

SQA Advanced Unit specification

General information

Unit title: CAD: Feature Based Modelling 2 (SCQF level 8)

Unit code: HV1X 48

Superclass: CH

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Source: Scottish Qualifications Authority

Version: 01

Unit purpose

This Unit is designed to enable the learner to develop knowledge, understanding and skills in the application of advanced Feature Based Modelling techniques.

Outcomes

On successful completion of the Unit the learner will be able to:

- 1 Create a feature based CAD model incorporating Parameters (design variables) in response to a given brief.
- 2 Create adaptive part and assembly models using a feature based CAD system in response to a given brief.
- 3 Create a feature based CAD assembly model using a variety of industry specific CAD tools to a given brief.
- 4 Use CAD tools to analyse the functionality of a CAD feature based assembly model.

Credit points and level

2 SQA Credits at SCQF level 8: (16 SCQF credit points at SCQF level 8)

Recommended entry to the Unit

Learners should possess a knowledge and understanding of feature based modelling and design processes. This may be evidenced by the possession of the following SQA Advanced Units (or equivalent):

- ◆ HV1X 48 CAD: Feature Based Modelling I
- ◆ HV1E 47 Design Methodology
- ◆ HT75 48 Design for Manufacture

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Core Skills

Opportunities to develop aspects of Core Skills are highlighted in the Support Notes for this Unit specification.

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

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.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

SQA Advanced Unit specification: Statement of standards

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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.

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. Learners 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

Create a feature based CAD model incorporating Parameters (design variables) in response to a given brief.

Knowledge and/or Skills

- ◆ Parameters
- ◆ Conditional features
- ◆ Design intent
- ◆ Table driven parts

Outcome 2

Create adaptive part and assembly models using a feature based CAD system in response to a given brief.

Knowledge and/or Skills

- ◆ In-place modelling
- ◆ Design Intent
- ◆ Part adaptivity
- ◆ Assembly adaptivity

Outcome 3

Create a feature based CAD assembly model using a variety of industry specific CAD tools to a given brief.

Knowledge and/or Skills

- ◆ Tube and piping CAD tools
- ◆ Sheet metal CAD tools
- ◆ Electrical cabling CAD tools
- ◆ Industry CAD tools

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Outcome 4

Use CAD tools to analyse the functionality of a CAD feature based assembly model.

Knowledge and/or Skills

- ◆ Collision detection
- ◆ Interference
- ◆ Functional integrity
- ◆ Simulation

Evidence Requirements for this Unit

Outcome 1

A learner's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each Knowledge and/or Skills item by showing that the learner is able to:

- ◆ produce a CAD model that:
 - can be controlled/manipulated by adjusting parameters while maintaining the design intent
 - incorporates conditional features that may become redundant depending on the overall sizes of the design
 - can be table driven to allow control and manipulation of parameters
- ◆ provide an electronic copy of the completed model.

Outcome 2

A learner's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each Knowledge and/or Skills item by showing that the learner is able to:

- ◆ produce a feature based CAD models that allows both part and assembly adaptivity while maintaining the design intent.
- ◆ provide an electronic copy of the completed model.

Outcome 3

Evidence for this Outcome will be generated via sampling. A **different two** of the four knowledge and skills items must be sampled on each assessment occasion.

A learner's response can be judged to be satisfactory where the evidence provided is sufficient to demonstrate for each sampled Knowledge and/or Skills item that the learner is able to:

- ◆ produce a feature based CAD assembly model that incorporates a minimum of two knowledge and skills items.
- ◆ provide an electronic copy of the completed model.

Assessment will be supervised but open-book. Learners will be allowed to refer to relevant Course material.

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Outcome 4

A learner's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each Knowledge and/or Skills item by showing that the learner is able to:

- ◆ use the CAD system to analyse a CAD feature based assembly model via simulation for collision detection, interference and functional integrity.
- ◆ provide an electronic copy of the completed model.

SQA Advanced Unit Support Notes

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Unit Support Notes are offered as guidance and are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 80 hours.

Guidance on the content and context for this Unit

This Unit has been written in order to allow learners to develop knowledge, understanding and skills in the following areas:

- 1 The design of feature based CAD models incorporating Parameters (design variables) in response to a given brief.
- 2 The creation of adaptive part and assembly models using a feature based CAD system in response to a given brief.
- 3 The creation of a feature based CAD assembly model using a variety of industry specific CAD tools to a given brief.
- 4 The use of CAD tools to analyse the functionality of a CAD feature based assembly model.

This Unit is at SCQF level 8 and may form part of a group award or be completed as a free-standing Unit.

In designing this Unit, the Unit writer has identified the range of topics that would be expected to be covered by lecturers. The writer has also given recommendations as to how much time should be spent on each Outcome assessment. This has been done to help lecturers decide what depth of treatment should be given to the topics attached to each of the Outcomes. While it is not mandatory for centres to use this list of topics, it is recommended that they do so.

Outcome 1

Design of feature based CAD models incorporating Parameters in response to a given brief.

In this Outcome the learner should demonstrate the ability to design feature based CAD models that incorporate parameters that satisfy the given design problem. Learners will be required to use equations within the parametric dimensions and build relationships between the elements of the model. As an example, the learner could be asked to design a range of water storage tanks that may have a varying capacity. The height of the tank may be restricted and the maximum fluid level should be below the top of the tank by a given distance. The learner would have to ensure that their design could hold the capacity and have the required clearance, but also be flexible enough to allow design change, eg variable capacity.

Outcome 2

Creation of adaptive part and assembly models using a feature based CAD system in response to a given brief.

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In this Outcome the learner should demonstrate their ability to use in-place modelling techniques for the creation of adaptive part and assembly models while maintaining the design intent of the model.

Outcome 3

Creation of a feature based CAD assembly model using a variety of industry specific CAD tools to a given brief.

In this Outcome the learner should demonstrate the ability to use industry specific CAD tools for the creation of a feature based CAD assembly model. Tools may include Tube and Piping; Sheet Metal; Electrical Cabling and others depending on CAD software being used.

Outcome 4

Use of CAD tools to analyse the functionality of a CAD feature based assembly model.

In this Outcome the learner should demonstrate knowledge and skills in the application and of appropriate analysis tools, eg collision detection and interference checking. Functional integrity of the model may be established through the application of the previous mentioned tools and animated simulation of any moving parts.

Guidance on approaches to delivery of this Unit

It is intended that this Unit be presented at all times using the specialist application CAD software available at the centre. Appropriate technical and support material should be available to the learner.

In delivery of this Unit, learners should be provided with the opportunity to gain as much 'hands on' experience as possible. Each learner should have access to a PC with the CAD software installed.

Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Outcome 1 requires the learner to design a feature based CAD model incorporating Parameters (design variables) in response to a given brief. The assessment for Outcome 1 in this Unit should last a maximum of four hours. Learners should be allowed to refer to relevant Course material.

Outcome 2 requires the learner to develop adaptive part and assembly models using a feature based CAD system in response to a given brief. The assessment for Outcome 2 in this Unit should last a maximum of three hours. Learners should be allowed to refer to relevant Course material.

Outcome 3 requires the learner to develop a feature based CAD assembly model using a variety of industry specific CAD tools to a given specification. The assessment for Outcome 3

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in this Unit could be taken by learners at one single event that should last a maximum of three hours. Learners should be allowed to refer to relevant Course material.

Outcome 4 requires the learner to use CAD tools to analyse the functionality of a CAD feature based assembly model. The assessment for Outcome 4 in this Unit could be taken by learners at one single event that should last a maximum of one hour. Learners should be allowed to refer to relevant Course material.

It would also be possible to assess the Knowledge and/or Skills of Outcomes 1, 2, 3 and 4 as a single assignment.

It should be noted that learners must achieve all the minimum evidence specified for each Outcome in order to pass the Unit.

It is essential that the centres ensure that evidence generated is the learner's own work.

Opportunities for 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 social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at www.sqa.org.uk/e-assessment.

Opportunities for developing Core and other essential skills

There are opportunities to develop the Core Skills of *Communication*, *Problem Solving* and *Information and Communication Technology (ICT)* to SCQF level 6, and the Core Skill of *Numeracy* to SCQF level 4 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

History of changes to Unit

Version	Description of change	Date

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SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our [Centre Feedback Form](#).

General information for learners

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This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

This Unit has been designed to provide you with the knowledge and skills that will enable you to understand the concepts of *CAD: Feature Based Modelling II*.

This Unit will also allow you to develop practical skills that will enable you to create part and assembly drawings. You should be able to demonstrate the ability to design feature based CAD models that incorporate parameters (design variables) and build relationships between the elements of a 3D model. You will also be able to demonstrate skills in the use of in-place modelling techniques for the creation of adaptive part and assembly models while maintaining the design intent of the model. The Unit will provide a platform for you to demonstrate the ability in the use of industry specific CAD tools for the creation of a feature based CAD assembly model. Tools may include Tube and Piping; Sheet Metal; Electrical Cabling and others depending on CAD software being used. Finally you will be able to demonstrate the use of analysis tools, eg Collision detection and Interference checking.

The formal assessment for this Unit consists of four practical elements. The actual assessment times are as follows:

Outcome 1	Practical	4 hours
Outcome 2	Practical	3 hours
Outcome 3	Practical	3 hours
Outcome 4	Practical	1 hour

You will be allowed access to all Course notes during the assessment event.

At the discretion of the individual centres, the assessment of all Outcomes can be carried out after the teaching of the appropriate topics or as an integrated assignment; this will not usually be attempted until all teaching has been completed.