



## National Unit Specification: general information

**UNIT** Computer Aided Draughting (CAD) for Engineers (SCQF level 6)

**CODE** F5H5 12

### 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 knowledge, understanding and skills in Computer Aided Draughting. During delivery of the Unit candidates will develop the knowledge and skills to use a commercial CAD system to create detailed, two-dimensional engineering drawings with auxiliary and sectional views. They will also import components and symbols into engineering drawings. Candidates 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 technicians.

### OUTCOMES

- 1 Use a commercial CAD platform to generate detailed, two-dimensional engineering drawings with specified views.
- 2 Use standard components and symbols in CAD drawings.
- 3 Generate an assembly drawing.

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#### Administrative Information

**Superclass:** VF

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## **National Unit Specification: general information (cont)**

**UNIT**      Computer Aided Draughting (CAD) for Engineers (SCQF level 6)

### **RECOMMENDED ENTRY**

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following, or equivalent:

- ◆ the NQ Unit *Computer Aided Draughting (CAD) for Engineers* (SCQF level 5)
- ◆ Standard Grade Graphic Communication at credit level
- ◆ experience of engineering drawing and/or computer hardware and software

### **CREDIT VALUE**

1 credit at SCQF level 6 (6 SCQF credit points at SCQF level 6\*).

*\*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 6)
- ◆ Information Technology (SCQF level 6)

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 6)**

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 with specified views.

##### **Performance Criteria**

- (a) Use a CAD system and techniques to draw two dimensional engineering drawings correctly to current engineering draughting 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 prior to printing a hard copy.

#### **OUTCOME 2**

Use standard components and symbols in CAD drawings.

##### **Performance Criteria**

- (a) Import standard engineering components and symbols within a template drawing(s).
- (b) Use correctly templates and standard components and symbols in the creation of detailed, two-dimensional engineering drawings.
- (c) Apply appropriate limit and fit details.

#### **OUTCOME 3**

Generate an assembly drawing.

##### **Performance Criteria**

- (a) Generate correctly an assembly drawing including a partial view from existing CAD drawings and standard components.
- (b) Compile correctly written assembly instructions for an engineering assembly drawing.
- (c) Use correctly a hyperlink to augment drawing details.
- (d) Produce correctly a hard copy of an engineering assembly drawing and instructions.

## **National Unit Specification: statement of standards (cont)**

**UNIT**      Computer Aided Draughting (CAD) for Engineers (SCQF level 6)

### **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(s) 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.

With regard to Outcome 1:

- ◆ candidates must produce one detailed, two-dimensional engineering drawing in First Angle Projection
- ◆ candidates must produce one detailed, two-dimensional engineering drawing in Third Angle Projection
- ◆ one of the above drawings must contain an auxiliary view and the other a sectional view
- ◆ 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

#### **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:

- ◆ template drawings must include layers, linetypes and associated lineweights.
- ◆ candidates must insert from external sources 6 standard components and symbols into the drawing(s). These components and symbols must be saved into a drawing(s).

#### **Outcome 3**

Product and performance evidence supported by an assessor observation checklist(s) is required for Outcome 3 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)**

### **UNIT**      Computer Aided Draughting (CAD) for Engineers (SCQF level 6)

With regard to Outcome 3:

- ◆ candidates must generate one assembly drawing from a fully dimensioned CAD drawing(s). The assembly drawing must comprise two or more parts, or sub-assemblies, in their assembled form and must incorporate four standard components, a parts list with supplier parts numbers and assembly instructions.
- ◆ candidates must use a hyperlink to link the assembly drawing to an external file such as a text document, spreadsheet, database, webpage or drawing.

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

### UNIT Computer Aided Draughting (CAD) for Engineers (SCQF level 6)

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, Manufacturing Engineering and Mechanical Engineering at SCQF level 6, but may also be offered on a free standing basis.

The aim of this Unit is to allow candidates to develop knowledge, understanding and skills in CAD. On successful completion of the Unit candidates will have developed the knowledge and skills to use a CAD platform to create detailed, two-dimensional engineering drawings with auxiliary and sectional views. They will also have learnt how to use a CAD system to create template drawings. Candidates will also be able 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 6 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 6 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 learn how to use a CAD system to draw two dimensional engineering drawings to current engineering drawing Standards. Drawings should be produced in both first and third angle projection and contain auxiliary and sectional views as appropriate. As part of creating such drawings candidates should also learn how to use CAD commands to apply dimensions and other details to engineering drawings. Candidates should also be taught how to save engineering drawings to a specified directory and how to print their drawings.

In Outcome 2 candidates should be taught how to import from external sources and save engineering components and symbols within a template drawing(s). Candidates will also be taught how to associate a hyperlink with an object contained in the drawing to an external file.

In Outcome 3 candidates should be taught how to create assembly drawings including partial views from existing CAD drawings and standard components. Such drawings should include assembly instructions. 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.

## **National Unit Specification: support notes (cont)**

**UNIT**      Computer Aided Draughting (CAD) for Engineers (SCQF level 6)

### **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.

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

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.

### **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 software to search for components and symbols on the Internet and generate objects, detailed engineering drawings and engineering assembly drawings.

## **National Unit Specification: support notes (cont)**

**UNIT**      Computer Aided Draughting (CAD) for Engineers (SCQF level 6)

### **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)*.

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

#### **Outcome 1**

Outcome 1 may be assessed by two practical exercises in which candidates create one fully dimensioned engineering drawing in First Angle Projection and another fully dimensioned engineering drawing in Third Angle Projection. The drawings should be of two different engineering components and one drawing must contain an auxiliary view and the other a sectional view. Both drawings should be saved to file. Candidates' competence may be recorded through the use of a checklist.

#### **Outcome 2**

Outcome 2 may be assessed as a practical assignment in which candidates are expected to import standard engineering components and symbols from external sources and then insert these into engineering drawings. Existing engineering drawings created as part of Outcome 1 may be used in the assessment of Outcome 2.

#### **Outcome 3**

Outcome 3 may be assessed as 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. Drawings produced as a part of Outcome 1 may be used as part of the assessment to Outcome 3. The completed assembly drawing should incorporate four standard components, a complete parts list with part numbers and manufacturing instructions. Drawings should also include an appropriate hyperlink.

### **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](http://www.sqa.org.uk/assessmentarrangements)**