



## National Unit specification: general information

**Unit title:** 3D CAD (SCQF level 6)

**Unit code:** FT8P 12

**Superclass:** VF

**Publication date:** September 2011

**Source:** Scottish Qualifications Authority

**Version:** 02

## Summary

This is a mandatory Unit within the National Certificate in Computer Aided Design and Technology (SCQF level 6) but may also be taken as a free-standing Unit. This Unit is suitable for candidates who would like to pursue a career in CAD and related industries.

This practical Unit is designed to allow candidates to develop knowledge, understanding and skills in 3D Computer Aided Draughting (CAD). During delivery of the Unit candidates will develop the knowledge and skills to use a commercial CAD system to create 3D wireframe, surface and solid models. Candidates will also develop knowledge and skills in the production of 2D drawings from 3D solid models.

## Outcomes

- 1 Produce 3D wireframe and surface models using a 3D CAD system.
- 2 Produce 3D Solid Models using a 3D CAD system.
- 3 Generate 2D drawings from 3D solid model geometry using a 3D CAD system.

## 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:

- ◆ *F5H5 12: Computer Aided Draughting (CAD) for Engineers.*
- ◆ Relevant industrial experience of Computer Aided Draughting and Design.

## National Unit specification: general information (cont)

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### Credit points and level

1 National Unit 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

Achievement of this Unit gives automatic certification of the following Core Skills component:

- ◆ Using Graphical Information at SCQF level 4

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

## **National Unit specification: statement of standards**

**Unit title:** 3D CAD (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**

Produce 3D wireframe using a 3D CAD system.

#### **Performance Criteria**

- (a) Create 3D wireframe models from given 2D drawing details.
- (b) Using a range of surface model techniques create 3D surface models from given 2D drawing details.
- (c) Produce printed drawings of 3D wireframe and surface models.

### **Outcome 2**

Produce 3D Solid Models using a 3D CAD system.

#### **Performance Criteria**

- (a) Using a range of solid modelling techniques create 3D solid models from given 2D drawing details.
- (b) From a given brief add specific details to each 3D solid model created.
- (c) Produce printed drawings of 3D solid models.

### **Outcome 3**

Generate 2D drawings from 3D solid model geometry using a 3D CAD system.

#### **Performance Criteria**

- (a) Produce 2D drawing details from 3D solid models which are consistent with current drawing standards.
- (b) Demonstrate the skills and knowledge of angle projection and the production of section views.
- (c) Demonstrate the skills and knowledge to add relevant dimensioning and annotation.
- (d) Produce printed 2D drawings developed.

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

**Unit title:** 3D CAD (SCQF level 6)

### **Evidence Requirements for this Unit**

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

Product and performance evidence required to demonstrate that the candidate has achieved the Outcomes and Performance Criteria. Assessment must be conducted under supervised conditions.

In order to pass the Unit each candidate must produce sufficient evidence of their own work to satisfy the Outcomes and Performance Criteria in the Unit Specification.

#### **Outcome 1**

- ◆ Candidates must create a minimum of two wireframe models.
- ◆ Candidates must produce a drawing for each of the wireframe models showing a minimum of two 3D views and print a copy of the completed drawings.
- ◆ Candidates must create a minimum of three surface models using three different surface modelling techniques.
- ◆ Candidates must produce a drawing for each of the surface models showing a minimum of two 3D views and print a copy of the completed drawings.

#### **Outcome 2**

- ◆ Candidates must create a minimum of three solid models using a minimum of three solid modelling techniques.
- ◆ Candidates must add details to the 3D solid models such as, fillets, chamfers and holes to a minimum of three solid models.
- ◆ Candidates must produce a drawing for each of the solid models showing a minimum of two 3D views and print a copy of the completed drawings.

#### **Outcome 3**

- ◆ Candidates must produce a 2D drawing, consistent with current drawing standards, for each of the 3D solid models
- ◆ Candidates must demonstrate the ability to work to an appropriate angle of projection, produce section views, and add relevant dimensioning and annotation.

## **National Unit specification: support notes**

### **Unit title: 3D CAD (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 Computer Aided Design and Technology 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 skills in the creation of 3D CAD models. On successful completion of the Unit candidates will be able to use a CAD system to create a range of 3D CAD models using a variety of 3D modelling techniques.

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 3D wireframe, surface and solid models, as well as, producing detailed 2D drawings from solid models which include sectional views and appropriate annotation and dimensioning.

As part of the NC CAD and Technology, or any other structured programme, this Unit should be delivered after the Unit Computer Aided Draughting (CAD) for Engineers at SCQF level 6.

In Outcome 1 candidates are required to use a CAD system to produce 3D wireframe and surface models from given 2D drawings. The 2D drawings should provide candidates with a range of shape/geometry which includes linear and curved elements. The 2D drawings provided for the surface geometry should encourage candidates to demonstrate a range of 3D surface modelling techniques.

In Outcome 2 candidates are required to use a CAD system to produce 3D solid models from given 2D drawings. The 2D drawings should provide candidates with a range of shape/geometry which includes linear and curved elements. The 2D drawings provided for the solid geometry should encourage candidates to demonstrate a range of 3D solid modelling techniques.

In Outcome 3 candidates are required to produce 2D drawing detail from 3D solid models. The drawings should be consistent with current drawing standards. The drawings should be produced in an appropriate angle of projection and contain sectional views as appropriate. As part of creating such drawings candidates should also learn how to use CAD commands to apply dimensions and other relevant details.

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

**Unit title:** 3D CAD (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, demonstration, group discussions and tutorial exercises.

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

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

Tutor demonstration will play an important role in allowing candidates to observe how CAD techniques are applied to the creation of drawings. Tutors 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.

### **Guidance on approaches to assessment for this Unit**

It is recommended that candidates undertake formative assessment exercises involving such activities as the creation of 3D CAD models to build their knowledge, understanding, skills and confidence in 3D CAD.

#### **Assessment of Outcome 1**

Outcome 1 may be assessed by practical exercises in which candidates create three 3D wireframe and three 3D Surface models. Each model should be of different components/artefacts. Drawings showing two 3D views for each of the 3D models should be produced. Candidates' competence may be recorded through the use of a checklist.

#### **Assessment of Outcome 2**

Outcome 1 may be assessed by practical exercises in which candidates create three 3D solid models. Each model should be of different components/artefacts. Drawings showing two 3D views for each of the 3D solid models should be produced. Candidates' competence may be recorded through the use of a checklist.

## National Unit specification: support notes (cont)

**Unit title:** 3D CAD (SCQF level 6)

### Assessment of Outcome 3

Outcome 3 may be assessed by practical exercises in which candidates create 2D drawings of the 3D solid models created in Outcome 2. The drawings must reflect current drawing standards and include appropriate section, dimension and annotation details. The drawings should be consistent with and appropriate angle of projection.

An integrated approach to the generation of assessment evidence could be used for Outcomes 2 and 3.

### 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)*.

### Opportunities for developing Core Skills

Candidates have to evaluate, apply and convey a range of complex technical information. Support materials and self assessment checklists could emphasise the requirement for technical accuracy.

There is the opportunity for *Numeracy* and *Information and Communication Technology (ICT) Skills* to be contextualised. Measurements and calculations will be essential and accurately recorded; data will be interpreted, applied and communicated using graphics and number. Access to technology will support the presentation of documents and diagrams, with use of CAD, or specialist application software to model, simulate or evaluate possible solutions.

### 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)

## History of changes to Unit

Version	Description of change	Date
02	Core Skills Component Using Graphical Information at SCQF level 4 embedded.	29/09/2011

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