THE UNIVERSITY OF EDINBURGH

PROGRAMME SPECIFICATION FOR MEng in Electronics and Electrical Engineering (Communications)

DRAFT (UCAS Code missing)

A1. Awarding Institution: The University of Edinburgh
A2. Teaching Institution: The University of Edinburgh
A3. Programme accredited by: Institution of Electrical Engineers
A4. Final Award: MEng Honours
A5. Programme Title: MEng in Electronics and Electrical Engineering (Communications)
A6. UCAS Code: H ?????????? ??????? ?????????
   Relevant QAA Subject Benchmarking Group(s): Engineering

7) Postholder with overall responsibility for QA: Dr J M Hannah
9) Educational aims of programme:

Aims:
- give students broad knowledge and understanding of the theoretical foundations of electrical, electronics and communications engineering;
- give students knowledge and understanding at the forefront of current professional practice in selected topics in electronics and communications engineering;
- develop the analytical and mathematical expertise necessary for research or advanced design and development work in industry, academia or government service;
- give students experience of using up-to-date equipment and software in industrially relevant problem solving contexts;
- give students an understanding of how to apply their technical knowledge to the design of electronic communications systems and products;
- give students personal experience of professional engineering work in an active research, design or manufacturing environment;
- make students aware of the commercial context of engineering;
- develop the general skills and attitudes expected of a professional engineer, especially of working in a design team;
- retain professional accreditation by the IET;
- encourage those students who wish to broaden their curriculum by including first or second year courses outwith the engineering and information technology fields;
- develop in students a disciplined and deep approach to independent learning, as a foundation for future self-learning and continuing professional development.

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1 The information contained in this Programme Specification should be used as a guide to the content of a degree programme and should not be interpreted as a contract.
10) Programme Outcomes:

(a) **Knowledge and understanding**

a1. Mathematical methods relevant to electrical, electronics and communications engineering;

a2. Solid-state physics and electromagnetics, sufficient to understand their application to electronic and electrical devices in communications systems;

a3. Concepts, theoretical principles and analytical techniques which underpin the design and manufacture of discrete and integrated electronic circuits (analogue, digital and power) and communications systems;

a4. The essential role of computer aided design tools in (i) the design of analogue and digital integrated circuits and (ii) for the digital realisation and implementation of communication systems

a5. The principles of software engineering;

a6. The methodology of design, applied to discrete and integrated electronic circuits and systems and to electrical communications systems;

a7. Concepts and techniques of business management and finance relevant to innovation in the fields of electronics, electrical engineering and communications;

a8. Statistical methods of manufacturing and quality assurance;

a9. A selection of advanced topics within the fields of electronics, electrical engineering and/or communications, e.g.: the process of product design; the design of experiments and optimisation of manufacturing processes; the factors affecting the manufacture and operation of modern electronic, electrical and communications engineering systems, including environmental and regulatory issues;

Teaching/learning methods and strategies

- Acquisition of a1 is through lectures, tutorials and weekly, or twice-weekly, marked assignments in years 1 and 2.
- Acquisition of a2 is through a combination of lectures, examples classes and tutorials, mainly in years 2 and 3.
- Acquisition of a3 is through lectures, examples classes and tutorials throughout the degree programme, supported by structured practical projects in years 1 to 3 and learning modules in year 5.
- Acquisition of a4 is through structured practical projects in years 1, 2 and 3 and learning modules in year 5.
- Acquisition of a5 is through lectures and practical programming and software design exercises in years 2 and 3.
- Acquisition of a6 is through structured practical projects in years 1 to 3 and learning modules in year 5.
- Acquisition of a7 is by lectures and tutorials, mainly in year 2, and a learning module in year 5.
- Acquisition of a8 is by lectures, tutorials and two small structured projects in year 2.
- Acquisition of a9 is by learning modules in year 5.

Assessment

- Assessment of the knowledge base is through a combination of unseen written examinations (a1, a2, a3, a5, a7, a8), assessed coursework (a1, a3, a4, a5, a6, a7, a8, a9), project reports (a3, a4, a6) and an essay (a7).
(b) **Intellectual skills**

b1. Apply scientific principles and mathematical methods to the modelling and analysis of electronic and electrical devices, circuits and communications systems;
b2. Analyse and solve problems in electronics, electrical and communications engineering;
b3. Apply computer based tools to the analysis and synthesis of electronic devices, circuits and communications systems;
b4. Write efficient and reliable computer programmes, applying the basic principles of software engineering;
b5. Design a device, circuit or communications system to a given specification;
b6. Seek out and evaluate information and data from a variety of sources;
b7. Identify and evaluate the wider commercial or social implications of current developments in a specific technical field related to electronics, electrical and communications engineering;
b8. Plan, carry out, report and critically evaluate an engineering design or research programme;
b9. Evaluate alternative strategies for the design of digital components for a larger VLSI system;
b10. Apply a systematic approach to the innovation and design of an electronic system;

**Teaching/learning methods and strategies**

- Skills in modelling, analysis and problem solving (b1 and b2) are developed throughout the degree programme by attempting prescribed questions, both in examples class hours and in private study time, observing specimen solutions and approaches presented by staff in examples classes or in written form and discussing difficulties with staff in group tutorials;
- Skills in applying computer based tools (b3) are acquired through structured practical projects in years 1, 2 and 3. Skills in the use of state of the art CAD tools for VLSI systems, semiconductor process optimisation and software implementation of communications systems are developed in learning modules in year 5;
- Programming and software engineering skills (b4) are developed by practical exercises in years 2 and 3.
- Design skills (b5, b8, b9, b10) are developed through practical projects, initially in the context of a narrowly defined specification in years 1 and 2, progressing through more openly specified, but still fairly structured, exercises in year 3 to a major project in year 4, in which the student is expected to demonstrate initiative and personal responsibility in carrying out work of the type and level that might be expected of a young professional engineer in industry.
- Specific strategies for the design and evaluation of electronic communications systems and products are practised in the learning modules in year 5.
- Skills of obtaining, interpreting and evaluating information (b6 and b7) are developed through the dissertation exercise in year 4.

**Assessment**

- Analytical and problem solving skills (b1 and b2) are assessed through unseen written examinations.
- Programming and software engineering skills (b4) are assessed by submitted coursework.
- Design skills, including the use of appropriate computer based tools, (b3, b5, b8, b9, b10) are assessed through laboratory and project daybooks, written and oral reports and by the direct evaluation by staff of the hardware or software deliverables produced by the student.
- Skills in seeking out and evaluating information (b6 and b7) are assessed by oral presentations at seminars and by a written report.
### Professional/subject-specific/practical skills

- **c1.** Use electronic test and measurement equipment;
- **c2.** Follow correct procedures and make safe use of approved instruments for working at mains, or higher, voltages;
- **c3.** Use computer based design tools;
- **c4.** Test and evaluate design solutions, in the laboratory or by simulation;
- **c5.** Interpret the results of experiments or simulations and present them in written technical reports and oral presentations;
- **c6.** Make effective use of scientific and commercial information sources;
- **c7.** Plan and carry out a research or design project, taking account of resource constraints and responding flexibly and effectively to any unanticipated difficulties that arise during the project;

### Teaching/learning methods and strategies

- Basic practical skills, including the use of computer based design tools, (c1, c2 and c3) are developed in the structured practical projects in years 1 to 3 and applied in the year 4/5 project.
- The testing, evaluation and reporting of design solutions (c4) are also developed through the structured projects throughout the programme, leading up to the major project in year 4/5.
- Experience in a variety of styles of written and oral reporting (c5) is acquired through the various structured projects, ranging from short-form written reports and verbal reports to staff, through to a full length project thesis and formal oral dissertation presentations in year 4.
- Familiarity with basic information sources, such as data sheets, is acquired through the structured projects from year 1 through to the dissertation in year 4 which specifically develops the skills of obtaining, interpreting and evaluating scientific and other sources of information (c6).
- Planning, monitoring and evaluation skills are refined through the project in year 4/5 (c7).

### Assessment

- Competence in practical skills (c1, c2, c3 and c4) is assessed during the structured projects in years 1, 2 and 3 by direct observation of students’ working methods and of the build quality of their hardware and/or software.
- Skills in the interpretation and evaluation of design solutions and in literature searching and reporting (c5 and c6) are assessed by written and oral reports.
- The quality of students’ project planning and organisation (c7) are a specific element of the assessment of the project and dissertation in year 4/5.
**Transferable skills**

d1. Rigorously apply scientific and mathematical methods to the analysis of problems;
d2. Be creative and innovative in developing new solutions to problems;
d3. Effectively manage time and resources;
d4. Communicate effectively, both orally and in writing;
d5. Work effectively in a group;
d6. Make proficient use of general IT tools, including word processing, email, spreadsheets and WWW;
d7. Evaluate the wider implications of technology;
d8. Learn independently;

**Teaching/learning methods and strategies**

- The application of scientific and mathematical methods (d1) is practised throughout the degree programme by doing tutorial problems, reporting on laboratory and project work and obtaining feedback on these from staff.
- In the year 4/5 project, students are expected to develop their own solutions to a broadly specified problem (d2), with only general guidance and constructive criticism from their supervisor.
- Systematic approaches to innovation and design are acquired through a learning module in year 5.
- The development of effective personal time management (d3) is necessary to cope with the demands of the overall degree programme and to comply with deadlines for the submission of work. These skills are specifically developed within the year 4/5 dissertation and project (which also requires the management of physical resources).
- Communication skills (d4) are developed throughout the degree programme, from the Professional Engineering essay in year 1, through a variety of styles of report that are required for the structured projects in years 1 to 3, leading up to the preparation of a substantial thesis on the year 4/5 project and six oral presentations and a thesis on the year 4 dissertation.
- Students work as a design team (d5) in the practical projects associated with the year 2 Ballmann and Castaway exercises. The year 4 dissertation requires a group of students to collaborate in obtaining information and producing a coordinated set of reports within the broad field of the group topic. Weekly meetings are conducted formally, chaired by a student who also writes brief minutes. Students work in design teams for many of the learning modules in year 4/5.
- General IT tools are routinely used throughout the degree programme (d6). Students are required to use word processing for the production of project reports. Email is the prime means of communication between Course Organisers and students. The use of spreadsheets for presenting data is formally taught in the year 2 project. Dissertation groups are encouraged to set up a Web site. The University has an extensive network of PCs in libraries and halls of residence, for which all students are given an account when they enrol.
- In year 1, students receive a series of lectures on "Professional Engineering" and submit an essay.
- The year 4 dissertation requires that the broader implications of a technical topic are evaluated (d7).
- Although not specifically "taught", the entire degree programme requires the student to reinforce what is taught in classes by independent study. The project and dissertation in year 4/5 require largely independent work, in both engineering and wider areas of knowledge (d8). The year 4/5 learning modules are heavily based on independent study.

**Assessment**

- The use of scientific and mathematical methods (d1) is assessed through written examinations and project reports.
- The student’s original contribution (d2) is specifically assessed through the written
thesis and oral examination on the year 4/5 project.

- The School enforces deadlines for all submitted work and strictly applies a standard scale of penalties for lateness. The dissertation exercise requires a disciplined approach to preparing for weekly seminars. Performance in these respects is specifically assessed in the project and dissertation marking schemes (d3).
- Report writing skills are assessed throughout the degree programme and the oral presentations for the year 4 dissertation are specifically assessed (d4).
- The student’s contribution to the group carries a small proportion of the mark for the year 4 dissertation (d5) and for some of the learning modules in year 4/5.
- General IT skills are not specifically assessed but the standards expected for report presentation, and the way in which courses are managed, make the routine use of email and word processing essential.
- The year 4 dissertation assessment specifically includes the student’s evaluation of the wider implications of the technical topic (d7).
- Success throughout the degree programme, especially in the later years, requires a substantial element of independent study and learning by the student (d8).

11) Programme Structure and Features:
Entry requirements: SQA BBBB at Higher including Mathematics; GCE BBB at A-Level including Mathematics

**Electronics and Electrical Engineering (Communications) (MEng)**

Degree Type: Integrated Masters Single Honours

UCAS Code: ####### ??????????? #######

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* Or alternative courses in Mathematics, with permission of the Head of School.

† Normally recommended.

†† Alternatively, *Computer Science 2A or Computer Science 2B*, with permission of the Head of School.

# Entry to fourth year MEng normally requires an average mark of 55% in third year, at the first attempt.

††† Pre-requisites for 5th year courses are (a) Electronic/Electrical System Design 5: Digital Signal Analysis 4 and Digital Communications 4. Care should be taken to ensure that a reasonable balance between courses delivered in semester 1 and semester 2 is maintained.

@ Circuits Engineering 4 and Large Scale Integrated Circuits 4 are both co-requisites for Analogue VLSI 4

+ Or alternative courses with permission of the Head of School.
12) Other items:

In the earlier years there are often opportunities for students to select outside courses, which may from other disciplines and often from other Colleges. The selection of these courses is made with the advice of the student’s Director of Studies (a Director of Studies is allocated to a student on arrival and normally remains the student’s Director of Studies throughout the programme). Possible criteria for the selection of these courses may be either to provide a broadening of the curriculum or to keep open possible options for joint degree programmes.

Further information can be obtained from http://www.see.ed.ac.uk/teaching/electronics/