Higher National Unit specification

General information for centres

Unit title: CAD: Customised Programming

Unit code: F216 35

Unit purpose: This Unit will develop candidates' knowledge and understanding of the design of software solutions to a problem. In addition, candidates will develop competence in implementing and supporting a software design. On completion of the Unit, the candidate will be able to:

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

Credit points and level: 2 HN credits at SCQF level 8: (16 SCQF credit points at SCQF level 8*)

**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: While access to this Unit is at the discretion of the centre, it is recommended that candidates 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*, DW13 34 *CAD: 3D Modelling*, DW19 34 *CAD: Feature-Based Modelling 1* or any equivalent level of study.

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

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.

Assessment: 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.

Higher National Unit specification: statement of standards

Unit title: CAD: Customised Programming

Unit code: F216 35

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

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

Evidence Requirements

Candidates 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 candidate 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.

Assessment Guidelines

As a guide, the assessment for Outcome 1 might require approximately two hours.

Higher National Unit specification: statement of standards (cont)

Unit title: CAD: Customised Programming

Outcome 2

Create design documentation for a software solution

Knowledge and/or Skills

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

Evidence Requirements

Candidates 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

The specification presented must provide sufficient detail to enable the candidate 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.

Assessment Guidelines

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

Higher National Unit specification: statement of standards (cont)

Unit title: CAD: Customised Programming

Outcome 3

Programme a software solution

Knowledge and/or Skills

- Programming techniques
- Programming language tools
- Program testing

Evidence Requirements

Candidates 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 candidate must provide sufficient detail to enable the candidate 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.

Assessment Guidelines

It would be possible to assess the Knowledge and Skills for this Outcome as a stand alone task. 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 assessment lasting no more than ten hours.

Higher National Unit specification: statement of standards (cont)

Unit title: CAD: Customised Programming

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

Candidates 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 candidate must provide sufficient detail to enable the candidate 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

Assessment Guidelines

It would be possible to assess the Knowledge and Skills for this Outcome as a stand alone task lasting no more than three hours. 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.

Administrative Information

Unit code: F216 35

Unit title: CAD: Customised Programming

Superclass category: CB

Original date of publication: February 2008

Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: CAD: Customised Programming

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 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 candidates 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 candidate 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 candidates 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.

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 candidate 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 candidate creating program which generates a component, drawn to user defined dimensions and properties.

Outcome 3

Programme a software solution.

Knowledge and/or Skills

Candidates 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 program 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 candidate creating program which generates a component, drawn to user defined dimensions and properties.

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, Candidates 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.

Higher National Unit specification: support notes (cont)

Unit title: CAD: Customised Programming

Guidance on the delivery and assessment 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 candidate to create a program to set up a CAD system to a given specification. Outcome 2 requires the candidate to create design documentation for a software solution. Outcome 3 requires the candidate to use programming techniques to implement a software solution. Outcome 4 requires the candidate to create a user manual for a software solution.

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

It would is possible to assess the Knowledge and Skills for Outcomes 2, 3 and 4 as a stand alone task. However if one software problem was devised to integrate all assessment tasks by setting appropriate parameters for gathering evidence for the remaining Outcomes, it would be possible to integrate assessments for Outcomes 2, 3 and 4.

After introducing the steps involved in developing a solution to typical problems, candidates 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 candidate comparing the expected and the actual results, evaluating the differences and amending the code as necessary.

During the learning process, part-completed code modules may be offered to the candidate 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 developing Core Skills

There are opportunities to develop the Core Skills of Communication, Problem Solving, Information Technology 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 IT 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.

Higher National Unit specification: support notes (cont)

Unit title: CAD: Customised Programming

Open learning

This Unit could be delivered by distance learning, which may incorporate some degree of on-line support. The candidate would require access to a PC with the appropriate software installed. With regard to assessment, arrangements would need to be made by the centre to ensure the sufficiency and authenticity of candidate evidence and the assessment conditions. Candidates should also be made aware of the time commitment to assessment.

Candidates with disabilities and/or additional support needs

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. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.

General information for candidates

Unit title: CAD: Customised Programming

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 Technology 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.