

Higher National Unit Specification

General information for centres

Unit title: Computer Aided Draughting for Engineers

Unit code: DR1X 34

Unit purpose: This Unit has been designed to enable candidates to develop the necessary knowledge and skills to allow them to operate a commercial CAD system to produce 2D engineering drawings. Candidates will also be provided with the opportunity to develop an awareness of the 3D environment within an engineering context. The Unit is particularly suitable for candidates undertaking programmes in engineering or wishing to specialise in computer aided draughting/design.

On completion of the Unit the candidate should be able to:

- 1 Use a commercial CAD system to create and modify engineering drawings.
- 2 Use a commercial CAD system to create engineering composite drawings.
- 3 Use an appropriate CAD system to generate 3D shapes.

Credit points and level: 1 HN Credit 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.*

Recommended prior knowledge and skills: It would be beneficial for candidates to have prior knowledge of technical drawing to current standards or computer aided draughting at an introductory level. However, these requirements are not absolutely essential as basic orthographic drawing skills will be revised in Outcome 1. Possession of basic knowledge and understanding in these areas may be evidenced by possession of NQ Units in Graphical Communication (D16T 12), Graphical Engineering Communication (D993 12) and Introduction to Computer Aided Draughting (E8M2 11).

Core skills: There may be opportunities to gather evidence towards the following listed Core Skill components in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

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Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

The Assessment Support Pack (ASP) for this unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment.

Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website (<http://www.sqa.org.uk/sqa/46233.2769.html>).

General information for centres (cont)

Assessment: In Outcome 1 candidates should be asked to produce engineering CAD drawings from given paper drawings and should also be asked to modify these drawings.

In Outcome 2 candidates should be asked to produce and print composite drawings using standard parts, external drawing files and custom menus.

In Outcome 3 candidates will be asked to produce 3D drawings.

Higher National Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Use a commercial CAD system to create and modify engineering drawings

Knowledge and/or skills

- ◆ Geometry Creation
- ◆ Editing
- ◆ Layers/Drawing environment
- ◆ Hatching, Dimensions and Text
- ◆ Properties

Evidence requirements

All of the knowledge and/or skills items in this Outcome should be assessed.

Evidence should be gathered of candidates' abilities to use a CAD package effectively and efficiently to create and modify accurate working drawings by producing drawings containing horizontal lines, vertical lines, angled lines, arcs, fillets, circles, layers, hatching, dimensions and text, all to current standards. Candidates will also require to demonstrate their skills and knowledge in using such commands as Move, Copy, Rotate, Scale, Extend, Trim, Mirror, Array, Erase and Line Width in altering such drawings.

Centres must develop checklists to record candidate evidence of the use of commands in the production of the drawing(s). Candidates must have access to current BS/ISO Engineering Drawing Practice specifications throughout this Outcome.

Assessment guidelines

It is left to the discretion of centres to decide the number of drawings candidates will have to undertake in order to demonstrate the range of knowledge and / or skills listed above.

Drawings from this Outcome may be used in Outcome 3 to produce 3D drawings of components.

Higher National Unit specification: statement of standards (cont)

Unit title:

Outcome 2

Use a commercial CAD system to create engineering composite drawings

Knowledge and/or skills

- ◆ Third party standard details/parts
- ◆ Drawing files insertion
- ◆ Customised menu or library
- ◆ Plotting/Printing

Evidence requirements

All of the knowledge and/or skills items in this Outcome should be assessed.

Candidates will be required to provide evidence of creating composite drawings to given specifications using self-created drawings and existing drawing files. Candidates should also be able to use alternative reference files that may contain third party libraries or in-house libraries.

Candidates should produce hard copies of their work to given scales through the use of a suitable output device such as a printer or plotter. Plots produced should be to a 1:1 and one other scale.

Centres must develop checklists to record candidate evidence of the creation of composite drawings and the use of alternative reference files. Candidates must have access to current BS/ISO specifications for Engineering Drawing Practice throughout this Outcome.

Assessment guidelines

It is left to the discretion of centres to decide the number of drawings candidates will have to undertake in order to demonstrate the range of knowledge and / or skills listed above.

Higher National Unit specification: statement of standards (cont)

Unit title: Computer Aided Draughting for Engineers

Outcome 3

Use an appropriate CAD System to generate 3D shapes

Knowledge and/or skills

- ◆ Box
- ◆ Sphere
- ◆ Cylinder
- ◆ Cone
- ◆ Wedge
- ◆ Torus
- ◆ Extruding
- ◆ Revolving
- ◆ Chamfer
- ◆ Radius

Evidence requirements

Evidence for the knowledge and / or skills items in this Outcome will be provided on a sample basis. Each candidate will need to demonstrate that he/she can produce correct responses based on a sample of the items shown under the knowledge and/or skills. In any assessment of this Outcome **seven out of ten** knowledge and/or skills items should be sampled.

In order to ensure that candidates will not be able to foresee what items they will be questioned on, a different sample of seven out of ten knowledge and / or skills items are required each time the Unit is assessed.

Where sampling takes place a candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

Draw the sample of simple 3D shapes (as outlined in the Knowledge and/or Skills items) as part of producing drawings of components. Modification to these shapes should be carried out utilising commands which allow fillets and chamfers or other modifications to be created.

Candidate evidence in the form of outputs from a printer/plotter should be used.

Assessment guidelines

It is left to the discretion of centres to decide the number of drawings candidates will have to undertake in order to demonstrate the range of knowledge and / or skills listed above. Candidates may want to use 2D drawings they themselves have produced as part of Outcome 1.

Administrative Information

Unit code:	DR1X 34
Unit title:	Computer Aided Draughting for Engineers
Superclass category:	VF
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Higher National Unit specification: support notes

Unit title: Computer Aided Draughting for Engineers

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 is designed to familiarise candidates with a CAD package which is in current use in the production of engineering drawings. The Unit can build on the expertise gained from earlier drawing units, setting previous drawing skills developed within a CAD context. However, previous drawing experience is not entirely necessary as various drawing skills will be developed as part of this Unit.

The Unit is designed to give candidates skills and knowledge to allow them to create, modify, build and present graphical information to users via hard copies of electronic work.

This Unit may be taken on a freestanding basis. It is particularly suitable for candidates undertaking programmes in engineering or wishing to specialise in computer aided draughting/design.

Guidance on the delivery and assessment of this Unit

Learning must take place in a practical environment where CAD stations are available allowing candidates' individual hands-on experience. Terminology and demonstrations showing CAD features and system commands should be introduced in discrete stages and as a natural progression in completion of a series of engineering drawings.

Emphasis should be placed on the generic nature of this Unit with the Unit being able to be delivered across a range of disciplines. It is envisaged that approximately 50% of the delivery and assessment time will be taken up covering Outcome 1 with 30% for Outcome 2 and 20% for Outcome 3

Outcome 1

The user should be shown how to set up the drawing environment; paper scale, units etc. CAD system commands should be worked through progressively by demonstration and application. Progression through the drawing commands and the use of modify commands should be carried out in a logical fashion. It is anticipated that suitable drawing tutorials will be utilised to reinforce the use of such CAD system commands.

Once users are confident in using both modify and draw commands, levels / layers, text styles and dimension styles should be discussed and introduced. The use of drawing tutorials should be utilised to reinforce the use of such CAD system commands until candidates are confident in their use

Higher National Unit specification: support notes (cont)

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Assessment of Outcome 1

This may be carried out through a series of practical assessments where candidates are expected to create working drawings from given paper drawings to demonstrate their skills in creating a working engineering drawing from scratch. Through the use of partial completed CAD drawings users can demonstrate their skills in modifying existing drawings and saving their updated versions. In this case candidates may be expected to complete these partially completed CAD drawings using specific commands such as mirror, stretch, rotate, scale, copy, move, chamfer, fillet, etc. Candidate's competence must be recorded through the use of a checklist.

Outcome 2

Candidates may use either their own drawings as standard parts (possibly created in Outcome 1) or parts taken from a standard library of parts. Candidates should be introduced to creating composite drawings both in the storing and retrieving entities, which build up such drawings.

Candidates should be introduced to the use of customised menus to demonstrate the flexibility of the CAD system in creating such composite drawings. The loading of customised in-house menus or third party menus should be utilised at this stage. Through the use of practical tutorials the above can be reinforced.

Candidates should be shown how to effectively plot their work to a suitable output device (printer / plotter). The candidate should be shown how to output their work to various scales one of which should be 1:1.

Assessment of Outcome 2

This may be carried out through the use of a practical assignment where the candidate is expected to compose a composite engineering drawing from standard parts and entities, which they may have created themselves. The completed composite drawing is to be output to a printer/plotter. Candidate competence must be recorded through the use of a checklist.

It is envisaged that at this stage that the candidate is capable of using CAD system commands effectively and efficiently. Drawings, which have been produced in Outcomes 1 and 2, may also be utilised to produce a full drawing set consisting of details drawing, assembly drawings and parts list.

Outcome 3

This Outcome is designed to introduce candidates to the 3D environment. Creation of 3D shapes are to be produced and output to a printer/plotter.

Assessment of Outcome 3

This may be carried out by giving the candidate suitable 2D drawings where they convert them into suitable 3D drawings to meet the assessment sample. Fillet and chamfers or other modification could be added to the 3D shapes. Suitable plotter/printer outputs of these drawings should be made. Candidate competence must be recorded through the use of a checklist.

Higher National Unit specification: support notes (cont)

Unit title: Computer Aided Draughting for Engineers

Opportunities for developing Core Skills

There may be opportunities to gather evidence towards the following listed Core Skill components in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

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Open learning

Where the delivery of this Unit is undertaken by open learning, candidates should attend a centre for a minimum of 2 hours. During this time candidates will be expected to prove that from a sample of the knowledge and skills, they are competent in performing tasks which give evidence to support their achievement in the Outcomes. Candidates may bring along to the centre their partially completed work and demonstrate their competence in completing this work at the centre.

As an alternative to candidates attending a centre, video evidence of candidates' work on their own PC creating drawings may be used. This Unit could also be delivered to some degree through online support. Materials could be made available electronically and completed work sent via email or through some other form of electronic transfer system. However, to fully satisfy the evidence requirements of this Unit hard copies of drawings plotted to the correct scale must be sent to a centre.

Candidates with additional support needs

This 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 alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on the SQA website www.sqa.org.uk.

General information for candidates

Unit title: Computer Aided Draughting for Engineers

This Unit has been designed to provide you with the knowledge and skills that will enable you to use a CAD system's command structure effectively and efficiently in the production of 2D working drawings.

This is a practical Unit requiring you to have individual access to a CAD system. A CAD system is defined as hardware and software, which will enable an operator to generate (and regenerate) engineering drawings at an acceptable processor speed. A typical minimum hardware configuration would be a current single user PC fitted with suitable peripherals attached such as a printer/plotter to produce hard copies of work. Alternatively other computer configurations, such as networked CAD stations, are possible provided they can satisfy the Unit's criteria.

By doing a series of practice exercises and drawing tutorials you will logically progress through the CAD command structures, producing 2D fully working drawings to a given specification. Having gained confidence in 2D creation and presentation you will be introduced to simple 3D creation and editing.

Formal assessment for this Unit will be based on your competence in producing a series of engineering drawings to a given specification via practical assignments using CAD system commands effectively and efficiently.