Higher National Unit specification

General information

Unit title: CAD: Customised Programming (SCQF level 8)

Unit code: F216 35

Superclass:	CB
Publication date:	February 2008
Source:	Scottish Qualifications Authority
Version:	02 (July 2016)

Unit purpose

This Unit will develop learners' knowledge and understanding of the design of software solutions to a problem. In addition, learners will develop competence in implementing and supporting a software design.

Outcomes

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

1   Create a program to set up a CAD system.
2   Create design documentation for a software solution.
3   Programme a software solution.
4   Create a user manual for a software solution.

Credit points and level

2 Higher National Unit credits at SCQF level 8: (16 SCQF credit points at SCQF level 8)

Recommended entry to the Unit

While access to this Unit is at the discretion of the centre, it is recommended that learners possess a knowledge and understanding of Computer Aided Draughting. This may be evidenced by the possession of the following HN Units DW1E 34 *CAD: 2D I*, HE27 34 *CAD: 3D Surface and Solid Modelling*, DW19 34 *CAD: Feature-Based Modelling 1* or any equivalent level of study.

Higher National Unit specification: General information (cont)

Unit title: CAD: Customised Programming (SCQF level 8)

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.

This Unit was developed for the HNC/HND Computer Aided Draughting and Design.

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**.

Higher National Unit specification: Statement of standards

Unit title: CAD: Customised Programming (SCQF level 8)

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

Create a program to set up a CAD system.

Knowledge and/or Skills

- Declaration and use of variables
- Input and output
- User interaction
- Data types
- Programming languages
- Syntax
- CAD system settings

Outcome 2

Create design documentation for a software solution.

Knowledge and/or Skills

- Software requirements
- Pseudo code
- Flowcharts
- Function specifications
- Test documentation

Outcome 3

Programme a software solution.

Knowledge and/or Skills

- Programming techniques
- Programming language tools
- Program me testing

Higher National Unit specification: Statement of standards (cont)

Unit title: CAD: Customised Programming (SCQF level 8)

Outcome 4

Create a user manual for a software solution.

Knowledge and/or Skills

♦   User documentation
♦   Installation guide
♦   User guide
♦   Error messaging
♦   Help functions
♦   Programme overview

Evidence Requirements for this Unit

Outcome 1

Learners will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

♦   create a program to automatically set a CAD system's settings to meet a given specification which must include the necessary input/output information, user interaction information, appropriate data type, programming language and syntax.

Outcome 1 is assessed as a stand-alone, supervised open-book assessment.

The specification presented must provide sufficient detail to enable the learner to produce evidence all of the Knowledge and Skills elements. Evidence for this Outcome will be provided by the production of a hard copy printout of the program code and a demonstration of the program in operation.

Outcome 2

Learners will need to provide evidence to demonstrate all Knowledge and/or Skills by showing that they can create documentation for a software solution.

Evidence for this Outcome will be provided by the production of a hard copy program design document containing:

♦   one flow chart indicating a possible solution
♦   pseudo code
♦   function specifications
♦   program code which aids in the creation of a solution at this stage
♦   program test documentation containing expected results for the solution
♦   a brief explanation of how the chosen software influenced the design of their solution

Higher National Unit specification: Statement of standards (cont)

Unit title: CAD: Customised Programming (SCQF level 8)

The specification presented must provide sufficient detail to enable the learner to produce a software solution which contains evidence all of the Knowledge and Skills elements.

The assessment must be conducted under open-book, supervised conditions.

Outcome 3

Learners will need to provide evidence to demonstrate all Knowledge and/or Skills by showing that they can create a robust automated software solution. The software solution must include the following details: input and output (writing to and reading from files), data types, user interface, CAD system settings, arithmetic operations, comparison operations, commenting and error trapping, loops (if essential), programming language tools and evidence of programme testing.

Evidence for this Outcome will be the production of a hard copy printout of the program code and a practical demonstration of the working programme.

The specification presented to the learner must provide sufficient detail to enable the learner to produce a software solution which contains evidence all of the Knowledge and Skills elements.

The assessment must be conducted under open-book, supervised conditions.

Outcome 4

Learners will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can produce user guide information containing: program overview, installation guide, user guide, schedule of error messages and help functions as well as an indication of the distribution methods that may be employed in getting the programme and manual to the end user.

The specification details presented to the learner must provide sufficient detail to enable the learner to produce a software solution which contains evidence all of the Knowledge and Skills elements.

The assessment must be conducted under open-book, supervised conditions.

Higher National Unit Support Notes

Unit title: CAD: Customised Programming (SCQF level 8)

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 developed as part of the HND in Computer Aided Draughting and Design but may be delivered on a standalone basis or within another Group Award. The Unit will allow learners to develop fundamental knowledge and skills in the development of robust, reliable, efficient and maintainable programs. The implementation of good practice should be stressed throughout the Unit.

It is advised that specified problems are simple enough to permit the learner to concentrate more fully on the programming techniques involved, rather than on the initial problem itself.

In designing the Unit a range of topics could be included and the Unit has been designed to encourage a case study approach to assessment. Suggested themed topics for delivery are given below.

Outcome 1

Create a program to set up a CAD system.

Generic topics should be put into context by reference to the programming language being used at the centre.

This Outcome is designed to introduce learners to the principles and good practice behind coding programs, such as internal commenting, use of variables, code indentation and naming conventions.

All input and output should use appropriate data types and should make use of both user defined and preset data including number and text. Commonly altered system variables such as background colour, cursor size and drawing aids could be set via user defined input to a series of options or prompts.

Higher National Unit Support Notes (cont)

Unit title: CAD: Customised Programming (SCQF level 8)

Outcome 2

Create design documentation for a software solution.

Generic topics should be put into context by reference to the programming language being used at the centre.

Correct use of technical details should be encouraged in all answers to the solution.

The documentation produced may be used for reference while programming a software solution, and therefore should outline all parts of the program and include an overview of how it will work. The document should give a fairly complete description of each function making use of flow charts to plot the possible progression routes through the program, as well as loop backs to correct errors. Attention should be given to the importance of design documentation in coordinating a large team working on a single project and vision. Test data should be included to provide evidence that the learner has thought about error trapping the program with expected results displayed at this stage.

Where an integrated project is used, the project specified should be carefully chosen so as to result in the learner creating program which generates a component, drawn to user defined dimensions and properties.

Outcome 3

Programme a software solution.

Learners should make use of standard arithmetic operators, eg add (+), subtract (-), multiply (*) and divide (/), as well as at least one appropriate comparison operator, eg equal to, not equal to, less than and greater than.

The programme should utilise a variety of input and output methods such as user defined via mouse and keyboard, data read from/written to files. The program should be error trapped so as to provide the use with information and options when an error has occurred, and make use of loops to avoid unnecessary creation of code.

Where a dedicated programming environment is used, the tools should be used to speed up the process of creating the program. This could be in the form of automatic indentation, syntax checking or debugging code.

The project specified should be carefully chosen so as to result in the learner creating program which generates a component, drawn to user defined dimensions and properties.

Higher National Unit Support Notes (cont)

Unit title: CAD: Customised Programming (SCQF level 8)

Outcome 4

Create a user manual for a software solution.

The documentation produced should be of a high standard with graphics used throughout to support any instructions/explanations given, Learners should have an understanding of the differences between comprehensive and quick start user documentation and make use of one method for this project. The documentation should introduce the user to the program and guide the user through the loading procedure and use, as well as a comprehensive listing of error messages and corresponding help available.

Guidance on approaches to delivery of this Unit

As this Unit provides an introduction to programming skills, which requires continual use to acquire proficiency, it is recommended that the Unit be delivered immediately before any other Units that may make use of learned programming or documentation skills.

Where this Unit is incorporated into other Group Awards it is recommended that it is delivered in the context of the specific occupational area(s) that the award is designed to cover, eg programming to accelerate production of repetitive architectural elements.

Outcome 1 requires the learner to create a program to set up a CAD system to a given specification. Outcome 2 requires the learner to create design documentation for a software solution. Outcome 3 requires the learner to use programming techniques to implement a software solution. Outcome 4 requires the learner to create a user manual for a software solution.

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 is assessed as a stand-alone, open-book assessment.

It would also be possible to assess the Knowledge and Skills for Outcomes 2, 3 and 4 as stand-alone tasks. However, if one software solution were used to set appropriate parameters for gathering evidence, it would be possible to integrate assessments for Outcomes 2, 3 and 4 into a project-based assignment lasting no more than ten hours.

After introducing the steps involved in developing a solution to typical problems, learners should be presented with a series of practical exercises to illustrate the features of the programming language as they are introduced. Testing should involve the learner comparing the expected and the actual results, evaluating the differences and amending the code as necessary.

Higher National Unit Support Notes (cont)

Unit title: CAD: Customised Programming (SCQF level 8)

During the learning process, part-completed code modules may be offered to the learner for completion.

Unit Assessment

Outcome 1	Practical	2 hours
Outcome 2	Practical/written and or oral	2 hours
Outcome 3	Practical	5 hours
Outcome 4	Written or oral recorded	3 hours

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, Information and Communication Technology (ICT)* and *Numeracy* all at SCQF level 6 although there is no automatic certification of Core Skills or Core Skills components. Opportunities to develop *Problem Solving, Numeracy* and *ICT* skills to a highly advanced level are required to analyse and seek solutions to a range of practical problems to solve a number of programming solutions. *Communication* skills are required to formulate the instructional detail for the user information.

History of changes to Unit

Version	Description of change	Date
02	No change to context. Some minor changes to correct errors/typos and transferred to the current template.	06/07/16

General information for learners

Unit title: CAD: Customised Programming (SCQF level 8)

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 help you to develop fundamental skills and knowledge in the development of robust, reliable, efficient and maintainable programmes. It may be beneficial for you to undertake this Unit if you are studying subjects within areas such as Built Environment, Architecture, Mechanical or Civil Engineering.

The Unit will develop your knowledge and understanding in the area of software design. Specifically, you will learn about the design of software solutions and, additionally, competence in implementing and supporting software design. On completion of the Unit, you should be able to:

1   Create a program to set up a CAD system to a given specification.
2   Create design documentation for a software solution.
3   Programme a software solution.
4   Create a user manual for a software solution.

You will be asked to create a software solution, involving programming and documentation, to solve a given problem. However, the emphasis will be on your use of programming techniques, rather than on the initial problem itself.

In designing the Unit a range of topics could be included and the Unit has been designed to encourage a case study approach to assessment.

Most assessment tasks are of a practical/programming nature and may be individually assessed or may be assessed as a response to one set software problem.

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

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

At the discretion of the individual centres, 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.