

Higher National Graded Unit Specification

General Information for Centres

This Graded Unit has been validated as part of the HNC Engineering Systems award. Centres are required to develop the assessment instrument in accordance with this validated specification. Centres wishing to use another type of Graded Unit or assessment instrument are required to submit proposals detailing the justification for change for validation.

Graded Unit Title: Engineering Systems: Graded Unit 1

Graded Unit Code: DW11 34

Type of Graded Unit: Examination

Assessment Instrument: Examination

Credit points and level: 1 HN Credit(s) at SCQF level 7: (8 SCQF credit points at SCQF level 7)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Purpose: This Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of the HNC Engineering Systems:

- ◆ Develop knowledge, understanding and skills in an engineering systems approach to the study of Engineering
- ◆ Develop candidates' ability to apply analysis and synthesis skills to the solution of engineering problems
- ◆ Develop learning and transferable skills (including Core Skills)

Recommended Prior Knowledge and Skills: It is recommended that the candidate should have completed or be in the process of completing the following Units relating to these specific aims prior to undertaking this Graded Unit:

- ◆ Communication: Practical Skills
- ◆ Principles of Engineering Systems
- ◆ Engineering Communication
- ◆ Engineering Measurement and System Monitoring
- ◆ Mathematics for Engineering 1: Mechanical and Manufacturing

Core Skills: There are no Core Skills embedded in this Graded Unit specification.

Assessment: This examination-based Graded Unit is Engineering. It will consist of a written examination of three hours.

An exemplar instrument of assessment and marking guidelines have been produced to indicate the national standard of achievement required at SCQF Level 7.

Administrative Information

Graded Unit Code: DW11 34

Graded Unit Title: Engineering Systems: Graded Unit 1

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Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates

Graded Unit Title: Engineering Systems: Graded Unit 1

Conditions of Assessment

The assessment is based on an examination lasting three hours.

If a candidate does not achieve a pass or if a candidate wishes to retake the Graded Unit examination, this must be based on a significantly different examination from that given originally. A candidate's grade will be based on his/her achievement on the new event using a significantly different examination.

The examination should be unseen and the assessment should be conducted in controlled and invigilated conditions.

At all times, the security, integrity and confidentiality of examinations must be ensured.

The Examination Paper should comprise of a Case Study of an engineering system or systems. The Examination paper should have the following two sections: Section A, comprising of between 8 and 12 short answer and restricted response questions based on the Case Study and covering topics across all units in the Principles/Technology section of the HNC Engineering award. Candidates should answer all questions in this Section and be able to score a maximum of 50%. The Paper should also have a Section B comprising of three 25 mark question. Each of the three questions, while covering topics within the units in the Principles/Technology section of the HNC Engineering award, should have a particular engineering bias (eg electrical/electronics, mechanical /manufacture/fabrication or mechatronics) to reflect to some degree the candidates specialisation in the optional units. Candidates should be able to score a maximum of 50% from Section B.

Candidates should be given a copy of the Case Study only 14-days before they sit the Examination.

The examination should be conducted under closed book, supervised conditions with candidates only being allowed to use a maximum of three sides of A4 notes they have prepared on the Case Study. These notes **must** be handed in to the invigilator at the end of the examination.

The grade given will reflect the candidate's achievement on the first assessment event. A candidate may wish to retake the group award Graded Unit but this should be based on a significantly different examination.

The examination paper should be unseen prior to the assessment event which should be conducted under controlled and invigilated condition.

Instructions for designing the assessment task:

The examination should be designed to assess the candidate's critical knowledge and understanding of the topics relating to the specific aims which this Graded Unit is designed to cover. The questions and corresponding marks should be designed in accordance with the ranges indicated in the table that follows. However, the overall total mark for the examination is 100.

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Topic	Level of knowledge/ understanding	Weighting/ Mark Allocation
Apply mathematical techniques in the context of Engineering	Apply algebraic and vector techniques to solve problems commonly found in Engineering	5%
Block diagram representation of engineering systems	Represent mechanical, electrical and electromechanical systems in block diagram format	10%
Sketch engineering component and system layout	Accurate neat and annotated sketches of component and layout	10%
Description and comparison of engineering quantities	Explain a minimum of four electrical and four mechanical quantities given in Principles of Engineering Systems unit and compare and contrast these mechanical and electrical quantities	15%
Energy calculations and audit	Perform energy calculations involving at least two mechanical and two electrical energy/power forms. Undertake an energy audit of a system where appropriate	15%
Material properties	Identify key properties of materials used in engineering system and suggest possible alternatives	10%
Engineering system responses and corrective actions	Draw typical engineering responses and recommended corrective action for a system operating out with its normal range	15%
Sensor/Transducer operation and applications	Describe the operation and application of at least one electrical and one mechanical transducer	20%

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Graded Unit Title: Engineering Systems: Graded Unit 1

The examination will be marked out of 100. Assessors will aggregate the marks achieved by the candidate to arrive at an overall mark for the examination. Assessors will then assign a grade to the candidate for this Graded Unit based on the following grade boundaries:

- ◆ A = 70% – 100%
- ◆ B = 60% – 69%
- ◆ C = 50% – 59%

Candidates with Additional Support Needs

This Graded Unit specification is intended to ensure that there are no artificial barriers to learning or assessment. The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering special alternative assessment arrangements. For information on these, please refer to the SQA document *Guidance on Alternative Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: www.sqa.org.uk.

Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

Graded Unit Title: Engineering Systems: Graded Unit 1

Guidance to Centres

Centres are encouraged to study this Engineering Systems: Graded Unit 1 specification and the associated Assessment Exemplar paper carefully before embarking on the writing of any HNC Engineering Systems Examination paper.

The main purpose of the Engineering Systems: Graded Unit 1 specification is to assess the candidate's ability to solve problems based on the Engineering units specified under the Recommended Prior Knowledge and Skills in this Graded Unit specification. Centres should make every attempt to ensure that questions are set within a realistic industrial context. Centres should also make every reasonable effort to integrate the knowledge and understanding learnt in one subject area to another area(s) so that candidates' ability to transfer knowledge and understanding from one subject area to another can also be assessed. Experience shows that candidates often have great difficulty in transferring knowledge, understanding and skills from one subject area to solve problems in another area of study. Candidates tend to compartmentalise knowledge, understanding and skills into subject areas with considerable reluctance to transfer across subject boundaries. It is important however in Engineering that candidates can apply knowledge, understanding and skills from different subject areas to the solution of complex problems.

As well as having a three hour examination, the Unit includes a notional study time of 37 hours to allow candidates to practise solving problems which should include the transfer of knowledge, understanding and skills across the subject boundaries. Centres should use a range of formative assessments to support such skills development.

Centres are also strongly recommended not to limit opportunities for the transferability of knowledge, understanding and skills within the HNC Engineering Systems to the Engineering Systems: Graded Unit 1 only but to seek opportunities for the consolidation of these critical skills throughout the whole HNC award.