SCQF level 6
Unit Specification

Engineering Contexts and Challenges

SCQF: level 6 (6 SCQF credit points)

Unit code: J29D 76

Unit outline

The general aim of this Unit is to develop a deep understanding of the broad discipline of engineering, and its role and impact on our society and environment. Learners will investigate complex engineering systems, problems and solutions, involving some existing and emerging technologies, and consider implications relating to the environment, sustainable development, and to economic and social issues.

Learners who complete this Unit will be able to:

1 Research and describe a complex engineering system
2 Model aspects of a complex engineered solution
3 Present a critical analysis of an engineered solution to a contemporary problem

This Unit is available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Unit Support Notes* which provide advice and guidance on delivery, assessment approaches and development of skills for learning, skills for life and skills for work. Exemplification of the standards in this Unit is given in *Unit Assessment Support*.

Recommended entry

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

- Engineering Contexts and Challenges (National 5) Course

Equality and inclusion

This Unit 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 *Unit Support Notes*.

Standards

Outcomes and assessment standards

Outcome 1

The learner will:

1 Research and describe a complex engineering system by:

1.1 Analysing the needs being met by the system
1.2 Identifying sub-systems, and describing the function of each and how they interact
1.3 Producing system and sub-system diagrams
1.4 Explaining the role of feedback in the system
1.5 Carrying out an energy audit of the system

The system researched should include both mechanical and electronic aspects.

Outcome 2

The learner will:

2 Model aspects of a complex engineered solution by:

2.1 Constructing or simulating a model of its control system
2.2 Constructing or simulating a model of a mechanical or structural aspect of the solution

Outcome 3

The learner will:

3 Present a critical analysis of an engineered solution to a contemporary problem by:

3.1 Describing clearly the nature of the problem
3.2 Describing some social and economic impacts of the solution
3.3 Describing clearly some environmental impacts of the solution
3.4 Identifying and describing emerging technologies which may impact future developments

Evidence Requirements for the Unit

Assessors should use their professional judgement, subject knowledge and experience, and understanding of their learners, to determine the most appropriate ways to generate evidence and the conditions and contexts in which they are used.

For this Unit, learners will be required to demonstrate technological skills, knowledge and understanding in appropriately complex engineering contexts and challenges.

Evidence of Outcomes may take many forms, including oral or written evidence, or may be demonstrated by carrying out practical tasks. Evidence of Outcomes and Assessment Standards may be generated during one or more activities.

Exemplification of assessment is provided in *Unit Assessment Support*.
Advice and guidance on possible approaches to assessment is provided in the *Unit Support Notes*.

Assessment standard thresholds

If a candidate successfully meets the requirements of the specified number of Assessment Standards they will be judged to have passed the Unit overall and no further re-assessment will be required.

The specific requirements for this Unit is as follows:

- 8 out of 11 Assessment Standards must be achieved.

It should be noted that there will still be the requirement for candidates to be given the opportunity to meet all Assessment Standards. The above threshold has been put in place to reduce the volume of re-assessment where that is required.

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

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

5.2 Understanding
5.3 Applying

Amplification of these is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work.* The level of these skills should be at the same SCQF level of the Unit and be consistent with the SCQF level descriptor. Further information on building in skills for learning, skills for life and skills for work is given in the *Unit Support Notes.*

Appendix: unit support notes

These support notes provide advice and guidance on approaches to delivering and assessing this unit. They are intended for teachers and lecturers who are delivering this unit. They should be read in conjunction with:

- the *unit specification*
- the *unit assessment support packs*

The systems approach	Complex system, sub-system and control diagrams The role of feedback in a system Closed loop, automatic, two-state and proportional feedback Use of error detection in a closed loop system
Energy and efficiency	Calculations related to energy audits: inputs, outputs, energy losses and efficiency Applied calculations involving efficiency, work done and power, using: $E_w = Fd$ $P = E/t$, $E_k = ½ mv^2$ $E_p = mgh$ $E_e = VIt$ $E_h = cm\Delta T$ Efficiency $\eta = E_{out}/E_{in} = P_{out}/P_{in}$
Calculations	Manipulating and combining given formulae to obtain answers Solving structural problems using trigonometric functions and substitution in simultaneous equations
Engineering roles and disciplines	The role of the professional engineer within a project, including communication and team working The skills and specialist knowledge required within projects
Impacts of engineering	Examples of social and economic impacts (positive and negative) of engineering Examples of environmental impacts (positive and negative) of engineering Sustainability of engineering solutions Emerging technologies and their impact

Administrative information

Published: July 2019 (version 3.0)

Superclass: XA

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date
2.0	Level changed from Higher to SCQF level 6. Unit support notes added. Assessment standard threshold added.	Qualifications Manager	September 2018
3.0	Unit code updated	Qualifications Manager	July 2019