms for gaining student feedback*

Feedback is channelled via the Staff-Student Committee and the Board of Studies.

*Faculty and University Review Mechanisms*

The programme is subject to the University's Internal Subject Review process. Every five years degree programmes in each subject area are subject to periodic review. This involves both the detailed consideration of a range of documentation, and a two-day review visit by a review team which includes an external subject specialist in addition to University and Faculty representatives. Following the review a report is produced, which forms the basis for a decision by ULTSEC on whether the programmes reviewed should be re-approved for a further five year period.

*Accreditation reports*

This programme is accredited by the Institute of Engineering and Technology.

**16 Regulation of assessment**

*Pass mark*

The pass mark is 50%

*Course requirements*

Progression is subject to the University's Masters Degree Progress Regulations, Taught and Research and Examination Conventions for Taught Masters Degrees. There are reassessment opportunities, with certain restrictions. NB: For the purpose of professional accreditation, the University's Teaching, Learning and Student Experience Committee has approved a variation in Postgraduate (Taught) Examination Convention K.35 to the effect that limited compensation of only 20 credits, of the taught element and down to a mark of 40%, is possible.

The University employs a common marking scheme, which is specified in the Taught Postgraduate Examination Conventions, namely:

**Summary description applicable to postgraduate Masters programmes**

**Summary description applicable to postgraduate Certificate and Diploma programmes**

<50	Fail
50-59	Pass
60-69	Pass with Merit
70 or above	Pass with Distinction

<50	Fail
50 or above	Pass

*Role of the External Examiner*

An External Examiner, a distinguished member of the subject community, is appointed by Faculty Teaching and Learning Committee, following recommendation from the Board of Studies. The External Examiner is expected to:

- i. See and approve assessment papers
- ii. Moderate examination and coursework marking
- iii. Attend the Board of Examiners

Report to the University on the standards of the programme

In addition, information relating to the programme is provided in:

The University Prospectus (see <http://www.ncl.ac.uk/postgraduate/>)

The School Brochure (contact [enquiries@ncl.ac.uk](mailto:enquiries@ncl.ac.uk))

The University Regulations (see <http://www.ncl.ac.uk/regulations/docs/>)

The Degree Programme Handbook

Please note. This specification provides a concise summary of the main features of the programme and of the learning outcomes that a typical student might reasonably be expected to achieve if she/he takes full advantage of the learning opportunities provided. The accuracy of the information contained is reviewed by the University and may be checked by the Quality Assurance Agency for Higher Education.

## Mapping of Intended Learning Outcomes onto Curriculum/Modules

Intended Learning Outcome	Module codes (Comp/Core in Bold)
A1	All modules
A2	All modules
A3	EEE8092, EEE8009, EEE8068, EEE8064, EEE8010, EEE8097
A4	EEE8076, EEE8077, EEE8092, EEE8009, EEE8002, EEE8008, EEE8097
A5	EEE8092, EEE8068, EEE8097
A6	EEE8043, EEE8092, EEE8068, EEE8097
B1	EEE8092, EEE8009, EEE8002, EEE8008, EEE8043, EEE8068, EEE8064, EEE8010, EEE8097
B2	EEE8092, EEE8002, EEE8008, EEE8043, EEE8108, EEE8068, EEE8097
B3	EEE8076, EEE8077, EEE8092, EEE8043, EEE8068, EEE8064, EEE8010, EEE8097
B4	EEE8076, EEE8077, EEE8092, EEE8002, EEE8008, EEE8043, EEE8068, EEE8097
B5	EEE8009, EEE8002, EEE8008, EEE8043, EEE8068, EEE8097
C1	EEE8076, EEE8077, EEE8092, EEE8002, EEE8008,, EEE8043, EEE8068, EEE8097
C2	EEE8076, EEE8077, EEE8043, EEE8068, EEE8097
C3	EEE8092, EEE8009, EEE8097
C4	EEE8071, EEE8097
C5	EEE8076, EEE8077, EEE8092, , EEE8068, EEE8097
D1	EEE8076, EEE8077, EEE8092, EEE8002, EEE8008, EEE8043, EEE8068, EEE8097
D2	EEE8076, EEE8077, EEE8092, EEE8009, EEE8002, EEE8008, EEE8043, EEE8068, EEE8097
D3	EEE8076, EEE8077, EEE8092, EEE8002, EEE8008, EEE8097
D4	EEE8076, EEE8077, EEE8092, EEE8002, EEE8008, EEE8043, EEE8068, EEE8097
D5	EEE8076, EEE8077, EEE8043, EEE8097
D6	EEE8076, EEE8077, EEE8092, EEE8068, EEE8097
D7	EEE8076, EEE8077, EEE8092, EEE8043
D8	EEE8076, EEE8077, EEE8092, EEE8009, EEE8043, EEE8068, EEE8097
D9	EEE8076, EEE8077, EEE8092, EEE8009, EEE8043, EEE8068, EEE8097