National Unit Specification: general information

UNIT Computer Aided Draughting (CAD) for Engineers (SCQF level 5)

CODE F5H4 11

SUMMARY

This Unit may form part of a National Qualification Group Award or may be offered on a free standing basis.

This largely practical Unit is designed to allow candidates to develop basic knowledge, understanding and skills in Computer Aided Draughting (CAD). During delivery of the Unit candidates will learn to create detailed, two-dimensional engineering drawings using a commercial CAD system. They will also develop the knowledge and skills to use a CAD system to modify existing two-dimensional drawings and create an assembly drawing.

This Unit is suitable for candidates who are training to be fabrication and welding, manufacturing, mechanical, maintenance or multi-disciplinary crafts persons but may also be delivered to candidates who are being introduced to CAD for the first time.

OUTCOMES

1 Use a commercial CAD platform to generate detailed, two-dimensional engineering drawings.
2 Modify two dimensional engineering drawings and create an assembly drawing.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, it would be an advantage if candidates had basic knowledge and skill in engineering drawing and in using computer hardware and software.

Administrative Information

Superclass: VF

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National Unit Specification: general information (cont)

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CREDIT VALUE

1 credit(s) at SCQF level 5 (6 SCQF credit points at SCQF level 5*).

**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.*

CORE SKILLS

There is no automatic certification of Core Skills in this Unit.

The Unit provides opportunities for candidates to develop aspects of the following Core Skills:

- Numeracy (SCQF level 5)
- Information Technology (SCQF level 5)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit Specification: statement of standards

UNIT Computer Aided Draughting (CAD) for Engineers (SCQF level 5)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

OUTCOME 1

Use a commercial CAD platform to generate detailed, two-dimensional engineering drawings.

Performance Criteria

(a) Use a CAD system and techniques to create two dimensional engineering drawings correctly to current engineering drawing Standards.
(b) Use CAD commands correctly to apply dimensions and other relevant details to engineering drawings.
(c) Save correctly engineering drawings to a specified directory.

OUTCOME 2

Modify two dimensional engineering drawings and create an assembly drawing.

Performance Criteria

(a) Use CAD system edit commands correctly to modify existing two dimensional engineering drawings.
(b) Create correctly an engineering assembly drawing to current engineering drawing Standards.
(c) Generate correctly hard copies of two-dimensional engineering drawings and an assembly drawing.

EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Outcome 1

Product and performance evidence supported by an assessor observation checklist is required for Outcome 1 to demonstrate that a candidate has achieved the Outcomes and Performance Criteria. Assessments must be conducted under supervised, open-book conditions.

National Unit Specification: statement of standards (cont)

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With regard to Outcome 1:

- candidates must produce two drawings, one in First Angle Projection and the other in Third Angle Projection
- while producing the two drawings candidates must demonstrate the use of a minimum of seven drawing/editing commands
- candidates must include on the two engineering drawings all the necessary information required (eg the form, dimensions, tolerances, materials, finishes, treatments etc) to define completely the object in the drawing
- candidates must use system supplied drawing sheet templates and utilise appropriate layers, linetypes and text

Outcome 2

Product and performance evidence supported by an assessor observation checklist(s) is required for Outcome 2 to demonstrate that a candidate has achieved the Outcomes and Performance Criteria. Assessments must be conducted under supervised, open-book conditions.

With regard to Outcome 2:

- while modifying existing engineering drawings candidates must demonstrate the use of a minimum of three separate edit commands. These must be additional to the commands used in Outcome 1.
- the assembly drawing must comprise two or more parts, or sub-assemblies, in their assembled form, including any dimensions and instructions necessary to effect assembly. A simple parts list should be included or referred to.

The Assessment Support Pack for this Unit provides sample assessment material. Centres wishing to develop their own assessments should refer to the Assessment Support Pack to ensure a comparable standard.

National Unit Specification: support notes

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This part of the Unit Specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

This Unit forms part of the National Qualification Group Awards in Fabrication and Welding Engineering, Maintenance Engineering and Manufacturing Engineering at SCQF level 5, but may also be offered on a free standing basis.

The aim of this Unit is to allow candidates to develop basic knowledge, understanding and skills in CAD. On successful completion of the Unit candidates will have learnt to create detailed, two-dimensional engineering drawings using a commercial CAD system. They will also have the knowledge and skills to use a CAD system to modify existing two-dimensional drawings and create an engineering assembly drawing.

This Unit may be delivered after the Unit *Graphical Engineering Communication* at SCQF level 5 so that candidates have an opportunity to develop a range of drawing skills by hand before attempting to transfer these to a CAD system. Alternatively, the Unit may be delivered in parallel with the Unit *Graphical Engineering Communication* at SCQF level 5 so that drawing skills can be developed both on paper and on the computer screen.

It is important to emphasise that only two-dimensional draughting is required for the successful completion of this Unit.

In Outcome 1 candidates should be provided with opportunities to develop CAD knowledge and skills to produce detailed, two dimensional engineering drawings that meet current engineering drawing Standards. Such drawings should include sufficient dimensions, tolerances, materials, finishes, treatments etc to define fully the object(s) in the drawing. Candidates should also learn to save their drawings to an appropriate directory.

In Outcome 2 candidates should learn to use edit commands to modify existing two-dimensional engineering drawings. Modified drawings should be used to produce an engineering assembly drawing that meets current engineering drawings Standards. Candidates should also be shown how to plot their work effectively to a suitable output device (printer/plotter). They should also be shown how to output their work to various scales with the assembly drawing on A3 paper dimensions.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is recommended that the Unit is delivered in the same sequence the Outcomes are presented in the National Unit Specification: statement of standards section of the Unit. The Unit should be delivered in a practical environment containing sufficient CAD stations to allow candidates individual hands-on experience of CAD. Centres should use commercially available licensed CAD software.

Unit delivery may involve a combination of lectures, lecturer demonstration, group discussions and graded tutorial exercises.

CAD terminology should be explained to candidates as it arises during the course of delivery of the Unit.

Candidates should be encouraged to make reference to current British Standards relating to draughting practice, symbols and limits and fits.

Lecturer demonstration will play an important role in allowing candidates to observe how CAD techniques are applied to the creation of drawings. Lecturers should encourage candidates to use effective and efficient ways to create drawings.

The Internet contains rich sources of materials on CAD including video clips demonstrating the way in which CAD commands may be used.

Candidates should be allowed to study at their own pace receiving support from the lecturer when required. The use of graded tutorial exercises will support self paced learning.

Lecturers should encourage candidates to fully utilise the inbuilt software help system as well as the specific CAD system online help facilities.

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Accuracy in calculating, recording and presenting graphic data underpins the competences assessed in the Unit as candidates create engineering drawings and interpret, select and apply graphical symbols.

As they learn effective working practice candidates could be encouraged to demonstrate greater understanding of numerical concepts and graphic symbols used in engineering contexts, carrying out necessary calculations and measurements. Issues which will affect practical work in measuring, recording and drawing could be discussed, and formative opportunities to practise skills in handling numerical and graphical information should focus on Numeracy as a tool to be used in work related contexts.

Candidates will also have opportunities to develop the *Information Technology* Core Skill as they use computer hardware and CAD software to generate objects, detailed engineering drawings and engineering assembly drawings.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003), SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

National Unit Specification: support notes (cont)

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Candidates should be encouraged to undertake graded formative assessment exercises involving such activities as the creation and saving of objects, two-dimensional drawings and engineering assembly drawings to build their knowledge, understanding, skills and confidence in CAD.

Outcome 1

Outcome 1 may be assessed by two practical assessments in which candidates create one engineering drawing in First Angle projection and one engineering drawing in Third Angle projection. Such drawings may be taken from given paper drawings so that candidates can demonstrate their abilities to create a working drawing in CAD. Another approach to assessment may involve allowing candidates to complete partially-completed CAD drawings.

In this case candidates may be expected to complete these partially-completed CAD drawings using specific commands such as line, arc, polygon, rectangle, mirror, stretch, rotate, scale, copy, move, chamfer, fillet, etc. The candidate's competence may be recorded through the use of a checklist with observation used to assess the candidate's ability to recognise and identify at least six elements on the CAD screen layout. Whichever approach is taken candidates must demonstrate their ability to save their drawings to an appropriate directory.

Outcome 2

Outcome 2 may be assessed by a practical assignment in which candidates are expected to edit an existing drawing(s) which they may have created themselves and then create an assembly drawing which should be printed using a printer/plotter. Candidate competence may be recorded through the use of a checklist.

It is envisaged that at this stage that candidates are capable of using CAD system commands effectively and efficiently. Drawings which have been produced in Outcome 1 may also be used to produce a full drawing set consisting of detail drawings and assembly drawing.

Centres may choose to limit the time candidates have to complete the assessments for Outcomes 1 and 2 to two hours.

DISABLED CANDIDATES AND/OR THOSE WITH ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**