SCQF level 7
Unit Specification

Mechanisms and Structures

SCQF: level 7 (8 SCQF credit points)

Unit code: J29K 77

Unit outline

The general aim of this Unit is to develop a deep 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. Learners will choose and investigate a related aspect of engineering, and apply this in practical situations.

Learners who complete this Unit will be able to:

1 Develop mechanical or structural solutions to solve complex problems
2 Investigate an aspect of engineering related to mechanical, structural or civil engineering

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:

- Mechanisms and Structures (SCQF level 6) Unit
- Higher Engineering Science Course
- Higher Mathematics 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 Develop mechanical or structural solutions to solve complex problems by:

1.1 Applying knowledge and understanding of mechanisms or structures
1.2 Applying mathematical techniques
1.3 Simulating and/or constructing a mechanism or a structure

Outcome 2

The learner will:

2 Investigate an aspect of engineering related to mechanical, structural or civil engineering by:

2.1 Researching a relevant engineering topic
2.2 Reporting on research and findings

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.

Evidence of Outcome 1 may be generated during one or more activities. Systems developed may combine structural and mechanical aspects, although this integration is not a requirement of the Unit.

Evidence of Outcome 2 could be an informal summary of research findings. The research findings should be into a relevant aspect of engineering not covered in the 'Further mandatory information on Course coverage' in the *Course Assessment Specification* for the Higher or Advanced Higher Engineering Science Courses.

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:

- 4 out of 5 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

2.1 Number processes
2.3 Information handling

3 Health and wellbeing

3.1 Personal learning

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 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 as 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)*

Calculations	extracting data for use in analysis and calculations manipulating and combining given formulae to obtain answers solving simultaneous equations solving quadratic equations applying trigonometric techniques using integration and differentiation in familiar contexts
Drive systems	♦ Analysis and calculation of forces and torque within drive systems, comprised of spur gears and/or belts and pulleys
Structures and forces	Free body diagram for a beam under the action of gear or pulley forces Use of equations of equilibrium for simply supported beams (including forces acting in three dimensions, by resolving into two orthogonal planes) and cantilever beams Bending moment diagrams and shear force diagrams
Materials	Second moment of area General beam bending equation Maximum values of deflection for cantilever, simply supported and built-in beams subject to either a point load or a UDL

Administrative information

Published: July 2019 (version 3.0)

Superclass: XH

History of changes to National Unit Specification

Version	Description of change	Authorised by	Date
2.0	Minor changes to wording of Assessment Standards 1.1, 1.2 and 1.3, removal of Assessment Standard 1.4 and replacement of Assessment Standard 2.2. Evidence requirements for Outcome 1 re-worded accordingly.	Qualifications Development Manager	April 2015
2.1	Assessment standard thresholds added	Qualifications Manager	September 2018
2.2	Unit Support Notes added	Qualifications Manager	
3.0	Unit code updated	Qualifications Manager	July 2019