PROGRAMME SPECIFICATION	

1	**Awarding Institution**	Newcastle University
2	**Teaching Institution**	Newcastle University
3	**Final Award**	M.Eng.
4	**Programme Title**	Electrical and Electronic Engineering with Industrial Project Electrical and Electronic Engineering with Industrial Project with Placement Year Electrical and Electronic Engineering with Industrial Project with Placement Year (Inverted) Microelectronic Engineering with Industrial Project Microelectronic Engineering with Industrial Project with Placement Year Digital Electronics with Industrial Project Digital Electronics with Industrial Project with Placement Year Electrical Power Engineering with Industrial Project Electrical Power Engineering with Industrial Project with Placement Year Automation and Control with Industrial Project Automation and Control with Industrial Project with Placement Year Electronic Communications with Industrial Project Electronic Communications with Industrial Project with Placement Year

		Automation and Contril with Industrial Project with Placement Year
5	**UCAS/Programme Code**	H605, 1181U, 1604U, H612, 1185U, H991, 1195U, H622,1187U, H661, 1193U, H621, 1186U, 1554U
6	**Programme Accreditation**	IET
7	**QAA Subject Benchmark(s)**	Engineering
8	**FHEQ Level**	7
9	**Last updated**	May 2023

10 Programme Aims

- to provide opportunities for students to undertake a broad-based education in electrical and electronic engineering and to acquire appropriate knowledge and understanding, of engineering skills and key skills,
- to produce graduates who will be equipped to enter employment in industry, the professions or public service, or to follow a postgraduate route into research, industry or academia, or apply the skills learnt in a range of areas other than engineering,
- to allow for the development of increased knowledge in areas of specialisation,
- to give extended experience of group activities,
- to give experience of working in an industrial environment in accord with the university's policy and procedures for the assurance of the quality and standards of placement learning,
- to produce graduates who will meet the accreditation requirements of the Institution of Engineering and Technology.
- to provide a qualification which meets the designated learning outcomes at level 7 of the National Qualifications Framework and meets the requirements of the National Subject Benchmarks in Engineering.
- Provide, in the later stages, specialisation in an area of engineering to enhance their professional capability in their chosen field, as demonstrated by a coherent group of specialist taught modules and a major individual project in the specified area:
- Electrical and Electronic Engineering: in contrast to the other named specialist streams below, the later stages of this degree maintain the breadth of the earlier stages, to produce graduates capable of developing into senior roles in which they may be required to understand and manage a broad spectrum of engineering activities.
- Microelectronic Engineering: the later stages of this degree focus on meeting the requirements of the semiconductor industry.
- Digital Electronics: the later stages of this degree focus on meeting the requirements of the computer hardware and digital systems design industry.
- Electrical Power Engineering: the later stages of this degree focus on meeting the requirements of the electrical power generation and distribution industry, including renewables.
- Automation and Control: the later stages of this degree focus on meeting the requirements of industries using electrical automation and control.
- Electronic Communications: the later stages of this degree focus on meeting the requirements of the telecommunications industry.

For students on the Placement Year programme:

- Provide students with the experience of seeking and securing a position with an employer.
- Facilitate independent self-management and proactive interaction in a non-university setting.

- Provide a period of practical work experience that will benefit current academic study and longer term career plans.
- Enable students to ethically apply their knowledge and skills in the work place, reflect upon their development and effectively evidence and articulate their learning in relevant future settings.

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. The programme outcomes (US, EA, D, P, S prefixes) have references to the UK-SPEC learning outcomes which are referenced in the QAA benchmark statements for Engineering.	
Underpinning Science And Mathematics	
US1	Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of historical, current, and future developments and technologies
US1m	A comprehensive understanding of the scientific principles of own specialisation and related disciplines;
US2	Knowledge and understanding of mathematical principles necessary to underpin their education in their engineering discipline and to enable them to apply mathematical methods, tools and notations proficiently in the analysis and solution of engineering problems.
US2m	An awareness of developing technologies related to own specialisation
US3	Ability to apply and integrate knowledge and understanding of other engineering disciplines to support study of their own engineering discipline
US3m	A comprehensive knowledge and understanding of mathematical and computer models relevant to the engineering discipline, and an appreciation of their limitations.
US4m	An understanding of concepts from a range of areas including some outside engineering, and the ability to apply them effectively in engineering projects
	Knowledge and Understanding (For students on the placement programmes only)
A1	Apply personal and professional development strategies to prioritise, plan, and manage their own skills development and learning.
A2	Research, select and apply relevant knowledge aimed at enhancing their own skills and effectiveness in specific duties at their placement.
A3	Demonstrate an understanding of a work environment, how it functions and their contribution to it.
A4	Relate their work based learning to other areas of personal development, including academic performance.
	Teaching and Learning Methods
US	The primary means of imparting knowledge and understanding of fundamental mathematics, science and engineering principles (US1-US4m) is lectures. These are supplemented by example classes and (in stage 1) by small group tutorials which enable students to check their learning. Practical lab work reinforces learning (US1,US2). Throughout the course students are encouraged to supplement taught material by

	independent reading, for which they are given extensive support and guidance on reading materials and how to use them.
	Awareness of new developments (US2m) is acquired through examples in lectures and project work in the latter stages. Knowledge of other engineering disciplines (US3) is acquired through Engineering Mathematics which includes examples from a range of disciplines and through mechanical engineering and physics concepts covered in topics such as electrical machines and semiconductor devices. Mathematical and computer modelling skills (US3m) are acquired through lectures and practical programming exercises in Matlab and C and through CAD tools in project work. Concepts in areas outside engineering (US4m) are learned through lectures in accountancy and law and through project work.
	Assessment Strategy
	Testing the knowledge base is through a combination of unseen written examinations and assessed coursework (US1-US4m) in the form of laboratory reports, coursework reports, project reports and presentations.
Engineering Analysis	
EA1	Understanding of engineering principles and the ability to apply them to analyse key engineering processes.
EA1m	An ability to use fundamental knowledge to investigate new and emerging technologies.
EA2	Ability to identify, classify and describe the performance of systems and components through the use of analytical methods and modelling techniques.
EA2m	Ability to apply mathematical and computer-based models for solving problems in engineering, and the ability to assess the limitations of particular cases.
EA3	Ability to apply quantitative methods and computer software relevant to their engineering discipline, in order to solve engineering problems.
EA3m	Ability to extract data pertinent to an unfamiliar problem, and apply in its solution using computer based engineering tools when appropriate.
EA4	Understanding of and ability to apply a systems approach to engineering problems.
	Teaching and Learning Methods
EA	Analytical skills (EA1, EA3) are developed through worked examples in lectures and small group teaching (at stage 1), and solving tutorial problems. Mathematical and computer modelling (EA3, EA2, EA2m,EA3m) is used in project work to solve engineering problems. Student are encouraged to learn a systems approach (EA4) by applying principles taught in lectures to their project work. Knowledge of emerging technologies is imparted through lectures and students carry out investigations into aspects of these during literature studies and project work.
	Assessment Strategy
	Analysis and problem solving skills (EA1-EA4) are assessed through written examinations and coursework and through project work, which appears throughout the course.
Design	

D1	Investigate and define a problem and identify constraints including environmental and sustainability limitations, health and safety and risk assessment issues;
D1m	Wide knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations
D2	Understand customer and user needs and the importance of considerations such as aesthetics;
D2m	Ability to generate an innovative design for products, systems, components or processes to fulfil new needs
D3	Identify and manage cost drivers
D4	Use creativity to establish innovative solution;
D5	Ensure fitness for purpose for all aspects of the problem including production, operation, maintenance and disposal;
D6	Manage the design process and evaluate outcomes.
	Teaching and Learning Methods
D	Design skills (D1,D2,D3,D5,D6,D1m) are learned from lectures and practised in project work and paper design exercises. Students are supported in developing creativity (D4,D2m) during project work.
	Assessment Strategy
	Design skills (D1,D2,D3,D5,D6,D1m) are assessed through laboratory project reports, assignments and dissertations, presentations and written examinations.
.	Creative skills (D4,D2m) are mainly assessed through coursework and project work reports and presentations
Economic, Social, And Environmental Context	
S1	Knowledge and understanding of commercial and economic context of engineering processes;
S1m	Extensive knowledge and understanding of management and business practices, and their limitations, and how these may be applied appropriately
S2	Knowledge of management techniques, which may be used to achieve engineering objectives within that context;
S2m	The ability to make general evaluations of commercial risks through some understanding of the basis of such risks
S3	Understanding of the requirement for engineering activities to promote sustainable development;
S4	Awareness of the framework of relevant legal requirements governing engineering activities, including personnel, health, safety, and risk (including environmental risk) issues;
S5	Understanding of the need for a high level of professional and ethical conduct in engineering.
	Teaching and Learning Methods
S	Knowledge of management techniques and practices (S2,S1m,S2m) is imparted through lectures and practised through business exercises and project work. An understanding of ethical issues (S5) is imparted by lectures and developed through group discussions. Knowledge of social, legal, environmental and economic implications of engineering activities (S1,S3,S4) is imparted through lectures on engineering topics and on accountancy, finance and law and business management. Students are

	encouraged to develop further awareness in project work, particularly the group projects and industrial project.
	Assessment Strategy
	Knowledge of management techniques and practices (S2,S1m,S2m) is assessed by written examinations, group project reports and business exercise reports. Understanding of ethical issues (S5) is not assessed directly. Knowledge of social, legal, environmental and economic implications of engineering activities (S1,S3,S4) is assessed by examinations, project reports and business exercise reports.
Engineering Practice	
P1	Knowledge of characteristics of particular materials, equipment, processes, or products.
P1m	A thorough understanding of current practice and its limitations, and some appreciation of likely new developments;
P2	Workshop and laboratory skills.
P2m	Extensive knowledge and understanding of a wide range of engineering materials and components.
P3	Understanding of contexts in which engineering knowledge can be applied (e.g. operations and management, technology development, etc.).
P3m	Ability to apply engineering techniques taking account of a range of commercial and industrial constraints.
P4	Understanding use of technical literature and other information sources.
P5	Awareness of nature of intellectual property and contractual issues.
P6	Understanding of appropriate codes of practice and industry standards
P7	Awareness of quality issues.
P8	Ability to work with technical uncertainty.
	Teaching and Learning Methods
P	Experimental skills (P2) are developed by carrying out laboratory experiments and constructing practical projects. Knowledge of materials, products and processes (P1,P2m) is imparted through lectures and through open-ended project work. Students are encouraged to 'learn by doing'. An understanding of the industrial and commercial application of engineering practice and some practical limitations (P1m, P3,P3m,P5,P6,P7,P8) is achieved through open-ended project work including an industrial project. Students also learn how to use information sources such as technical literature (P4) during these projects. An awareness of intellectual property and contractual issues is also imparted through lectures in business management, accountancy and law.
	Assessment Strategy
	Assessment of practical skills (P1, P2, P2m) is through observed laboratory work, laboratory and project report writing and assessed presentations and demonstrations. Skill P4 is assessed directly by literature study report and by integration into project and laboratory reports. Understanding of industrial and commercial practice (P1m, P3,P3m,P5,P6,P7,P8) is assessed through industrial project presentation and report and through extended coursework.
General Transferable Skills	
T1	Plan, conduct and report a programme of investigative work.

T1m	Develop, monitor and update a plan or programme of work, to reflect a changing operating environment;
T2	Communicate effectively in writing, verbally and diagrammatically (E, C).
T3	Give oral presentations using a variety of visual aids (E).
T4	Apply mathematical skills (E).
T5	Work as a member of a team (E, C).
T5m	Understand different roles within a team, and be able to exercise leadership;
T6	Use information and communications technology (E, C).
T7	Learn independently in familiar and unfamiliar situations with open-mindedness and in the spirit of critical enquiry (E).
T7m	Learn new theories, concepts, methods etc. in unfamiliar situations.
	For students on the placement programmes only:
T8	Reflect on and manage own learning and development within the workplace.
T9	Use existing and new knowledge to enhance personal performance in a workplace environment, evaluate the impact and communicate this process.
T10	Use graduate skills in a professional manner in a workplace environment, evaluate the impact and communicate the personal development that has taken place.
	Teaching and Learning Methods
T	Project planning skills (T1,T1m) are developed through business exercises and practical project work. Knowledge of Communication and presentation skills (T2,T3) is imparted through communications skills lectures and practised through report writing, and giving oral presentations. Mathematical skills (T4) are developed throughout the course in lectures, problem solving exercises and analysis of practical experimental work.
	Team working skills (T5, T5m) are developed through group project work.
	IT and communication technology skills (T6) are developed through the use of computer aided design and office software tools to produce coursework submissions.
	Throughout the course the learner is encouraged to undertake independent reading both to supplement and consolidate what is being taught / learnt and to broaden their individual knowledge and understanding of the subject (T7, T7m).
	Assessment Strategy
	Skills T1, T6 and T1m are assessed through coursework, laboratory and project reports.
	Skill T3 is assessed through presentations.
	Skills T2 and T4 are assessed by examinations and coursework throughout the course.
	Skill T5 and T5m are assessed by group project coursework in Stages 2 and 4
	Skill T7, T7m is assessed as part of specialist modules and through integration in other activities.
	T6 is assessed.

12 Programme Curriculum, Structure and Features

Basic structure of the programme

Stages 1 and 2 are broadly-based and common to all BEng and MEng Honours streams with all modules compulsory.

Stage 1 aims to provide all students with a firm foundation on which to build their future studies. A substantial mathematical base is provided and is enhanced by mathematical techniques and practice introduced in other modules. Knowledge and understanding of fundamental engineering principles is provided through the technical modules, which also serve to broaden and enhance intellectual abilities. Practical work in the laboratory emphasises a project based approach, this, together with computing classes, develops a range of practical and transferable skills.

Stage 2 builds on the work of Stage 1, continuing the development of an understanding of mathematical methods at the point of application. Knowledge and understanding is increased through all modules. Project work again forms a major part of the practical work of the stage. In Stage 2 all students take part in a group project which develops and exercises practical and teamwork skills as well as enhancing intellectual abilities. Work on Project Management provides an understanding of the requirements of the management of engineering programmes. This work is practised and assessed as part of the group project.

Stage 3 continues to enhance and expand the student's knowledge, understanding and intellectual abilities. However, it is distinct from Stages 1 and 2, where almost all modules are compulsory, as the student will now specialise in particular aspects of electrical and electronic engineering and additionally study a small number of options selected freely from a wider range of topics, though some appropriate modules are recommended. (except for the Electrical and Electronic stream which remains broad-based and most taught modules are optional).

- Microelectronic Engineering students take compulsory modules in analogue and digital systems, electronic devices and power electronics.
- Digital Electronics Engineering students take compulsory modules in design and test of digital systems, real time and embedded systems, IC design and electronic communications.
- Electrical Power Engineering students take compulsory modules in machines and drives, renewable energy and control systems.
- Automation and Control Engineering students take compulsory modules in control systems, robotics and electric drives.
- Electronic Communications Engineering students take compulsory modules in communications and signal processing, image processing and analogue design.

All students take a module covering commercial and legal aspects of engineering to further their understanding of commercial engineering practice. A major part of Stage 3 is the individual student project, which is a significant part of the training of a professional engineer. This project enables the development of intellectual ability and practical and transferable skills as well as providing a mechanism for their assessment.

Stage 4 of the course is structured so that students spend the first semester working in an industrial environment (these activities can extend back into the preceding summer vacation period). Students take further technical and non-technical modules in Stage 4. A major activity for these MEng students is a group project. Project activities relate to real engineering problems, the group is run as a small business venture with a defined product specification to be fulfilled within a budget.
Students study compulsory advanced topics according to specialism, except Electrical and Electronic Engineering students who choose advanced options from the specialist streams.

- Automation and Control students study distributed and adaptive control
- Digital Electronics students study digital CAD software and mobile communications
- Electrical Power Engineering students study machine design and distributed control
- Electronic Communications students study modulation, coding and mobile communications
- Microelectronic Engineering students study digital CAD software and semiconductor fabrication.

Students on the Careers Placement Year programme will take their placement in the penultimate year of studies.

Key features of the programme

The normal Undergraduate year is arranged in three terms and is divided into two Semesters. Semester 1 is twelve weeks, preceded by an induction week and followed by a period of examination for those topics completed in Semester 1. Semester 2 is also twelve weeks long and is followed by a second examination period

The course normally lasts four years, although it is possible to take a gap year.

Every Honours student studies 120 credits in each Stage (or year), resulting in MEng candidates completing 480 credits by the end of their course. Candidates must successfully complete all parts of a stage before progressing to the next. Courses are pursued through full-time study; the only part-time study is limited provision for the repetition of failed modules.

All students follow the same programmes in Stages 1 and 2. In the third and fourth years students follow a specialisation. The MEng and BEng versions of the programme are common up to the end of Stage 2 and it is possible for students to transfer between courses (subject to conditions) up to this point.

There is a Foundation Year for candidates not adequately qualified to embark on Stage 1 of Degree Programmes.

Programme regulations (link to on-line version)

-RH605-1181U.pdf (ncl.ac.uk)
-RH612_1185U.pdf (ncl.ac.uk)
-RH991_1195U.pdf (ncl.ac.uk)
-RH622_1187U.pdf (ncl.ac.uk)
-RH661-1554U.pdf (ncl.ac.uk)
-RH621_1186U.pdf (ncl.ac.uk)

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13 Support for Student Learning
Generic information regarding University provision is available at the following link. Generic Information

14 Methods for evaluating and improving the quality and standards of teaching and learning
Generic information regarding University provision is available at the following link. Generic Information *Accreditation reports* These programmes are accredited by the Institution of Engineering and Technology. *Additional mechanisms*

15 Regulation of assessment
Generic information regarding University provision is available at the following link. Generic Information

In addition, information relating to the programme is provided in:
The University Prospectus: http://www.ncl.ac.uk/undergraduate/degrees/#subject Degree Programme and University Regulations: http://www.ncl.ac.uk/regulations/docs/

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.