Practical Electronics (National 4)

Draft National Course Specification

Valid from August 2013

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Please refer to the note of changes at the end of this Course Specification for details of changes from previous version (where applicable).

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Course outline

Course title: Practical Electronics (National 4)

SCQF: level 4 (24 SCQF credit points)

Course code: to be advised

Mandatory Units

Electronic Design (National 4)	**6 SCQF credit points**
Electronic Circuit Simulation (National 4)	**6 SCQF credit points**
Electronic Construction (National 4)	**6 SCQF credit points**

Added Value Unit
Electronic Project (National 4) **6 SCQF credit points**
This Course includes six SCQF credit points for the assessment of added value in the Added Value Unit. Further information on this Unit is provided in the Assessment section.

Recommended entry

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills and knowledge required by the following or by equivalent qualifications and/or experience:

- Numeracy Unit (Access 3)

In terms of prior learning and experience, relevant experiences and outcomes may also provide an appropriate basis for doing this Course. Further information on relevant experiences and outcomes will be given in the *Course Support Notes*.

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Progression

This Course or its components may provide progression to:

- other SQA qualifications in Practical Electronics or related areas
- further study, employment or training

Further details are provided in the Rationale section.

Equality and inclusion

This Course Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information please refer to the *Course Support Notes* and the *Course Assessment Specification.*

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Rationale

All new and revised National Courses reflect Curriculum for Excellence values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalisation and choice.

In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.

This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

All Courses provide opportunities for learners to develop breadth, challenge and application, but the focus and balance of the assessment will be appropriate for the subject area.

Relationship between the Course and Curriculum for Excellence values, purposes and principles

Electronics is an area of human endeavour which brings together elements of technology, science and mathematics, and applies these to real world challenges. The Course therefore provides an excellent opportunity for making links across learning in the senior phase.

The Course encourages learners to become successful, responsible and creative in their use of technologies and to continue to acquire and develop the attributes and capabilities of the four capacities, including: creativity, flexibility and adaptability; enthusiasm and a willingness to learn; perseverance, independence and resilience; responsibility and reliability; confidence and enterprise.

The Course provides progression from experiences and outcomes in craft, design, engineering and graphics, and in science.

Purpose and aims of the Course

Electronics is vital to everyday life in our society. This Course provides skills and a basic understanding of electronics and its impact. It provides a solid foundation for those considering further study, or a career, in electrical engineering and related disciplines. The Course also provides a valuable complementary practical experience for those studying Engineering Science, Physics or other pure science Courses.

The electronics industry continues to be a major contributor to the economy. It contributes not only to manufacturing, but to other sectors such as finance, telecommunications, material processing, oil extraction, weather forecasting and renewable energy. Within all of these fields there exists a wide range of job opportunities for people with skills in electronics.

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The aims of the Course are to enable learners to develop:

- knowledge and understanding of key concepts in electronics and apply these in a range of contexts
- a range of practical skills in electronics, including skills in analysis and problem solving, design skills, skills in the safe use of tools and equipment, and skills in evaluating products and systems
- awareness of the importance of safe working practices in electronics
- an understanding of the role and impact of electronics in changing and influencing society and the environment

The Course is mainly practical in nature. The aims of the Course will be developed through practical projects and investigative tasks in a range of contexts.

Information about typical learners who might do the Course

The Course provides a broad practical introduction to electronics. It will be of value in providing an informed view of the impact of electronics to many learners, and particularly beneficial to those considering a career or further study in electronics, electrical engineering, physics, and related disciplines.

The Course provides sufficient breadth, flexibility and choice to meet the needs of all learners.

Learners will develop a broad understanding of the pervasive role of electronics in our society, as well as a range of transferable skills for learning, life and work, opening up a wide range of career and study opportunities.

On completing the Course, learners will have developed skills in analysis and problem solving, circuit design, safe use of tools and equipment, and evaluation of electronic solutions.

Course activities also provide opportunities to enhance generic skills in planning and organising, working independently and in teams, critical thinking and decision making, research, communication and self- and peer-evaluation, in a technological context.

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Course structure and conditions of award

Course structure

The Course enables learners to develop a range of technological skills, including skills in analysis and problem solving, design skills, skills in the safe use of tools and equipment, and skills in evaluating products and systems.

The Course also enables learners to develop knowledge and understanding of key concepts in electronics, and the ability to apply these in a variety of contexts; and an awareness of the impact of electronics on society and the environment.

Units are statements of standards for assessment and not programmes of learning and teaching. They can be delivered in a number of ways.

The Course comprises four mandatory Units including the Added Value Unit. The first three Units listed below are designed to provide progression to the corresponding Units at National 5.

Electronic Design (National 4)
This Unit provides a basic understanding of key electrical concepts and electronic components. Learners will design and build a range of appropriate systems and explore issues relating electronics to society and the environment.

Electronic Circuit Simulation (National 4)
In this Unit, the learner will use simulation software to design, test and evaluate a range of simple circuits and systems and their behaviour.

Electronic Construction (National 4)
This Unit provides experience in assembling a range of simple electronic circuits, using permanent and non-permanent methods. Skills in practical wiring and assembly techniques will be developed, and basic testing and fault-finding carried out.

Added Value Unit: Electronic Project (National 4)
This Unit requires the learner to apply skills and knowledge from the other Units to solve a straightforward electronics problem.

Conditions of award

To achieve the Practical Electronics (National 4) Course, learners must pass all of the required Units, including the Added Value Unit. The required Units are shown in the Course outline section.

National 4 Courses are not graded.

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Skills and knowledge

Full skills and knowledge for the Course will be given in the *Course Assessment Specification*. A broad overview of the mandatory subject skills, knowledge and understanding that will be assessed in the Course includes:

- awareness of some aspects of the impact of electronic systems on society and the environment
- awareness of safe working practices in electronics
- analysing, with guidance, straightforward electronic problems, and designing solutions to these problems
- simulating, testing and evaluating solutions to electronic problems, with guidance
- skills in using basic test equipment
- constructing simple electronic circuits using permanent (soldering) and non-permanent methods, using given layouts
- basic knowledge and understanding of the systems approach to electronics
- basic knowledge and understanding of a range of electronic components
- introductory knowledge and understanding of combinational logic
- understanding of key electrical concepts — current, voltage, resistance, analogue/digital
- applying basic electronic knowledge and skills in a range of straightforward contexts

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Assessment

Information about assessment for the Course will be included in the *Course Assessment Specification*, which will provide full details including advice on how a learner's overall attainment for the Course will be determined.

Unit assessment

All Units are internally assessed against the requirements shown in the Unit Specification.

They can be assessed on a Unit-by-Unit basis or by combined assessment.

They will be assessed on a pass/fail basis within centres. SQA will provide rigorous external quality assurance, including external verification, to ensure assessment judgments are consistent and meet national standards.

The assessment of the Units in this Course will be as follows:

Electronic Design (National 4)
For this Unit, learners will be required to provide evidence of:

- skills in designing simple electronic circuits
- knowledge and understanding of basic electronic concepts and components
- awareness of some aspects of issues relating electronics to society and the environment

Electronic Circuit Simulation (National 4)
For this Unit, learners will be required to provide evidence of:

- skills in using simulation software to design, test and evaluate simple electronic circuits
- knowledge and understanding of the behaviour of simple electronic circuits

Electronic Construction (National 4)
For this Unit, learners will be required to provide evidence of:

- skills in constructing simple electronic circuits
- knowledge and understanding of safe practice, basic assembly techniques, basic testing and fault-finding

Added Value Unit

Courses from National 4 to Advanced Higher include assessment of added value[1]. At National 4, added value will be assessed in an Added Value Unit. The Added Value Unit will address the key purposes and aims of the Course as defined in the Course Rationale. It will do this by addressing one or more of breadth, challenge or application.

In this Course, the Added Value Unit will focus on challenge and application.

[1] Definitions can be found here: www.sqa.org.uk/sqa/45528.html

The learner will draw on, extend and apply the skills they have learned during the Course. This will be assessed through a project[2] which involves applying skills and knowledge from the other Units to solve an appropriately challenging electronics problem.

Exemplification of possible assessment approaches for Units will be provided in the *National Assessment Resource*.

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[2] Definitions can be found here: www.sqa.org.uk/sqa/45528.html

Development of skills for learning, skills for life and skills for work

(Note: The information given below reflects the initial thinking on significant opportunities for development of skills for learning, skills for life and skills for work. These may be subject to change as the development process progresses.)

It is expected that learners will also develop broad, generic skills through this Course. The skills that are likely to be appropriate for this Course are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Course where there are appropriate opportunities.

2 Numeracy
2.3 Information handling

4 Employability, enterprise and citizenship
4.2 Information and communication technology (ICT)

5 Thinking skills
5.1 Remembering
5.2 Understanding
5.3 Applying

Amplification of these skills is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills will be appropriate to the level of the Course. Further information on building in skills for learning, skills for life and skills for work for the Course is given in the *Course Support Notes*.

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Administrative information

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Superclass: to be advised

History of changes to National Course Specification

Course details	Version	Description of change	Authorised by	Date

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