



National 5
Course Assessment
Specification



National 5 Engineering Science Course Specification (C723 75)

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: Engineering Science (National 5)

SCQF: level 5 (24 SCQF credit points)

Course code: C723 75

Mandatory Units

H23A 75	Engineering Contexts and Challenges (National 5)	6 SCQF credit points
Or		
H6NT 75	Engineering Contexts and Challenges with a Scottish Context (National 5)*	6 SCQF credit points
and		
H23B 75	Electronics and Control (National 5)	6 SCQF credit points
and		
H23D 75	Mechanisms and Structures (National 5)	6 SCQF credit points
and		
Course assessment		6 SCQF credit points

This Course includes six SCQF credit points for 40 additional programmed hours to allow preparation for Course assessment. The Course assessment covers the added value of the Course. Further information on the Course assessment is provided in the Assessment section.

*Scottish Studies Award contributing Unit: This Course Specification should be read in conjunction with the relevant Scottish Studies Unit Specification on the [Scottish Studies Award web page](#).

Recommended entry

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

- ◆ Engineering Science (National 4)

In terms of prior learning and experience, relevant experiences and outcomes may also provide an appropriate basis for doing this Course.

Progression

This Course or its Units may provide progression to:

- ◆ other SQA qualifications in Engineering Science or related areas
- ◆ further study, employment and/or training

Further details are provided in the *Course Support Notes*.

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*.

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

Engineering is a broad 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; and confidence and enterprise.

The Course provides progression mainly from craft, design, engineering and graphics experiences and outcomes. It also builds on some science experiences and outcomes, prior learning in mathematics and numeracy, and aspects of technological developments in society.

Purposes and aims of the Course

Engineering is vital to everyday life; it shapes the world in which we live and its future. Engineers play key roles in meeting the needs of society in fields which include climate change, medicine, IT and transport.

Our society needs more engineers, and more young people with an informed view of engineering. The Course provides a broad and challenging exploration of engineering. Because of its focus on developing transferable skills, it will be of value to many learners, and particularly beneficial to learners considering a career in engineering, or one of its many branches.

The aims of the Course are to enable learners to:

- ◆ apply knowledge and understanding of key engineering facts and ideas
- ◆ understand the relationships between engineering, mathematics and science
- ◆ apply skills in analysis, design, construction and evaluation to a range of engineering problems
- ◆ communicate engineering concepts clearly and concisely, using appropriate terminology
- ◆ develop an understanding of the role and impact of engineering in changing and influencing our environment and society

The Course develops a number of pervasive and integrative themes, including information, control, the systems approach, energy and sustainability. These are used to explore varied engineering systems through simulation, practical projects and investigative tasks in a range of contexts.

Courses in Engineering Science and in Physics (and other pure sciences) are designed to be complementary; a combination of this Course and a pure science Course will provide a very strong foundation for further study in engineering or the sciences.

Information about typical learners who might do the Course

The Course is designed for all learners who can respond to a level of challenge including, but not limited to, those considering further study or a career in engineering and related disciplines. It provides sufficient breadth, flexibility and choice to meet the needs of all learners.

Learners will develop an understanding of the far-reaching impact of engineering on our society and of the central role of engineers as designers and problem solvers, able to conceive, design, implement and operate complex systems. They will also develop a range of transferable skills for learning, life and work, opening up a wide range of career and study opportunities and enabling learners to develop as global citizens who can contribute effectively to their communities, society and the world.

On completing the Course, learners will have developed skills in analysis and problem solving, engineering design, the use of equipment and materials, and evaluation.

Course activities also provide opportunities to enhance generic and transferable 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.

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 use of equipment and materials, and skills in evaluating products and systems.

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

These skills, knowledge and awareness are developed through a range of contexts within the broad discipline of engineering, including mechanical, pneumatic, structural and electronic systems.

In addition to the Course assessment, the Course includes three mandatory Units. Each of these Units is designed to provide progression from the corresponding Unit at National 4, and to the corresponding Unit at Higher.

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

Engineering Contexts and Challenges (National 5)

This Unit provides a broad context for the Course. It develops an understanding of engineering concepts by exploring a range of engineered objects, engineering problems and solutions. This Unit allows the learner to explore some existing and emerging technologies and challenges, and to consider implications relating to the environment, sustainable development, and economic and social issues.

Electronics and Control (National 5)

This Unit explores an appropriate range of key concepts and devices used in electronic control systems, including analogue, digital and programmable systems. Skills in problem solving and evaluating are developed through simulation, practical projects and investigative tasks in a range of contexts.

Mechanisms and Structures (National 5)

This Unit develops an understanding of mechanisms and structures. Skills in problem solving and evaluating are developed through simulation, practical projects and investigative tasks in a range of contexts.

Conditions of award

To gain the award of the Course, the learner must pass all of the Units as well as the Course assessment. The required Units are shown in the Course outline section. Course assessment will provide the basis for grading attainment in the Course award.

Skills, knowledge and understanding

Further information on the assessment of the skills, knowledge and understanding for the Course is given in the *Course Assessment Specification*. A broad overview of the mandatory subject skills, knowledge and understanding that will be assessed in the Course is given in this section. These include:

- ◆ analysing engineering problems
- ◆ designing, developing, simulating, building, testing and evaluating solutions to engineering problems in a range of contexts
- ◆ investigating and evaluating existing and emerging technologies
- ◆ communicating engineering concepts clearly and concisely, using appropriate terminology
- ◆ knowledge of the many types of engineering
- ◆ knowledge of the wide role and impact of engineering on society and the environment
- ◆ knowledge of the workings of a range of engineered objects
- ◆ knowledge and understanding of key concepts related to electronic and microcontroller-based systems, and their application
- ◆ knowledge and understanding of key concepts related to mechanical, structural and pneumatic systems, and their application
- ◆ knowledge of the relevance of energy, efficiency and sustainability to engineering problems and solutions
- ◆ applying engineering knowledge and skills in a range of contexts

Skills, knowledge and understanding to be included in the Course will be appropriate to the SCQF level of the Course. The SCQF level descriptors give further information on characteristics and expected performance at each SCQF level (www.sqa.org.uk/scqf).

Assessment

Information about assessment for the Course is included in the *Course Assessment Specification*, which provides 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 an individual Unit basis or by using other approaches which combine the assessment for more than one Unit.

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.

Engineering Contexts and Challenges (National 5)

For this Unit, learners will be required to provide evidence of:

- ◆ technological skills in a range of contexts and challenges
- ◆ understanding of engineering contexts and challenges
- ◆ knowledge of the impact of engineering on society and the environment

Electronics and Control (National 5)

For this Unit, learners will be required to provide evidence of:

- ◆ skills in developing analogue electronic control systems
- ◆ skills in developing digital electronic control systems

Mechanisms and Structures (National 5)

For this Unit, learners will be required to provide evidence of:

- ◆ understanding of mechanisms and structures
- ◆ skills in developing mechanical and structural solutions

Course assessment

Courses from National 4 to Advanced Higher include assessment of [added value](#)¹. At National 5, Higher and Advanced Higher, the added value will be assessed in the Course assessment. The added value for the Course must 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, added value will focus on breadth, challenge and application.

The learner will draw on and apply the skills and knowledge they have developed during the Course. These will be assessed through a combination of an [assignment](#) and a [question paper](#)².

The Engineering Science assignment adds value by requiring challenge and application. Learners will apply knowledge and skills from the Units to solve an appropriately challenging engineering problem.

The question paper introduces breadth to the assessment. It requires depth of understanding and application of knowledge from the Units.

¹ Definitions can be found here: www.sqa.org.uk/sqa/58409.html

² Definitions can be found here: www.sqa.org.uk/sqa/58409.html

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

It is expected that learners will develop broad, generic skills through this Course. The skills that learners will be expected to improve on and develop through the 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

- 2.1 Number processes
- 2.3 Information handling

4 Employability, enterprise and citizenship

- 4.2 Information and communication technology (ICT)

5 Thinking skills

- 5.3 Applying
- 5.4 Analysing and evaluating

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*.

Administrative information

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History of changes to National Course Specification

Course details	Version	Description of change	Authorised by	Date
	1.1	Scottish Studies Award Unit contributing information added. No other changes made to document content.	Qualifications Manager	September 2014

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