| PROGRAMME SPECIFICATION |  |
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| **1** | **Awarding Institution** | Newcastle University |
| **2** | **Teaching Institution** | Newcastle University |
| **3** | **Final Award** | M.Eng. |
| **4** | **Programme Title** | Power Engineering (Degree Apprenticeship) |
| **5** | **UCAS/Programme Code** | H630 |
| **6** | **Programme Accreditation** | To be sought in 2021/22 |
| **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,
- 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 the field of Power Engineering, as demonstrated by a coherent group of specialist taught modules and a major individual project primarily meeting the requirements of the electrical power generation, transmission and distribution industry.

As this programme is for Apprentices, who are in employment, there will be considerable periods of time in the workplace, which will:

- Facilitate independent self-management and proactive interaction in a non-university setting.
- Provide practical work experience that will benefit current academic study and longer term career progression.
- 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 | |
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| 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** | |
| 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. |

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| 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; |

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| 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 through project work undertaken with their employer. |
| **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 |

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| | 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. |
| T3 | Give oral presentations using a variety of visual aids. |
| T4 | Apply mathematical skills. |
| T5 | Work as a member of a team. |
| T5m | Understand different roles within a team, and be able to exercise leadership; |
| T6 | Use information and communications technology. |
| T7 | Learn independently in familiar and unfamiliar situations with open-mindedness and in the spirit of critical enquiry. |
| T7m | Learn new theories, concepts, methods etc. in unfamiliar situations. |
| 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). |
| | Reflective learning and the use of this to enhance personal performance (T8, T9) are introduced in the Stage 1 Special Study Unit (SSU). This is built on in subsequent years, up to and including the End Point Assessment. |
| | Work based learning in SSUs at each stage are designed to encourage professionalism in the workplace while carrying out graduate level activities (T10) |
| **Assessment Strategy** | |
| | Skills T1, T6 and T1m are assessed through coursework, laboratory and project reports. |

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| | 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. |
| | T8 and T9 is assessed through mentoring by the apprentice's employer |
| | T10 is assessed in the outcomes from activity in the SSUs |

**12 Programme Curriculum, Structure and Features**

**Basic structure of the programme**

Stages 1 and 2 are broadly-based and all modules are 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 and develops a range of practical and transferable skills. A Special Study Unit (SSU) develops the ability to undertake reflective learning and use an ePortfolio to record this. The reflective learning element of this module will also be the start of preparation for the End Point Assessment in Stage 4.

Stage 2 is delivered across two years which allows students to spend time with their employer. These two years build 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 apprentices undertake SSUs with their employers which develop 2D/3D drawing knowledge and provide an understanding of the requirements of the management of engineering programmes. The SSUs also provide ample opportunity for students to practice their research and report writing which provides a good grounding for skills which will be most heavily utilised by the End Point Assessment in Stage 4. This work is practised and assessed as part of the SSUs.

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 cover general electrical and electronic engineering topics, as the apprentice will now largely specialise in power engineering. This covers power systems operation, machines and drives, renewable energy and control systems.

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 project, which is a significant part of the training of a professional engineer and essential preparation for the EPA in Stage 4. This project enables the development of intellectual ability and practical and transferable skills as well as providing a mechanism for their assessment.

Stage 4 provides further technical modules and the End Point Assessment of the Apprenticeship.

**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 five years, with Stage 2 split across Years 2 and 3 which also includes a significant period of time working with their employer.

Every Honours student studies 120 credits in each Stage, resulting in completion of 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, although it is noted that some of that study time is spent with the Employer in Special Study Units.

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

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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 will be submitted to the Institution of Engineering and Technology for accreditation in 2021/22.

*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.