SCQF level 5
Unit Specification

Engineering Contexts and Challenges

SCQF: level 5 (6 SCQF credit points)

Unit code: J29B 75

Unit outline

The general aim of this Unit is to develop a basic understanding of engineering, and its role and impact on our society and environment. Learners will investigate 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 Investigate engineered objects
2 Investigate engineering challenges and relate these to key engineering concepts
3 Describe some aspects of the impact of engineering

This Unit is available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Unit Support Notes*, which provides 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 the *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:

- Numeracy (SCQF level 4)
- Engineering Contexts and Challenges (National 4)

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 Investigate engineered objects by:

1.1 Describing, using the systems approach, how some engineered objects work
1.2 Identifying sub-systems and describing the function of each and how they interact
1.3 Producing system diagrams to show sub-systems
1.4 Carrying out energy audits

Outcome 2

The learner will:

2 Investigate engineering challenges and relate these to key engineering concepts by:

2.1 Identifying and describing how several different branches of engineering contribute to solving an engineering challenge
2.2 Describing examples of the varied roles of engineers in designing, implementing, testing and controlling complex systems
2.3 Modelling some aspect (related to one branch of engineering) of a solution to an engineering challenge
2.4 Explaining how emerging technologies may provide improved solutions to engineering challenges

Outcome 3

The learner will:

3 Describe some aspects of the impact of engineering by:

3.1 Describing examples of social and economic impacts of engineering
3.2 Describing some examples of environmental impacts of engineering
3.3 Describing some ways in which engineering solutions contribute to tackling climate change

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 a range of 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 the *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 (UASP)*

The systems approach	systems and sub-system diagrams function of a system in terms of input — process — output and feedback loops open and closed loop control interaction of sub-systems
Energy and efficiency	application of the law of conservation of energy calculations involving forms of energy (kinetic, potential, electrical, heat) energy transfers, losses and transformations in a system energy audits and calculation of overall 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 given formulae to obtain answers
Engineering roles and disciplines	examples of applications of environmental, civil, structural, mechanical, chemical, electrical and electronic engineering examples of the contribution of branches of engineering to solve engineering challenges that integrate branches of engineering the varied roles of engineers in designing, implementing, testing and controlling complex systems
Impacts of engineering	examples of social and economic impacts (positive and negative) of engineering examples of environmental impacts (positive and negative) of engineering ways in which engineering solutions contribute to tackling climate change

Administrative information

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Superclass: XA

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date
1.1	Assessment standard threshold added Unit Support Notes added.	Qualifications Manager	September 2018
2.0	Unit code updated	Qualifications Manager	July 2019