Higher National Unit Specification

General information for centres

Unit title: Audio Applications Programming

Unit code: DR2Y 36

Unit purpose: The purpose of this Unit is to provide candidates with the skills required to create bespoke audio software. The Unit is intended for those who wish to be able to design their own software or who are considering developing this skill at Higher Education level.

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

1 Evaluate a piece of commonly used audio software using a user-centred model.
2 Create a Design Specification for an audio application.
3 Design a user interface from a Design Specification document.
4 Develop program code to provide functionality for an interface.
5 Create and apply an application testing model.

Credit points and level: 2 HN Credits at SCQF level 9: (16 SCQF credit points at SCQF level 9*).

**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: Access to this Unit is at the discretion of the centre. Although not essential, it would be preferable for candidates to have had some previous experience in computer programming.

Core Skills: There may be opportunities to gather evidence towards Core Skills in this Unit, 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.

Assessment: This Unit could be assessed as a mini project. There is a strong link between Outcomes 2 to 5 inclusive, and it is recommended that centres emphasis the relationship that exists between the skills and issues in these Outcomes. For these Outcomes, candidates should work towards the creation of a functioning piece of bespoke audio software which has a clear value to potential users in the sound production industry.

However, it is unlikely that there will be a method of integrating the assessment for Outcome 1 with any other.

General information for centres (cont)

Unit title: Audio Applications Programming

Outcome 1 will be assessed by carrying out an evaluation on a piece of commonly used, existing audio software. This is a two-part assessment, involving both the development and application of an evaluation model or strategy. The application of the evaluation model will be carried out in closed-book, controlled conditions.

For Outcome 2, a professional standard Design Specification must be produced. This will result either from candidates proposing a viable software project, or from an outline brief issued by the assessor.

Outcome 3 is closely related to Outcome 2 in that the documentation and interface produced must clearly stem for the Design Specification. This is a two part assessment, requiring the generation of interface design documents, and the production of an actual user interface using an Interactive Design Environment.

Outcome 4 develops the activities of Outcomes 2 and 3, whereby candidates are required to create the program code necessary for the designed interface. The assessment evidence will be a submitted as a functioning program.

Outcome 5 requires candidates to both create a testing strategy and apply that strategy. The testing strategy will be submitted in the form of the necessary documentation, but the application of the strategy will require candidates to perform this operation in controlled conditions.

Higher National Unit specification: statement of standards

Unit title: Audio Applications Programming

Unit code: DR2Y 36

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

Evaluate a piece of commonly used audio software using a user-centred model

Knowledge and/or skills

- Human factors in interface design
- Direct manipulation concepts in interface design
- Conceptual models
- Software functionality
- User types and user support
- Feedback mechanisms

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- evaluate how human factors have been taken into account in interface design
- evaluate the effectiveness of the direct manipulation controls in accessing the functionality
- evaluate the effectiveness of conceptual models in the interface presentation
- evaluate the functionality in relation to expected system outputs
- define user types that could be involved and so evaluate the effectiveness of system user support
- evaluate the effectiveness of system feedback to support various user groups

Candidates will be expected to meet all the evidence requirements with reference to an existing piece of audio software in common use. The software, which will be the subject of the assessment, can be selected by the candidate or issued by the assessor.

The assessment will be in two parts. The first part will involve the candidate developing an evaluation model. There are no assessment conditions for this element of the assessment. The second part will involve candidates producing the actual evaluation where they are expected to submit a full written/graphical account of their findings, this should be carried out in closed-book, controlled conditions and completed within a one hour working period.

Higher National Unit specification: statement of standards

Unit title: Audio Applications Programming

Assessment guidelines

This Outcome is a foundation for the remainder of the Unit and, as such, should be carried out before the other Outcomes. It is unlikely that this assessment will be integrated with any other from this Unit.

Should there be ambiguity regarding a candidate's response, oral questioning may be used to eliminate any doubt as to the candidate's understanding. The lecturer should note questions and responses.

Outcome 2

Create a Design Specification for an audio application

Knowledge and/or skills

- Task analysis
- User-environment analysis
- Specifying requirements
- Specifying functionality for identified requirements
- Document creation

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can:

- carry out task analysis
- carry out user-environment analysis
- specify the requirements of an audio application
- relate the specified requirements to system functionality
- compile a design specification document using appropriate terminology and style

Evidence will be generated by the creation of a Design Specification document. Candidates should either select or be given an outline brief for a piece of audio software for the purposes of this Outcome and the remaining Outcomes. Alternatively, candidates should be allowed to propose their own project, so long as the proposal is viable. From this brief/project, candidates will be expected to create a clear, complete and unambiguous Design Specification document.

Assessment guidelines

There is a clear link between this Outcome and Outcomes 3, 4 and 5 of this Unit. Consequently, it affords opportunity for assessment integration.

Should there be ambiguity regarding a candidate's response, oral questioning may be used to eliminate any doubt as to the candidate's understanding. The lecturer should note questions and responses.

Higher National Unit specification: statement of standards (cont)

Unit title: Audio Applications Programming

Outcome 3

Design a user interface from a Design Specification document

Knowledge and/or skills

- Sketching techniques
- Conceptual model design
- Navigation design
- Mapping functionality to interface design features
- Feedback and user support
- Using interactive development environments
- Early prototype testing

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by designing a user interface, showing that they can:

- use sketching techniques to propose possible interface presentations
- imbed a conceptual model in the interface design
- graphically model the navigation requirements of the interface
- derive necessary interface features from identified functionality
- design feedback and user support systems
- use an interactive development environment to create an actual user interface
- propose an early prototype testing strategy, identifying the value of user-centred evaluation

Candidates will need both written evidence and artefact evidence and will be expected to address the evidence requirements with reference to the Design Specification document created in Outcome 2 of this Unit.

The evidence will be presented in two parts. All necessary documentation should be submitted with details of:

- interface sketches
- conceptual model proposals
- navigation design
- mappings of functionality to interface features
- prototype testing strategy and user-centred evaluation

As well as the documentation, candidates will be required to submit an actual interface deigned using an interactive development environment. It should be clear that the submitted interface has been derived from the submitted documentation.

Assessment guidelines

There is a clear link between this Outcome and Outcomes 2, 4 and 5 of this Unit. Consequently, it affords opportunity for assessment integration.

Higher National Unit specification: statement of standards (cont)

Unit title: Audio Applications Programming

Should there be ambiguity regarding a candidate's response, oral questioning may be used to eliminate any doubt as to the candidate's understanding. The lecturer should note questions and responses.

Outcome 4

Develop program code to provide functionality for an interface

Knowledge and/or skills

- Programming constructs
- Saving to, and loading from, storage media
- Handling input and output functions
- Initialisation and termination requirements

Evidence Requirements

Candidates will need to provide evidence in the form of a functioning application to demonstrate their knowledge and/or skills. The application code will demonstrate that the candidate can:

- declare variables and their types
- use the assignment operation
- account for component and value dependencies
- use conditional operations
- program calculations
- provide data input and output facilities
- provide proper initialisation and termination procedures

Assessment guidelines

There is a clear link between this Outcome and Outcomes 2, 3 and 5 of this Unit. Consequently, it affords opportunity for assessment integration.

Should there be ambiguity regarding a candidate's response, oral questioning may be used to eliminate any doubt as to the candidate's understanding. The lecturer should note questions and responses.

Outcome 5

Create and apply an application testing model

Knowledge and/or skills

- Iterative testing
- User participation testing
- Usability testing
- Creating test documents
- Collecting and applying test data
- The role of re-design

Higher National Unit specification: statement of standards (cont)

Unit title: Audio Applications Programming

Evidence Requirements

Candidates will need to provide both written/graphical evidence and performance evidence to demonstrate their knowledge and/or skills. The written/graphical evidence should demonstrate that the candidate can:

- explain the concept of iterative testing
- fully justify the inclusion of user groups in applications testing
- translate the fundamentals of usability testing into testing activities
- create professional standard test documents
- show how test results inform any necessary re-design effort

Candidates will be expected to produce a documentation report that shows the clear relationship that exists between the Test Strategy and the Design Specification documents.

There are no particular restrictions on the conditions for the written part of this assessment exercise.

As well as the written graphical evidence, candidates will be expected to execute systematically and efficiently the created test strategy. Assessors must use appropriate checklists to record candidate performance. This part of the assessment should be carried out in controlled conditions.

Assessment guidelines

There is a clear link between this Outcome and Outcomes 2, 3 and 4 of this Unit. Consequently, it affords opportunity for assessment integration.

Should there be ambiguity regarding a candidate’s response, oral questioning may be used to eliminate any doubt as to the candidate’s understanding. The lecturer should note questions and responses.

Administrative Information

Unit code:	DR2Y 36
Unit title:	Audio Applications Programming
Superclass category:	CB
Date of publication:	August 2005
Version:	01
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: Audio Applications 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 provides an opportunity for candidates to develop a specialist skill in the sound production field. It introduces the approach of designing bespoke software for a range of sound and music applications.

It features a wide range of high level tasks such as analysis, evaluation and design. Consequently, although programme design is the main focus, candidates will develop, through this Unit, other transferable skills eg problem solving, task management and communication.

Although there are separate Outcomes, there exists clear potential and preference for assessment integration. With the exception of Outcome 1, candidates should consider a design project that can be used for Outcomes 2-5 inclusive. Projects that involve audio or MIDI should be used. Individual projects will allow candidates to be involved in all necessary areas of the Unit, but there may be opportunities for group exercises, for example creating test communities or document design communities and so on.

Outcome 1 introduces a model to equip candidates to evaluate the effectiveness of existing software types that are to be found in the sound technology industry. This will involve very definite measures like functionality, but will also introduce the human element, so that software performance can be evaluated in relation to human needs and limitations. This Outcome will also provide candidates with an insight into common software design practices and hence inspire design procedures later in the Unit.

Outcome 2 introduces the necessary rigours of creating a Design Specification document. Analytical techniques are introduced like Task Analysis, so that the document is the product of full and proper consideration. The role of this document in the other stages of a software design project should be highlighted to candidates. Candidates should also be made aware of the need to adopt and continually adhere to a document house style.

Outcome 3 considers critical factors in user interface design. It is important that candidates are made aware of the many advantages that can be enjoyed by making the code support the interface rather than the other way round. Again, human factors will figure largely in this Outcome, as issues such as concentration constraints, sociology, cognition, preferences and experience are considered. This will constrain candidates to design interfaces that suit people, and yet functionality will also be a key consideration.

The importance of support functions with no added functionality should also be considered like feedback and on-line help pages. Different approaches to design should be considered from simple sketching to prototype designs using design software.

Unit title: Audio Applications Programming

Outcome 4 introduces the coding aspects of the software design sequence. Where candidates will have had little or no experience, it is advisable that a significant portion of the time available for the Unit is apportioned to this Outcome. For this Outcome, it is recommended that a software builder type design tool is used like Visual Basic, Delphi, C++ Builder or Java Builder. The code developed will allow for the key aspects of the software functionality, data input, data processing and data output. As well as these, necessary functionality like default start-ups, saving preferences, data storage and data retrieval should be considered. The link between the designed interface and the necessary navigation and functionality code should be established.

Outcome 5 introduces the role of multi-faceted testing. From the outset, the role of the Design Specification in the test phase should be emphasised. Candidates should be encouraged to consider what exactly they want to test and how to create a test procedure that will allow that testing to take place. Although functionality is a key consideration, candidates should be made aware of the importance of the various usability tests that can be used like learnability, flexibility and so on. The need for a considered test procedure and associated documentation must be introduced, but this will also extend to the actual practical exercise of conducting the tests. Candidates should also be made aware of what happens with the data collected from the various tests, and how this data will inform any necessary remedial design work.

Guidance on the delivery and assessment of this Unit

This has been developed as an optional Unit in the HND Sound Production Group Award but is also a stand-alone specialised Unit. It introduces the approach of designing bespoke software for a range of sound and music applications. It is primarily designed to develop the specialist skill in the sound production field.

The Unit can be assessed using separate assessments for each Outcome or combining the assessments for Outcomes 2 - 5. The assessment for Outcome 1 should be stand-alone.

Open learning

It may be possible for this Unit to be completed on an open learning basis, although centres will need to devise and approve methods for ensuring the validity of submitted work that contributes to assessment evidence.

For further information and advice please refer to *Assessment and Quality Assurance for Open and Distance Learning (SQA,— publication code A1030).*

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: Audio Applications Programming

This Unit is designed to introduce you to the skill of designing your own software tools. It introduces you to a way of making a formal and useful assessment of the effectiveness of existing software tools with respect to functionality, ie the range of tasks that can be carried out, but also issues to do with user support are taken into account. It is intended that, by considering how software design houses create professional programmes, you will pick up on established good and acceptable practice.

It is likely that, after the first Outcome, you will be issued with, or asked to select a design project. This will form the focus for the remaining Outcomes of the Unit.

You will then be introduced to the key considerations in creating a design document known as the Design Specification document. The necessary content and approaches to creating the content will be emphasised to you as this document is used as the reference document throughout the design sequence.

The Unit goes beyond just technical considerations and deals with the human element. Because software is designed to be used by humans, it should consider how humans differ and the constraints and limitations we have like memory capacity, concentration span, and even sociological issues like experience, belief and preferences.

Having created the Design Specification as the project reference, you will begin the design effort by considering the user interface. Although simple techniques like sketching and storyboarding will be used initially, you will progress onto a ‘drag-and-drop’ design tool for interface and coding design. This will obviously introduce a learning curve into the process, and it is likely that you will have to set aside extra time to practise and familiarise yourself with this design tool.

Once the interface has been designed and tested, functionality will be created by using program code. If you have never worked with program code before, then it is likely that this element will consume most of your time on this Unit. The code will be included to control processes like input and output of audio and/or MIDI information, and will also include a level of processing of this data. However, important, basic requirements will also be addressed like data storage and retrieval, preference saving and start-up defaults. This part will also require you to manipulate code which carries out calculations, so will be expected to be familiar with some basic arithmetical and mathematical computations.

Once the software is designed and functions along with the interface, the test phase is introduced. It is at this stage you will again see the important role that the Design Specification document continues to play. You will be expected to consider the information you wish to gather at this phase, what procedures will have to be followed to obtain that information, design appropriate record documents and finally implement the tests and record the information. You will then be required to use the information gathered in an effective manner for any re-design work that may be required.

Key topics: The following list will form the knowledge attained at the end of the Unit.

- Direct manipulation interface components that facilitate interactive operation.
- Electronic circuits eg the difference between balanced/unbalanced and the difference between 'signal', 'line', 'speaker' and 'mains.'
- Software functionality.
- Human factors.

General information for candidates (cont)

Unit title: Audio Applications Programming

- User groups.
- Evaluations models and their application.
- Requirements and task analysis.
- Design Specification document creation.
- Interface design with respect to human factors.
- Navigation and user support.
- Program coding constructs.
- Data dependencies and functionality to interface relationships.
- Testing approaches and documentation.
- Testing procedures and record completion.