INFORMATION SYSTEMS
Higher

Third edition – published December 1999

SCOTTISH QUALIFICATIONS AUTHORITY

NOTE OF CHANGES TO ARRANGEMENTS
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COURSE TITLE: Information Systems (Higher)

COURSE NUMBER: C054 12

National Course Specification

Course Details: Core skills statements expanded

DETAILS OF THE INSTRUMENTS FOR EXTERNAL ASSESSMENT
Coursework   Re-written

National Unit Specification

All Units: Core skills statements expanded

National Course Specification

INFORMATION SYSTEMS (HIGHER)

COURSE NUMBER   C054 12

COURSE STRUCTURE

The course has two mandatory units and one optional unit as follows:

Mandatory units

D299 12	*Database Systems (H)*	*1 credit (40 hours)*
D303 12	*Information Organisation (H)*	*1 credit (40 hours)*

Optional units - choose one from:

D094 12	*Computer Application Software (H)*	*1 credit (40 hours)*
D304 12	*Expert Systems (H)*	*1 credit (40 hours)*
D305 12	*Hypermedia (H)*	*1 credit (40 hours)*

In common with all courses, this course includes 40 hours over and above the 120 hours for the component units. This is for induction, extending the range of learning and teaching approaches, support, consolidation, integration of learning, and preparation for external assessment. This time is an important element of the course and advice on its use is included in the course details.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

*   Information Systems course at Intermediate 2 level
*   Standard Grade in Computing Studies (Grade 1 or 2)
*   Equivalent

Administrative Information

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National Course Specification: general information (cont)

COURSE   Information Systems (Higher)

CORE SKILLS

This course gives automatic certification of the following:

Either

if the optional unit *D094 12 Computer Application Software (H)* is chosen

Complete core skills for the course	IT	H
Additional core skills components for the course	Critical Thinking	H
	Planning and Organising	H

Or

if any other optional unit is chosen

Complete core skills for the course	None	
Core skills components for the course	Critical Thinking	H
	Planning and Organising	H

For information about the automatic certification of core skills for any individual unit in this course, please refer to the general information section at the beginning of the unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Course Specification: course details

COURSE   Information Systems (Higher)

RATIONALE

Information and its associated technologies has been widely identified as having a unique and key role in many aspects of modern life. This is recognised, for example, in the inclusion of information technology (IT) as a core skill within many contemporary qualifications. Technological developments in hardware and software mean that a wide range of data types can be stored and processed in digital form to provide useful information. Developments in communication technologies have ensured that information is widely accessible. Such developments are themselves generating demand for further access to information.

In parallel with these developments has come recognition of the need to adopt a systematic approach to handling information and working with Information Systems. For example, disciplined approaches to the provision of information to meet user requirements have long been recognised and are well established in database design. Methodical approaches should be underpinned by technical considerations in collecting, storing, processing and communicating data in a meaningful form. Information is a vital resource to individuals and organisations and, as such, is worthy of detailed study.

The Information Systems course at Higher level builds on the corresponding course at Intermediate 2 level. It further develops candidates' database and information skills and also allows them to focus on specific aspects of Information Systems (such as hypermedia or expert systems). A central theme of Information Systems courses at every level, is the development of the candidates' knowledge and understanding of contemporary database systems, and units with this title appear within the core of every course. This course also focuses on the value and characteristics of information in a variety of contexts, including personal and educational applications.

The aims of the course are:

- to develop intellectual stimulus and academic rigour
- to provide candidates with knowledge and understanding of Information Systems
- to develop practical abilities in the use of a range of Information Systems
- to develop an awareness of modern trends in Information Systems
- to foster an awareness of the social, ethical and legal implications of Information Systems
- to foster an appreciation of the value of information as a resource
- to foster confidence and enjoyment in the use of IT systems

The knowledge and skills gained as part of this course should enable the candidate to play a full and active role within the 'information society'.

National Course Specification: course details (cont)

COURSE   Information Systems (Higher)

COURSE CONTENT

Information Systems courses draw on existing provision, supplemented by new units as appropriate. A number of topics are identified as important at various levels within the framework of provision. These multi-level topics relate to the following areas:

- database systems
- computer applications
- attributes of information
- contemporary Information Systems (such as the Internet and multimedia)
- contemporary developments
- social, ethical and legal implications

To help the teacher/lecturer ensure that the treatment of any one of these topics is coherent, a progression matrix has been produced for each of computer applications, database and multimedia topics. These matrices are part of the Subject Guide. They define the contents of these topics at each level and ensure that candidates working through the framework have a progressive experience. They are also helpful to teachers and lecturers in understanding the content of a unit at a given level, and units should be considered in the context of these tables.

While each unit has an appropriate mix of knowledge and skills represented within the outcomes, certain units may have more cognitive or practical outcomes than others. The proportion of outcomes relating to practical or cognitive competencies will depend on the domain of the unit. However, the number of practical and cognitive outcomes in a course context is broadly balanced.

Unit specifications provide detailed support notes to assist teachers and lecturers in their interpretation of the outcomes and performance criteria. The support notes provide details about content in the context of an individual unit; this documentation provides details about content in a course context.

A number of units (at various levels) include outcomes relating to the 'exploration' of software. The ability (and confidence) to explore the functions of applications software is deemed to be a crucial skill given the diversity and rate of change of contemporary software. These outcomes also provide the opportunity to give candidates credit for demonstrating competence in this time-consuming (but necessary) activity. Contemporary developments in Information Systems permeate the Arrangements and this ensures that candidates are exposed to a wide range of current developments. Topics that appear within several units have implications for whole-course teaching and further guidance on this is given in the Approaches to learning and teaching section. The Subject Guide will provide additional guidance on teaching and learning.

To ensure consistency of terminology, the meaning of the technical terms used throughout this documentation is taken from the British Computer Society's publication entitled *A Glossary of Computing Terms* which is published by Longman.

National Course Specification: course details (cont)

COURSE   Information Systems (Higher)

The course has a mandatory-and-option structure which provides candidates with an element of choice in the selection of the component units. Database systems are a central theme within all Information Systems courses, and units with this title appear within the mandatory section of courses at every level. Another central theme is an appreciation of the value of information as an important resource for individuals and organisations. These dual objectives are reflected in the choice of the core units (*Database Systems* and *Information Organisation*). These mandatory units have a degree of commonality: one refers to the organisation of information and the other requires candidates to design database structures. This has implications for integrated delivery (see Approaches to learning and teaching section).

The optional units provide opportunities for a degree of specialisation. Candidates can select a unit which focuses on specific aspects of Information Systems. The *Hypermedia* unit extends the candidate's knowledge of multimedia. This technology is emerging as a key tool for information structuring and is widely used within contemporary information systems (such as the Internet). A wide range of computer application packages can be used to create and manipulate information. *Computer Application Software* aims to develop advanced skills in the use of generic computer software packages. This unit completes a series of computer application software units which span a number of levels (from Access to Higher) and, as such, it incorporates complex concepts such as the selection, customisation and evaluation of computer software (as outlined in the computer applications progression matrix). The *Expert Systems* unit returns the focus to a specific type of information system and one that is likely to increase in importance during the next ten years.

Added benefit from undertaking the course

There is added benefit to be derived from taking the units as part of a course rather than as discrete units. In addition to guaranteed coherence, a course also provides the opportunity to integrate learning, teaching and assessment across all outcomes within the course. Learning and teaching can apply to a wide range of contexts across several units and a single instrument of assessment can contribute towards several outcomes. Undertaking the units as a coherent programme offers a number of benefits:

- taken together, the component units offer opportunities for delivery as a coherent, integrated, holistic experience
- balance and breadth of candidates' experiences and learning will be promoted
- both specific and core skills may be explored and developed
- skills and abilities developed through holistic and integrated activity support learning as a whole
- candidates' abilities to sustain effort and concentration, come to conclusions, make decisions, complete a process, and evaluate their work are developed

Unit contents

The detailed contents of each unit are defined within the respective unit specification and are not further described within this course documentation. However, the section entitled Relationship of the course to component units describes the course in the form of a syllabus which teachers may find helpful and familiar.

National Course Specification: course details (cont)

COURSE   Information Systems (Higher)

ASSESSMENT

To gain the award of the course, the candidate must achieve all the component units of the course, as well as the external assessment. External assessment will provide the basis for grading attainment in the course award.

When units are taken as component parts of a course, candidates will have the opportunity to demonstrate achievement beyond that required to attain each of the unit outcomes. This attainment may, where appropriate, be recorded and used to contribute towards course estimates, and to provide evidence for appeals. Additional details are provided, where appropriate, with the exemplar assessment materials. Further information on the key principles of assessment is provided in the paper *Assessment* (HSDU, May 1996) and in *Managing Assessment* (HSDU, 1998).

DETAILS OF THE INSTRUMENTS FOR INTERNAL ASSESSMENT

Each unit specification suggests a way of integrating assessment *within* that unit. The following table summarises the suggested integration of assessment for the units within the Information Systems course at Higher level.[2]

Outcomes ς	Database Systems OUTCOMES			Information Organisations OUTCOMES				Computer Applications Software OUTCOMES				
	1	2	3	1	2	3	4	1	2	3	4	5
Assessment 1	✓	✓	✓									
Assessment 2				✓	✓	✓	✓					
Assessment 3								✓	✓	✓	✓	
Assessment 4												✓

Table 1 - Assessment matrix for Information Systems at Higher level

Note that this table illustrates *internal integration*. It is also possible to combine assessment *between* units. Internal integration provides all the advantages of integration (reduced time for assessment, more holistic activity, etc.) while retaining the discrete identity of each unit and affording the inherent benefits of a unitised system.

The above table illustrates how the twelve outcomes within the component units can be assessed using four instruments of assessment. Outline details of each assessment follow.

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[2] Assuming that the optional unit is *Computer Application Software*.

National Course Specification: course details (cont)

COURSE Information Systems (Higher)

Assessment 1

This assessment combines all of the outcomes within the *Database Systems* unit. The assessment would be in the form of a project which would involve the candidate in analysing a system (Outcome 1) and designing (Outcome 2) and implementing (Outcome 3) a database model of that system.

Assessment 2

This assessment combines all the outcomes within the *Information Organisation* unit. The assessment would be in the form of an extended essay which would involve the candidate in explaining the value of information (Outcome 1), describing the characteristics and sources of information (Outcome 2), relating this to a specific information system (Outcome 3) and exploring the social, ethical and legal implications of contemporary Information Systems (Outcome 4).

Assessment 3

This assessment combines four outcomes from the *Computer Application Software* unit. The assessment would be in the form of a practical assignment which would involve the candidate in producing a magazine-type review of two software products. Candidates would select software from an in-house software library (Outcome 1), install and customise at least three of these products (Outcome 2), exploring the advanced features of two diverse products (Outcome 3), and then evaluating and comparing two similar products (Outcome 4).

Assessment 4

This assessment is simply the unit assessment for Outcome 5 described within the unit specification and is not further described here.

These outline descriptions give an indication of the type of assessment that could be used to integrate assessment, and thereby reduce the assessment burden on candidates and staff. They are provided for illustration only. Fully developed assessment specifications will be provided as part of the National Assessment Bank.

DETAILS OF THE INSTRUMENTS FOR EXTERNAL ASSESSMENT

External (course) assessment should provide opportunities to demonstrate:

- retention of knowledge, understanding and skills over a longer period of time
- the integration of knowledge, understanding and skills acquired in component units
- application of knowledge, understanding and skills in more complex contexts
- application of knowledge, understanding and skills in less familiar contexts

The course assessment for Information Systems at Higher level will consist of two components with weightings as follows:

- coursework 30%
- written examination 70%.

National Course Specification: course details (cont)

COURSE Information Systems (Higher)

Coursework

The coursework component assesses the level of the candidates' attainment in the practical skills of applying information systems. It also provides a context for the integration of their knowledge and skills in applying information systems. This includes the ability to analyse problems and design, implement and evaluate their solutions.

The coursework specification at Higher level will take one of two forms. An **integrated coursework** which encompasses the requirements of the coursework together with all of the outcomes from one of the component units of the course OR a **stand-alone coursework** which **may cover** outcomes **from different units** and has been designed for the sole purpose of appraising candidates' practical skills of applying information systems and integrating knowledge and skills.

Both types of coursework may reduce the burden of assessment on candidates by encompassing the requirements of the coursework together with the outcomes from units within this course. This single assessment activity will generate evidence for the purposes of both internal and external assessment.

Candidates' work will be assessed internally by teachers and lecturers and moderated externally by SQA.

Written examination

Comprising a single paper of 2 hours 30 minutes' duration. The examination will be set and marked by the Scottish Qualifications Authority. The paper will be divided into two sections:

- **Section 1** will allow candidates the opportunity to demonstrate retention of the knowledge, understanding and problem solving skills relating to the core units through the use of extended questions that sample across the course content
- **Section 2** will be sub-divided to provide questions on each optional unit and will provide candidates with the opportunity to demonstrate the ability to integrate the knowledge, understanding and problem solving skills acquired in the component units; and apply knowledge, understanding and problem solving skills to more complex, or less familiar contexts through the use of extended response questions

GRADE DESCRIPTIONS

Success in the course at grades C, B and A will be determined by the sum of performances in both components (coursework and written examination). These performances will be assessed through detailed marking schemes and the resulting mark will be used to grade the candidate's overall performance.

The characteristics of candidates' performance at grade C and at grade A are described below. These descriptions will assist examiners in setting examination papers and will help assessors and moderators in determining a national standard for candidates' coursework. The descriptions relate to the previously stated objectives of external assessment (see above).

National Course Specification: course details (cont)

COURSE   Information Systems (Higher)

Table 2 - Grade descriptions for Information Systems at Higher

GRADE C	GRADE A
• **Retention of knowledge, understanding and skills over a longer period of time**	
Candidates are able to identify and describe *some* facts and concepts to the standard defined within the performance criteria. Candidates are able to apply their skills in the context of an integrated assessment that encompasses outcomes from more than one unit to the standards defined by the related performance criteria.	Candidates are able to identify and describe *most* facts and concepts to the standard defined within the performance criteria. Candidates are able to apply their skills in the context of an integrated assessment that encompasses outcomes from more than one unit to standards that *exceed* the related performance criteria.
• **The integration of knowledge, understanding and skills acquired in component units**	
Candidates are able to apply their knowledge and skills in the context of specific units. Candidates are able to apply their skills in the context of a practical coursework which integrates outcomes from more than one unit.	Candidates are able to integrate knowledge and understanding acquired *in different component units*. Candidates are able to apply their skills in the context of a practical coursework which integrates outcomes from more than one unit *and skills are comfortably transferred and synthesised.*
• **Application of knowledge, understanding and skills in more complex contexts**	
Candidates are able to apply their knowledge and understanding in simple contexts, directly related to the component units. The artefact that results from practical activity meets the standards defined by the associated performance criteria.	Candidates are able to apply their knowledge and understanding in contexts that derive from outcomes in more than one unit. The artefact that results from practical activity *exceeds* the standards defined by the associated performance criteria (which may relate to quality or speed).
• **Application of knowledge, understanding and skills in less familiar contexts.**	
Candidates are able to apply their knowledge and understanding in familiar contexts. Candidates are able to carry out defined tasks to the standards defined in the associated performance criteria.	Candidates are able to apply their knowledge and understanding in less familiar contexts. Candidates are able to resolve non-routine problems that arise during their practical activity.

National Course Specification: course details (cont)

COURSE Information Systems (Higher)

Relationship of the course to the component units

The course consists of three component units, plus an additional 40 hours of study. An external examination tests the candidates' knowledge and understanding of the content covered in all three units and their ability to demonstrate and to integrate skills acquired throughout the course.

The criteria for a grade C in this course closely reflect the level of competence required for success in the component units. However, the external assessment of the course makes specific additional demands on the candidates.

The following table summarises the course in the form of a (brief) syllabus and relates each topic to a component unit. The topics were previously described in the course contents section.

Table 3 – Course summary for Information Systems at Higher

Database systems	Component unit(s)	Outcome(s)
Candidates should be able to:		
construct a normalised data model of an existing system	Database Systems	1
design database structures to represent the normalised data model	Database Systems	2
implement a designed database structure	Database Systems	3
Attributes of information		
Candidates should be able to:		
explain the value of information	Information Organisation	1
describe the characteristics and sources of information	Information Organisation	2
Contemporary Information Systems		
Candidates should be able to:		
investigate the organisation of a contemporary information system	Information Organisation	3
Social, ethical and legal implications		
Candidates should be able to:		
explain the social, ethical and legal implications of Information Systems	Information Organisation	4
Candidates should select one topic from the following:		
Computer applications: application software		
Candidates should be able to:		
select software for specific applications	Computer Application Software	1
install and customise application software	Computer Application Software	2
explore the advanced features of contemporary application software	Computer Application Software	3
evaluate and compare software products	Computer Application Software	4

National Course Specification: course details (cont)

COURSE   Information Systems (Higher)

Contemporary Information Systems: expert systems		
Candidates should be able to:		
describe characteristics of an expert system	Expert Systems	1
use an expert system	Expert Systems	2
construct a working expert system	Expert Systems	3
evaluate an expert system	Expert Systems	4
Contemporary Information Systems: hypermedia		
Candidates should be able to:		
describe the historical development of hypermedia systems	Hypermedia	1
describe the architecture of hypermedia systems	Hypermedia	2
construct a hypermedia application	Hypermedia	3
Contemporary developments in Information Systems[3]		
Candidates should be able to:		
describe contemporary developments relating to application software	Computer Application Software	5

APPROACHES TO LEARNING AND TEACHING

Advice on the delivery of each component unit is given within the support notes section of each unit specification. The Subject Guide provides generic advice applicable to all computing-related courses and units. This section provides further guidance on learning and teaching in a course context. In addition to the unit and course documentation and the Subject Guide, support materials will be provided to assist teachers and lecturers in their delivery of courses and units.

In designing the Information Systems courses, a number of topics were identified as important at various levels within the framework of provision. These multi-level topics (or themes) relate to the following areas:

- database systems
- computer applications
- attributes of information
- contemporary Information Systems (such as the Internet and multimedia)
- contemporary developments
- social, ethical and legal implications

Each of these topics appears in various units at various levels. For example, database systems appear within the Information Systems courses at every level. The identification of these themes permits the teacher to take a more holistic approach when discussing any of these topics so that knowledge and skills gained as part of one unit can contribute to another (at the same level or another level). The following table illustrates how these topics are distributed between units within the Higher course.

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[3] Candidates should only undertake this part of the syllabus if they elect the appropriate optional unit.

National Course Specification: course details (cont)

COURSE   Information Systems (Higher)

Integration of learning and teaching within the Information Systems course at Higher level

Integrative Topic	Database Systems	Information Organisation	Computer Application Software	Expert Systems	Hyper-media
Computer applications	✓		✓	✓	✓
Information attributes	✓	✓			✓
Database systems	✓	✓	✓	✓	
Contemporary systems				✓	✓
Contemporary developments		✓			✓
Implications		✓	✓		

The above table illustrates that the teaching of database systems (for example) can contribute to various outcomes within several units. The use of database software is mandatory within the *Database Systems* unit but can also be used as one of the software products that must be studied as part of the *Computer Application Software* unit and can contribute towards an outcome within the *Information Organisation* unit. Application software is an important part of several units and the careful selection of software products can reduce the time spent on teaching and learning.

Each unit specification has a section on learning and teaching and this, together with the above advice on learning and teaching in a course context, should assist teachers and lecturers in delivering the component units. These topics also appear within Information Systems courses at other levels. So, for example, the social implications of Information Systems is a recurring topic within courses at various levels and this facilitates bi-level delivery. This holistic approach to topics within (and between) Information Systems courses will help to ensure efficient and effective teaching and learning. The table illustrates that candidates can acquire knowledge and skills in an integrated manner rather than from teaching on an outcome by outcome (or even unit by unit) basis. The identification of these integrative topics will help teachers deliver the necessary knowledge and skills in a holistic and 'natural' manner.

National Course Specification: course details (cont)

COURSE   Information Systems (Higher)

An important objective of the course is to stimulate candidates' interest in, and enjoyment of, information technology. This can be achieved through innovative teaching methods such as the use of leisure software to deliver particular unit outcomes. Contemporary computer games are rich in features, and their complex structure can stimulate interest and foster confidence in the use of IT. They are particularly suited to developing candidates' explorative skills which is an important part of this course.

A variety of support materials will be produced to assist teachers and lecturers in their delivery of the component units and exemplar assessment materials will be provided as part of a National Assessment Bank. A wide range of learning media is available to assist teachers in delivering computing-related topics. These materials are available in a variety of formats (such as videotape and CD-ROM). The Internet is a rich source of learning and teaching materials for Information Systems courses. An important part of candidates' learning is the acquisition and development of a technical vocabulary.

Each unit specification has a section on learning and teaching and this, together with the above advice on learning and teaching in a course context, should assist teachers and lecturers in delivering the component units. Further details on learning and teaching are provided in the Subject Guide which provides additional information on the delivery of Information Systems courses and units.

Use of the additional 40 hours

The course allows 40 hours of additional flexible time. Appropriate activities that could be undertaken might include:

- preparing for external assessment
- remediation and re-assessment
- consolidation of learning
- formative assessment
- preparation of practical coursework for course assessment
- extending the range of study
- developing study skills
- visits

National Course Specification: course details (cont)

COURSE　　　　　Information Systems (Higher)

SPECIAL NEEDS

This course specification is intended to ensure that there are no artificial barriers to learning or assessment. Special 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 Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

SUBJECT GUIDES

A Subject Guide to accompany the Arrangements documents has been produced by the Higher Still Development Unit (HSDU) in partnership with the Scottish Consultative Council on the Curriculum (SCCC) and Scottish Further Education Unit (SFEU). The Guide provides further advice and information about:

- support materials for each course
- learning and teaching approaches in addition to the information provided in the Arrangements document
- assessment
- ensuring appropriate access for candidates with special educational needs

The Subject Guide is intended to support the information contained in the Arrangements document. The SQA Arrangements documents contain the standards against which candidates are assessed.

SCOTTISH
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National Unit Specification: general information

UNIT   Database Systems (Higher)

NUMBER   D299 12

COURSE   Information Systems (Higher)

SUMMARY

This unit is designed to develop a knowledge and understanding of data analysis and structuring techniques, and to provide an opportunity to apply this knowledge through the use of contemporary database software.

OUTCOMES

1   Construct a data model of an existing system.
2   Design database structures to represent a data model of an existing system.
3   Implement a designed database structure based on an existing system.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- *Database Systems (Int 2)* unit
- Information Systems course at Intermediate 2 level
- Standard Grade in Computing Studies (Grade 1 or 2)
- Equivalent

CREDIT VALUE

1 credit at Higher.

Additional copies of this unit specification can be purchased from the Scottish Qualifications Authority. The cost for each unit specification is £2.50 (minimum order £5).

National Unit Specification: general information (cont)

UNIT   Database Systems (Higher)

CORE SKILLS

This unit gives automatic certification of the following:

Complete core skills for the unit   None

Core skills components for the unit   Critical Thinking   H
                                                   Planning and Organising H

Additional information about core skills is published *in Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT   Database Systems (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Construct a data model of an existing system.

Performance criteria

(a)   Primary entities and their component data items are accurately identified and correctly described.
(b)   Repeating groups are correctly removed from data models.
(c)   Relationships between entities are accurately determined and correctly represented.
(d)   Data model diagram accurately represents normalised data model and existing system.
(e)   Functions required to operate on the model are accurately determined and described.

Note on range for the outcome

Relationships: one-to-many; many-to-many.
Data model diagram: data dictionary; entity-relationship diagram.
Functions: inputs; processes; outputs.

Evidence requirements
Performance evidence that the candidate can construct data models as detailed in PCs (a) - (e) for all classes in the range. This should be provided, for PCs (a) - (d), by a data model constructed from a narrative description of a system involving at least three entities and by descriptions of all required functions for PC (e).

OUTCOME 2

Design database structures to represent a data model of an existing system.

Performance criteria

(a)   Database structure and data item names are appropriate to the data model.
(b)   Unique keys are chosen for all database structures.
(c)   Data item characteristics correctly represent the data model.
(d)   Data item validity checks correctly represent the data model.
(e)   Designed database structures are appropriate to the intended implementation method.

Note on range for the outcome

Characteristics: size; type; key.
Validity checks: presence; range; restricted choice.

Evidence requirements

Performance evidence that the candidate can design a database structure comprising at least three entities and including integer, real, text, date and currency types as detailed in PCs (a) - (e) for all classes in the range.

National Unit Specification: statement of standards (cont)

UNIT   Database Systems (Higher)

OUTCOME 3

Implement a designed database structure based on an existing system.

Performance criteria
(a)   The design is correctly implemented in terms of database structures.
(b)   Data manipulations are performed effectively.
(c)   Queries are carried out efficiently to meet given criteria.
(d)   Reports are produced to meet given specifications.
(e)   Implementation is evaluated against the existing system.
(f)   Use of hardware and software is effective and responsible, and data is well managed and secure.

Note on range for the outcome

Database structure: name; data items; validity checks; keys.
Manipulations: edit; sort; insert; delete.
Queries: textual; numeric; exact; inexact; combinations of search criteria.

Evidence requirements

Performance evidence that the candidate can implement a database structure comprising at least three entities and including integer, real, text, date and currency types as detailed in the PCs (a), (b), (c), (d) and (f) for all classes in the range.

Written or oral evidence that the candidate can evaluate an implemented database structure as detailed in PC (e).

National Unit Specification: support notes

UNIT   Database Systems (Higher)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

This unit may be delivered as a stand-alone unit or in combination with other units as part of the Information Systems course at Higher level. The details of content given earlier provide information on the delivery and assessment of this unit within the context of a coherent course.

Corresponding to Outcomes 1-3
This unit is the second in a series of units relating to database systems (corresponding units exist at Intermediate 2 and Advanced Higher). It deals with the analysis of an existing non-computer based data storage and use system, and the subsequent design and implementation of a computer based system. The importance of this as a total process is critical – it is what distinguishes competent and efficient use of database software from casual use of a computer application package.

As a guide, approximately three-quarters of the time allocated to this unit should be allocated to Outcomes 1 and 2 – particularly where candidates have prior experience of the use of database packages.

The terminology used in the performance criteria and range statements is generic and may be interpreted as appropriate to the database package in use. For example 'data structures' can be files or tables containing groups of 'data items' (often referred to as fields) in records.

Outcome 1
This outcome introduces the concept of data analysis as an essential prerequisite to the design and implementation of database systems. The systems to be analysed should be relatively simple and familiar (at least in concept) to the candidate but nonetheless appropriate for implementation as a database. The systems need only comprise straightforward data types such as text and number (including currency and date). The inclusion of more complex data such as video, still images or sound clips should be considered as possible extensions.

PCs (a) and (b) require the identification and description of data items and entities and removal of repeating groups. Descriptions, at this stage, should be in plain English and relate to the existing system. All data items should first be identified and then grouped into appropriate entities and partially normalised. The normalisation (removal of repeating groups) should not be taken to third normal form given the limited scope of the required systems.

PC (c) is concerned with the relationships between entities and PC (d) with representing the data model. There are a number of formal methods of representing data models and the structure of data dictionaries; however, these need not be used so long as the required information is clearly presented. The data item description section of the data dictionary should include information, if appropriate, on the range of values which are valid for each data item and whether the data items are required or can be omitted.

National Unit Specification: support notes (cont)

UNIT Database Systems (Higher)

PC (e) deals with the description, in general terms, of the inputs, processing and outputs associated with the system. The analysis of the system should identify the benefits to be expected from computerisation including potential new uses of the stored data.

An example of a suitable system might be a video rental shop where the existing system involves individual record cards for each member on which details of each video rented are also recorded. Normalisation of the resulting data items would initially produce two entities: a membership list and a stock list with a many-to-many relationship between them. This would be highly inefficient and difficult to implement. Further normalisation would produce a third entity: transaction records. In this scenario the membership list is a primary entity with a one-to-many relationship with the transaction records since each transaction record relates to only one member. The membership list will contain data items such as name and address of the member and use a unique identifier for each member. The stock list (also a primary entity) will also have a one-to-many relationship with the transaction records since each transaction record relates to only one video.

Outcome 2

This outcome relates to the design of database structures. This should be interpreted in the engineering sense, that is, fitness for purpose, form-following-function and ease of use. The concept of computer system (including database) design and implementation as an engineering discipline (Information System Engineering) should be emphasised.

For PC (a) guidance should be provided as to the suitable naming of data structures and items (the parallels with high-level language programming can be drawn). This should include naming conventions and the use of meaningful names.

PCs (b) to (d) define how the candidate's design should be assessed as a representation of the data model. For PC (b) the choice of keys should reflect the requirements of the functions which will operate on the model. For PC (c) the designed data item characteristics should be appropriate to the actual data being represented: for example, dates should be represented by data items of type 'date' not 'number' or 'text'. The validity checks in PC (d) should be expressed in simple language such as 'a single character from A to F inclusive', 'this item is optional', 'an integer between 1 and 100 inclusive' which must be compatible with the intended implementation method.

For PC (e) the candidate should become familiar with the facilities and features of the intended implementation method before or during the design phase. Ideally, the candidate will have used the database package before starting this unit. The candidate should be encouraged to investigate the data validation features of the package and to make use of these in the database design. Any limitations on field, record or structure size imposed by the package should be identified and implications for the design considered.

The capability of the package to store complex data types (such as video) should be explored by the candidate although the actual design need not include them.

National Unit Specification: support notes (cont)

UNIT   Database Systems (Higher)

Outcome 3

This outcome covers implementation of a designed structure using a database package.

PC (a) requires that the structures which are implemented correspond to those designed. This means that all of the characteristics designed for each data item must be accurately reflected by the implemented structure.

PC (b) covers the entry of data into the implemented structures. This outcome centres on the implementation of the designed structures and, therefore, the candidate is not required to enter manually large amounts of data. It is, however, important that sufficient data should be entered to test that the validity checks and field characteristics match the design. The implementation should include simple data entry forms where possible.

PCs (c) and (d) involve use of the facilities of the database package to process the entered data and produce meaningful outputs. Returning to the video shop scenario, an example of a suitable query would be identifying overdue rentals. Reports could include member and stock lists, and member transaction reports. Manipulations could include adding and deleting members and stock, amendment of member details (such as address) and sorting to produce a list of members in alphabetical order.

PC (e) asks for a comparison of the existing (non-computerised) system with the newly implemented database structure. This should cover such elements as: ease of use, potential for information abstraction (eg, popularity of particular titles, inactive members) and data capacity.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

A candidate-centred, resource-based learning approach is recommended. Candidates will require access to appropriate computer hardware and software at various stages within this unit. To enliven learning, the use of video, audio and multimedia learning aids is recommended.

While the distribution of time between the outcomes will vary, candidates might be expected to complete each outcome within the following timescale:

Outcome 1   15 hours
Outcome 2   10 hours
Outcome 3   15 hours

National Unit Specification: support notes (cont)

UNIT Database Systems (Higher)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Schools/colleges may use the instruments of assessment which are considered to be most appropriate. Examples of instruments of assessment which could be used are as follows:

Outcome 1   Assignment involving the candidate in analysing a simple system leading to the production of a data model.

Outcome 2   Assignment involving the candidate in producing a design meeting the requirements of the data model.

Outcome 3   Practical exercise involving the candidate in implementation of the designed data structures.
Short report evaluating implemented data structure.

During the work of the unit, candidates should have several opportunities to develop their practical skills, and should be assessed at appropriate points. Terminology should be presented in context throughout the module. Where the candidate is unsuccessful in achieving an outcome, provision should be made for additional support and re-assessment.

The three assessments shown could sensibly be treated as components of a single, integrated assessment taking the form of a case study, which starts with analysis of an existing system, moves to design of a new, computerised system and then to implementation and evaluation of the design. In this case, the 'output' of each outcome (as defined by the evidence requirements) becomes the starting point of the following outcome. This approach mirrors that which should actually occur in a real situation.

Written evidence may take various forms including handwriting and word processed text or other forms of written communication that are more suited to candidates with physical disabilities.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special 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 Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

National Unit Specification: general information

UNIT   Information Organisation (Higher)

NUMBER   D303 12

COURSE   Information Systems (Higher)

SUMMARY

This unit is designed to develop an appreciation of the value of information to individuals and organisations together with an awareness of the sources of information and practice in accessing these sources.

OUTCOMES

1   Explain the value of information.
2   Describe the characteristics and sources of information.
3   Investigate the organisation of contemporary information systems.
4   Explain the social, ethical and legal implications of information systems.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- Information Systems course at Intermediate 2 level
- Standard Grade in Computing Studies (Grade 1 or 2)
- Equivalent

Administrative Information

Additional copies of this unit specification can be purchased from the Scottish Qualifications Authority. The cost for each unit specification is £2.50 (minimum order £5).

National Unit Specification: general information (cont)

UNIT   Information Organisation (Higher)

CREDIT VALUE

1 credit at Higher.

CORE SKILLS

There is no automatic certification of core skills or core skills components in this unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT   Information Organisation (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Explain the value of information.

Performance criteria
(a)   The distinction between data and information is correctly explained.
(b)   The uses of information to individuals and organisations are correctly explained.
(c)   Information is accurately classified as operational, tactical or strategic.
(d)   A list of personal information requirements is produced.

Note on range for the outcome
Uses: decision making; planning; control; education.

Evidence requirements
Written or other evidence that the candidate can explain the value of information as detailed in PCs (a) - (c) for all classes in the range.

A list of personal information requirements as detailed in PC (d).

OUTCOME 2

Describe the characteristics and sources of information.

Performance criteria
(a)   The characteristics of information are correctly described.
(b)   The major sources of information are correctly described.
(c)   The types of media for transmitting information are correctly described.

Note on range for the outcome
Characteristics: accessibility; accuracy; appropriateness; completeness; conciseness; cost; legality (including copyright); presentation; structure; timeliness; value.
Sources: internal (including intranets); external (including the Internet).
Media: broadcast; digital; paper.

Evidence requirements
Oral or written evidence that the candidate can describe the characteristics and sources of information as detailed in the PCs (a), (b) and (c) for all classes in the range. At least two diverse examples of each source must be described in terms of their characteristics and media. All three types of media must be encompassed in the chosen examples.

National Unit Specification: statement of standards (cont)

UNIT   Information Organisation (Higher)

OUTCOME 3

Investigate the organisation of contemporary information systems.

Performance criteria
(a)   The information characteristics of the system are correctly described.
(b)   The technical components of the system are correctly described.
(c)   The applications of the information system are correctly described.
(d)   The searching and navigation facilities are correctly described.
(e)   The structure of the information system is correctly described.
(f)   The investigation is carried out efficiently and the use of the information system is effective.

Note on range for the outcome
Technical components: hardware; software; communications.

Evidence requirements
Written or oral evidence that the candidate can describe the organisation of contemporary information systems as detailed in PCs (a) - (e) for all classes in the range. At least two diverse information systems should be described.

Performance evidence that the candidate can investigate and use contemporary information systems as detailed in PC (f). At least two diverse information systems should be investigated and used.

OUTCOME 4

Explain the social, ethical and legal implications of information systems.

Performance criteria

(a)   The social implications of information technology are accurately explained.
(b)   The ethical implications of information technology are accurately explained.
(c)   The legal requirements relating to information technology are accurately explained.
(d)   The extent and limitations of current legislation are correctly explained.

Note on range for the outcome
There are no specific requirements as to the range of contexts within which the outcome and performance criteria should be demonstrated. For further guidance on the range of content to be covered, see the support notes.

Evidence requirements
Oral or written evidence that the candidate can explain the social, ethical and legal implications of information technology as detailed in PCs (a) - (d).

National Unit Specification: support notes

UNIT   Information Organisation (Higher)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

This unit may be delivered as a stand-alone unit or in combination with other units as part of the Information Systems course at Higher level. The details of content given earlier provide information on the delivery and assessment of this unit within the context of a coherent course.

Corresponding to outcomes 1-4

This unit is intended to introduce candidates to the value, characteristics and organisation of contemporary information systems. The social, ethical and legal implications of such systems are also explored. The interpretation of the term 'information system' is broad, encompassing a wide range of systems including intranets and the Internet together with other complex, structured data repositories.

Outcome 1

This outcome relates to the value of information. The critical aspect of this outcome is to make candidates aware of the importance of information and to relate this to their own circumstances.

Candidates are required to distinguish between 'data' and 'information' (PC (a)). Data should be presented as unprocessed facts and figures; information as processed data and something that adds to the recipient's knowledge. Outcome 2 explores the characteristics of information and this will help to distinguish between these terms.

The uses of information (PC (b)) are defined in the range statements. These are decision making, planning, control and education. These should be explained in a number of contexts rather than a single context. So, for example, the use of information for decision making should be explained in a commercial and personal context (that is, information is used to make commercial decisions and personal decisions). While all the defined uses should be explained, the critical importance of information for decision making should be emphasised.

Candidates must be aware of the distinction between operational, tactical and strategic information (PC (c)) and must produce a list of personal information requirements (PC (d)). PCs (c) and (d) may be combined so that each item on the candidate's list of personal information requirements is classified as operational, tactical or strategic.

National Unit Specification: support notes (cont)

UNIT Information Organisation (Higher)

Outcome 2

This outcome relates to the characteristics and sources of information. The characteristics (PC (a)) are defined in the range statement. There is no universal definition of the characteristics of information but the defined list is comprehensive and encompasses most aspects of information. A brief explanation of each characteristic follows.

Characteristic	Explanation
Accessibility	The ease of access to the information.
Accuracy	The correctness of the information; truthfulness.
Appropriateness	Relevance or suitability or fitness of the information.
Completeness	Amount of information; omissions.
Conciseness	Brevity of information; efficiency of information.
Cost	The price or charge for information.
Legality	Relating to acquisition, copyright and use of information.
Presentation	The appearance of the information; aesthetic aspects.
Structure	The organisation of the information; navigation and search capabilities.
Timeliness	When the information is received; its topicality.
Value	Worth or importance of the information.

The inter-relationship between these characteristics should be emphasised. For example, the value of information may be related to its timeliness; and completeness and conciseness are usually competing characteristics.

The major sources of information must also be known (PC (b)). These relate to internal and external sources. Internal sources include paper documentation, procedure manuals and local-area networks (or intranets); external sources include published documentation, broadcast media and the Internet.

Candidates should describe the main types of media for transmitting information (PC (c)). These are defined in the range statement as paper, digital and broadcast media. These should be described in terms of their technical and functional characteristics. Paper-based information systems will be familiar to most candidates; it is important to emphasise the migration to digital and broadcast media.

The evidence requirements involve the candidate in describing the characteristics of two diverse examples of each source. So, for example, a candidate may choose procedure manuals (paper-based) and local-area networks (digital) as two examples of internal sources; and television (broadcast) and the Internet (digital) as examples of external sources. Note that all three types of media (paper, digital and broadcast) must be included in the selected examples.

Outcome 3

This outcome relates to the organisation of contemporary information systems. The candidate is required to explore at least two contemporary information systems (PC (f)). Suitable examples include the World Wide Web, Usenet newsgroups, teletext systems, intranets, or other internal or external database systems. The investigation of paper-based information systems is not appropriate; nor is the investigation of (relatively) simple digital systems (such as CD-ROM databases). The critical aspect is the candidate's ability to investigate and describe the technical and information characteristics of contemporary information systems. So, the choice of system is not critical so long as it is sufficiently large and complex to satisfy the performance criteria, range and evidence requirements.

National Unit Specification: support notes (cont)

UNIT   Information Organisation (Higher)

Candidates must describe the technical and information characteristics of the system (PC (a) and (b)). The technical description must relate to hardware, software and data communication components. While it is not expected that candidates should provide a highly technical description, the descriptions should be technically correct and include the major components of each sub-system (that is, software, hardware and data communications). The characteristics of the information provided by the system should relate to the characteristics defined in outcome 2 (that is, accessibility, accuracy, appropriateness, completeness, conciseness, cost, copyright, presentation, structure, timeliness and value). Of course, any one of these may be more or less relevant depending on the nature of the information system.

The uses of the information system should be described (PC (c)). The system may be generic (such as World Wide Web or teletext systems) or specialised (such as legal or medical databases). In describing generic systems the breadth of information should be emphasised.

The structure of the system and its searching and navigation facilities must also be described (PC (d) and (e)). These aspects are inter-related in that the structure of the system may affect its navigation and search capabilities. For example, a hypertext system (such as the World Wide Web) facilitates non-linear navigation and searching; broadcast teletext systems provide much simpler navigation and searching facilities.

Outcome 4

This outcome relates to the social, ethical and legal implications of IT. The social implications (PC (a)) include the effects of IT on society, such as employment trends and effects on the family. There are likely to be widespread changes to the composition of the workforce with increasing numbers of 'information workers' and 'telecommuters'. The creation of 'information rich' and 'information poor' individuals and the relationship between people and technology are suitable topics for discussion. The effects on the family include the potential for IT to create closed communities resulting in the loss of certain social skills.

Ethical considerations (PC (b)) relate to the way in which IT is used and embraces on-line conduct (network etiquette or 'netiquette'), types of information (which encompass censorship) and the uses of information (which encompass privacy). The Internet is a rich source of information on the social and ethical implications of IT.

The legal implications of IT (PC (c)) relate to contemporary legislation on the use and communication of information. At the time of writing, the main acts are the Data Protection Act (1984), the Copyright, Design & Patents Act (1988) and the Computer Misuse Act (1990). Candidates are required to know the main requirements and the limitations of current legislation (PC (c) and (d)). The desirability (or otherwise) of a Freedom of Information Act could be discussed.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Owing to the descriptive nature of many of the outcomes within this unit, it is anticipated that delivery will be teacher-led. However, learning can be enlivened through the use of outside speakers, visits and the use of audio visual or multimedia learning aids.

National Unit Specification: support notes (cont)

UNIT   Information Organisation (Higher)

The Internet is a rich source of resources to support this unit, and teachers and lecturers are advised to explore Web and newsgroup facilities for information on the topics contained within this unit.

While the distribution of time between the outcomes will vary, candidates might be expected to complete each outcome within the following timescale:

Outcome 1   5 hours
Outcome 2   10 hours
Outcome 3   20 hours
Outcome 4   5 hours

The nature of certain outcomes within this unit (such as Outcome 1) will present challenges to young people who may lack the experience to relate to the outcome. It is particularly important for this group of learners that teachers and lecturers exemplify concepts with meaningful examples which the candidate can relate to. In fact, all candidates will benefit from a wide range of examples, drawn from a variety of contexts (such as personal, community and workplace).

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Schools/colleges may use the instruments of assessment which are considered to be most appropriate. Examples of instruments of assessment which could be used are as follows:

Outcome 1   Structured questions on the value of information.

                   Practical assignment to produce a personal list of information requirements.

Outcome 2   Extended response questions on the characteristics and sources of information.

Outcome 3   Investigation into the organisation of information systems.

Outcome 4   Structured questions on the social, ethical and legal implications of information systems.

During the work of the unit, candidates should have several opportunities to develop their practical skills and should be assessed at appropriate points. Terminology should be presented in context throughout the module. Where the candidate is unsuccessful in achieving an outcome, provision should be made for additional support and re-assessment. There are opportunities to integrate assessment within this unit. For example, the four outcomes could be assessed using a single instrument of assessment. The assessment would be in the form of an extended essay which would involve the candidate in explaining the value of information (Outcome 1), describing the characteristics and sources of information (Outcome 2), relating this to a specific information system (Outcome 3), and exploring the social, ethical and legal implications of contemporary information systems (Outcome 4).

Written evidence may take various forms including handwriting and word processed text, or other forms of written communication that are more suited to candidates with physical disabilities.

National Unit Specification: support notes (cont)

UNIT   Information Organisation (Higher)

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special 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 Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

SCOTTISH
QUALIFICATIONS
AUTHORITY

National Unit Specification: general information

UNIT   Computer Application Software (Higher)

NUMBER   D094 12

COURSE   Information Systems (Higher)

SUMMARY

This unit is designed to develop advanced skills in the use of application software, together with the ability to select and evaluate a range of software products.

OUTCOMES

1   Select software for specific applications.
2   Install and customise application software.
3   Explore the advanced features of contemporary application software.
4   Evaluate and compare software products.
5   Describe contemporary developments relating to application software.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

*   *Computer Application Software (Int 2)* unit
*   Information Systems course at Intermediate 2 level
*   Standard Grade in Computing Studies (Grade 1 or 2)
*   Equivalent

National Unit Specification: general information (cont)

UNIT   Computer Application Software (Higher)

CREDIT VALUE

1 credit at Higher.

CORE SKILLS

There is no automatic certification of core skills or core skills components in this unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT   Computer Application Software (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Select software for specific applications.

Performance criteria

(a)   Types of application software are correctly described.
(b)   Factors affecting the choice of software are explained.
(c)   A number of appropriate software products are considered and one is selected.
(d)   The selected software product is justified in terms of cost, compatibility and functionality.

Note on range for the outcome

Types: Communications; database; graphics; financial; publishing; spreadsheet; reference; word-processing.
Factors: Compatibility; cost; functionality

Evidence requirements

Written or oral evidence that the candidate can select software for specific applications as detailed in PCs (a) - (d). Candidates must select specific software products to satisfy a minimum of three diverse applications.

OUTCOME 2

Install and customise application software.

Performance criteria

(a)   The factors affecting the installation of software are known.
(b)   The range of customisation features is known.
(c)   The installation is completed without assistance and the installed software executes correctly and efficiently.
(d)   The customisations are carried out efficiently and effectively and improve productivity or enhance ease of use or reflect personal preferences.
(e)   Legal requirements are known and observed.

Note on range for the outcome

Factors: storage; memory; peripherals
Customisation: user interfaces; automation.

National Unit Specification: statement of standards (cont)

UNIT   Computer Application Software (Higher)

Evidence requirements

Oral or written evidence that the candidate knows the factors that affect installation and the range of customisation features as detailed in PCs (a) and (b). The factors that affect installation should be described in generic terms; customisation features should be related to one or more specific product.

Performance evidence that the candidate can install and customise one piece of application software as detailed in PCs (c) - (e).

Oral or written evidence that the candidate knows the legal requirements as detailed in PC (e). The explanation should be expressed in generic terms for various classes of software and licensing arrangements.

OUTCOME 3

Explore the advanced features of contemporary application software.

Performance criteria
(a)   Use of documentation and on-line help is efficient and effective.
(b)   Exploration is carried out with limited assistance.
(c)   Exploration is effective in identifying advanced features.
(d)   Description of advanced features is accurate and concise.

Note on range for the outcome

Features: filing; editing; automation; communication; formatting; proofing; object linking.

Evidence requirements

Performance evidence that the candidate can explore the features of contemporary applications software as detailed in PCs (a) - (c).

Oral or written evidence that the candidate can describe the advanced features of at least two diverse types of application software as detailed in PC (d).

OUTCOME 4

Evaluate and compare software products.

Performance criteria
(a)   The products are evaluated in terms of key characteristics.
(b)   The products are compared in terms of key characteristics.
(c)   The evaluations and comparisons are accurate and concise.
(d)   Use of technical terminology is correct.

Note on range for the outcome

Key characteristics: cost; compatibility; functionality; ease of use (including user interface); speed.

National Unit Specification: statement of standards (cont)

UNIT Computer Application Software (Higher)

Evidence requirements

Oral or written evidence that the candidate can evaluate and compare at least two similar software products as detailed in PCs (a) - (d).

OUTCOME 5

Describe contemporary developments relating to application software.

Performance criteria

(a)   The developments relate to the application software and are non-trivial.
(b)   The developments are described in a historical context.
(c)   The stimulus to change is identified.
(d)   The descriptions are accurate, concise and technically correct.
(e)   The social, ethical and legal implications of the developments are accurately described.

Note on range for the outcome

Developments: relating to ease of use; relating to productivity; relating to functionality.

Evidence requirements

Written or oral evidence that the candidate can describe contemporary developments relating to applications software as detailed in PCs (a) - (e) for all classes in the range. A minimum of three diverse developments should be described: one relating to ease of use, one relating to productivity and one relating to functionality.

National Unit Specification: support notes

UNIT Computer Application Software (Higher)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

This unit may be delivered as a stand-alone unit or in combination with other units as part of the Information Systems course at Higher level. The details of content given earlier provide information on the delivery and assessment of this unit within the context of a coherent course.

This unit is the final one in a series of units entitled *Computer Application Software*. Similar units exist at Access, Intermediate 1 and Intermediate 2 levels. As such, candidates are expected to possess software skills prior to undertaking this unit.

Corresponding to Outcomes 1-5

A distinction is made between 'software' and 'program' throughout this unit specification. The term 'computer software' is taken to mean the combination of 'computer program' and associated 'documentation'. There are two types of computer software: systems software and application software. This unit only relates to application software and candidates are not required to know or use any type of systems software beyond that required to utilise application software.

Outcome 1

This outcome relates to the selection of computer software for specific purposes. Candidates are required to select actual software products. For example, a candidate may choose Microsoft Word for word processing or Photoshop for a graphics application.

Candidates are required to possess a general knowledge of the types of application software (PC (a)). The following types should be described:

- communications
- database
- graphics
- financial
- publishing
- spreadsheet
- reference
- word processing

Communications software includes e-mail, browsing and file transfer client software. Graphics software includes illustration and animation programs. Financial software includes accounting and personal finance packages. Publishing includes desktop publishing and Web publishing programs. Reference software includes a wide range of educational and information titles. The main purpose and functional characteristics of each type of package should be known.

National Unit Specification: support notes (cont)

UNIT Computer Application Software (Higher)

The distinction between the packages may be blurred (with some contemporary WP packages providing features normally associated with DTP software) and this tendency should be explained to candidates along with other contemporary developments, such as componentised software (consisting of various applets or objects).

The main factors affecting the choice of software are:

- compatibility
- cost
- functionality

These factors should be explained in generic terms rather than related to a specific software product (PC (b)).

In selecting a specific software product, candidates are required to consider a number of appropriate packages and then choose and justify the selection of a specific program (PC (c) and (d)). For example, in the context of a communications product, a candidate would shortlist two or three appropriate packages (these should be actual software products) and one would be selected and justified based on the defined criteria (ie, cost, compatibility and functionality). Candidates are not required to have personal experience of all (or any) of the shortlisted products. Their knowledge of these products may be derived from published information (such as product reviews or marketing information). Some candidates will be able to draw on personal experience of a wide range of computer software, and judgements based on first-hand experience should be encouraged (but are not essential).

Candidates are required to produce evidence that they have selected three diverse software products (see evidence requirements). This might be word processing software, graphics software and one example of communications software. It would not be appropriate for them to select two similar products (such as two database programs).

Outcome 2

This outcome relates to the installation and customisation of software. The performance criteria relate to an actual software product and candidates' written and practical work must also be undertaken in the context of a specific product (although installation can be described in generic terms). While the choice of program is open to the centre, it would be inappropriate to select a non-standard program with an unusual installation routine or limited or complex customisation facilities. Ideally, candidates should have the opportunity to experience a range of software with diverse installation and customisation routines.

Candidates are required to know the factors affecting the installation of software (PC (a)). These would typically include:

- compatibility with central processing unit (CPU)
- compatibility of operating system
- amount and availability of random access memory (RAM)
- amount of free disk space
- availability of peripherals
- configuration of operating system

UNIT   Computer Application Software (Higher)

For example, a software product would be written for a particular computer system (such as an Apple Macintosh system); it would require a specific operating system (such as Mac OS); it might also require particular peripherals (such as a mouse or scanner); it will require a certain amount of storage space (although there may be minimum, typical and maximum installation options); it will also require a minimum amount of memory (and candidates should be made aware that physical memory and free memory are not always the same); and it may require that the operating system is configured in a certain way (such as specific graphics drivers). Note that the evidence requirements relate to the generic factors that affect program installation.

Candidates should be aware of the program's customisation features (PC (b)). Since this performance criterion relates to specific software, this description will vary from product to product. Most contemporary software has a wide range of customisations including:

- menus
- toolbars
- keyboard
- colours
- editing
- printing
- viewing
- searching
- formatting

Certain automations can also be considered as customisations, and it would not be inappropriate to consider templates, style sheets and macro facilities. A clear distinction should be made between customisations performed at operating system level and customisations performed at the application level. For example, the user interface is normally configured through the operating system whereas program-specific customisations are normally configured within the application.

Candidates are required to actually install a specific program. They must complete this task without assistance from teachers or lecturers and the installed software must run correctly and efficiently (PC (c)). Program efficiency is important since it is possible to install a program successfully without optimising it for its operating environment, resulting in a program which loads correctly but runs less efficiently than it should. Examples of this include specifying less RAM or disk space than is actually available. In a similar vein, the customisations should be carried out efficiently and effectively (PC (d)). So, for example, it would not be acceptable for the candidate to take an inordinate amount of time when performing the customisations. The actual customisations performed must improve user productivity or enhance ease of use or reflect personal preferences (PC (d)). Examples of each include programming the keyboard with common text (productivity), customising the toolbar to include common commands (ease of use) and changing the colours to reflect personal preferences.

Candidates are required to know the legal constraints when installing application software (PC (e)). At the time of writing the Copyright, Design & Patents Act (1988) has the greatest bearing on this activity and candidates should be familiar with the main requirements of this Act. Teachers/lecturers should also distinguish between the main types of software with respect to copyright, that is, freeware, shareware, demonstration and commercial products. There may also be different requirements within a specific class of software. For example, different commercial products can have varying licensing arrangements.

National Unit Specification: support notes (cont)

UNIT Computer Application Software (Higher)

Outcome 3

This outcome relates to the exploration of contemporary software. The critical activity is the candidate's ability to explore software (PCs (a), (b), (c)) rather than his or her description of a specific software product (PC (d)). However, the latter provides evidence of the former and a written description of the features of a specific product is required. A wide variety of software may be explored, ranging from business applications to leisure software. However, the product selected must be capable of satisfying the prescribed performance criteria and associated range statement.

A crucial aspect of the candidate's exploration is his or her use of paper and electronic help facilities, and candidates are expected to utilise these throughout their research (PC (a)). Paper facilities include manufacturer's documentation, specially prepared notes or other printed descriptions. Electronic facilities include on-line help (which may be found locally or on the Internet), wizards and computer-based training materials.

It is required that candidates identify the main features of each product with limited assistance from the teacher (PC (b)). So, for example, it would be inappropriate for a candidate to make repeated requests for assistance during his or her exploration of a piece of software.

The candidate's exploration of the software should lead to the identification of the product's advanced features (PC (c)). The associated range statement defines the main features that the candidate should discover (although any one feature may be more or less relevant to different products). The identification of the features of the software is closely related to the description of the features (PC (d)) since the candidate will explore, identify and describe the advanced features of a specific product. While the focus for this outcome is the advanced features, the exploration and description should encompass most of the features of the product and only the most basic features should be omitted from the resulting description.

Outcome 4

This outcome relates to the evaluation and comparison of software products. Candidates must evaluate and compare a minimum of two (similar) products (see evidence requirements). A wide variety of software can be used for these purposes, ranging from business packages to leisure software.

The candidate is required to evaluate products in terms of key characteristics (PC (a)). The key characteristics are cost, compatibility, functionality, ease of use and speed. Note that some of these characteristics are inter related. So, for example, a specific product may be inexpensive but have limited functionality, or be very fast but difficult to use. The products must also be compared in terms of these characteristics (PC (b)). So, for example, if the candidate chose two graphics programs to evaluate and compares then he or she would do so in terms of these key characteristics. It would be desirable if the programs chosen had diverse characteristics, such as a shareware program (which is typically cheap, fast and easy to use but may have limited functionality and compatibility) and commercial software (widely compatible and feature-rich but may be expensive, slow and difficult to use). The evaluations and comparisons must be accurate and concise (PC (c)) so, for example, it would not be appropriate for a candidate to produce an incomplete or long-winded evaluation of a product. It is important that candidates employ technical terminology throughout (PC (d)) and it would not be acceptable for a candidate to avoid such terminology or use it incorrectly. So, for example, in comparing the compatibility of software products it is expected that the comparison would include details of the hardware and software requirements of each product.

National Unit Specification: support notes (cont)

UNIT   Computer Application Software (Higher)

Outcome 5

This outcome relates to contemporary developments in application software. The selected developments must relate to application software and must be non-trivial (PC (a)). So, for example, operating systems (OS) developments are not appropriate (although if OS developments lead to corresponding improvements in application software then they would be eligible for consideration). The identified developments must relate to ease of use or productivity or functionality.

The developments must be put in historical context and the stimulus to change must be described PC (b) and (c). For example, if improved artificial intelligence (AI) were identified as a current development in application software then the historical background to this development would be described together with the need for enhanced capabilities in this area.

The descriptions must be accurate, concise and technically correct (PC (d)) so, for example, careless use of technical terminology is unacceptable. The social, ethical and legal implications of each development must be considered (PC (e)). Social implications relate to the effects of the development on the individual or society; ethical implications relate to professional considerations; and legal implications relate to legislative consequences of the development. Of course, different developments will have different implications and a specific development may have many or few implications. The critical aspect of this performance criterion is that the candidate has considered the implications of the development rather than the scope of the development.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

A candidate-centred, resource-based learning approach is recommended. While the distribution of time between the outcomes will vary, candidates might be expected to complete each outcome within the following timescale:

Outcome 1   6 hours
Outcome 2   8 hours
Outcome 3   12 hours
Outcome 4   8 hours
Outcome 5   6 hours

A range of software will be required to deliver this unit. The recommended teaching approach (see below) requires candidate access to a small software library which candidates can use to undertake each of the outcomes. While two of the four outcomes can be undertaken in a theoretical context (Outcomes 1 and 4), it is recommended that all four outcomes are undertaken in an integrated manner using a candidate-centred approach to learning and teaching (see below). At a minimum, candidates will require the use of two pieces of contemporary software (Outcome 3).

National Unit Specification: support notes (cont)

UNIT   Computer Application Software (Higher)

It is possible for a suitably equipped centre to take a holistic approach to all four outcomes by providing the candidate with a library of software to select (Outcome 1), install and customise (Outcome 2), explore (Outcome 3) and then evaluate and compare. The library need not be extensive and may comprise a number of different software products such as commercial application software, commercial demonstration software, shareware and freeware. In a PC context, a suitable library of software might include the following programs:

Title	Application area	Type
Microsoft Works	Integrated	Commercial
Claris Works	Integrated	Demonstration
Photoshop	Graphics	Commercial
Paintshop Pro	Graphics	Shareware
Microsoft Publisher	Publishing	Demonstration
Claris Homepage	Design (Web)	Beta
HTML Pro	Design (Web)	Freeware
Encarta	Leisure (education)	Commercial

This sample library contains a mix of application areas and software types. Suitable software is available from a variety of sources including the Internet and CD-ROMs. A resource like this would permit all learning and teaching to be undertaken in a controlled context with candidates borrowing from the library as they undertake each outcome.

To enliven learning, candidates could undertake Outcome 4 in the style of a magazine review of two comparative software products.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Schools/colleges may use the instruments of assessment which are considered to be most appropriate. Examples of instruments of assessment which could be used are as follows:

Outcome 1   Case study whereby candidates are required to select software for three specific applications.

Outcome 2   Written assignment on the factors that affect installation and customisation for a specific software product.

Practical assignment involving the installation and customisation of one application package.

Written assignment on the legal requirements of software installation and customisation.

Outcome 3   Practical assignment relating to the exploration of the advanced features of contemporary software.

National Unit Specification: support notes (cont)

UNIT   Computer Application Software (Higher)

Outcome 4   Written assignment on the comparative features of two software products.

Outcome 5   Extended response question on contemporary developments relating to computer application software.

During the work of the unit, candidates should have several opportunities to develop their practical skills and should be assessed at appropriate points. Terminology should be presented in context throughout the module. Where the candidate is unsuccessful in achieving an outcome, provision should be made for remediation and re-assessment. There are opportunities to integrate assessment within this unit. For example, it is possible to undertake Outcomes 1-4 in the context of a single project which would be undertaken in the form of a magazine review of two software products. This would involve candidates in selecting software from an in-house software library (Outcome 1), installing and customising at least three of these products (Outcome 2), exploring the advanced features of two diverse products (Outcome 3) and then evaluating and comparing two similar products (Outcome 4).

Written evidence may take various forms including handwriting and word processed text, or other forms of written communication that are more suited to candidates with physical disabilities.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special 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 Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

National Unit Specification: general information

UNIT   Expert Systems (Higher)

NUMBER   D304 12

COURSE   Information Systems (Higher)

SUMMARY

This unit is designed to develop knowledge and skills in the use and construction of expert systems.

OUTCOMES

1 Describe the characteristics of an expert system.
2 Use an expert system to solve problems.
3 Construct a working expert system.
4 Evaluate an expert system.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- Information Systems course at Intermediate 2 level
- Standard Grade in Computing Studies (Grade 1 or 2)
- Equivalent

CREDIT VALUE

1 credit at Higher level.

National Unit Specification: general information (cont)

UNIT   Expert Systems (Higher)

CORE SKILLS

There is no automatic certification of core skills or core skills components in this unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT   Expert Systems (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Describe the characteristics of an expert system.

Performance criteria

(a)   The function of an expert system is clearly stated.
(b)   The description of the component parts of an expert system is correct.
(c)   An expert system is correctly categorised.
(d)   Limitations and social implications of expert systems are correctly described.

Note on range for the outcome
Components: knowledge base; inference engine; user interface.
Categories: used to advise; used to classify; used to diagnose; used to plan.

Evidence requirements
Written or oral evidence that the candidate can describe the characteristics of an expert system as detailed in PCs (a) - (d) for all classes in the range.

OUTCOME 2

Use an expert system to solve problems.

Performance criteria

(a)   Interaction with the expert system is efficient and effective.
(b)   Justification features are used to explain line of questioning and advice supplied.
(c)   Problems are resolved using appropriate test data.

Note on range for the outcome
There are no specific requirements as to the range of contexts within which the outcome and performance criteria should be demonstrated. For further guidance on the range of content to be covered, see support notes.

Evidence requirements
Performance evidence that the candidate can use an expert system to solve problems as detailed in PCs (a) - (c). The candidate is required to enter test data using at least two different knowledge bases.

National Unit Specification: statement of standards (cont)

UNIT Expert Systems (Higher)

OUTCOME 3

Construct a working expert system.

Performance criteria
(a)   The purpose of the expert system is clearly stated.
(b)   The knowledge domain is accurately and clearly stated.
(c)   Knowledge acquisition is methodical.
(d)   The system is implemented efficiently.
(e)   The system is adequately tested to ensure correctness.

Note on range for the outcome
Knowledge base: 20 - 50 rules; non-complex.

Evidence requirements
Written or oral evidence that the candidate can document an expert system as detailed in PCs (a), (b) and (c). Documentation should include a statement of purpose, identification of the knowledge domain, sources of knowledge and a listing of the knowledge base.

Performance evidence that the candidate can produce and test an expert system as detailed in PCs (d) and (e) for all classes.

OUTCOME 4

Evaluate an expert system.

Performance criteria
(a)   The domain and purpose of the expert system are correctly outlined.
(b)   The effectiveness of the system is measured in accordance with its stated purpose.
(c)   A relevant comparison is made between the expert system and a human expert.
(d)   Limitations are accurately identified and potential improvements are identified.

Note on range for the outcome
There are no specific requirements as to the range of contexts within which the outcome and performance criteria should be demonstrated. For further guidance on the range of context to be covered, see the support notes.

Evidence requirements
Written or oral evidence that the candidate can evaluate an expert system as detailed in PCs (a) - (d).

National Unit Specification: support notes

UNIT   Expert Systems (Higher)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

This unit may be delivered as a stand-alone unit or in combination with other units as part of the Information Systems course at Higher level. The details of content given earlier provide information on the delivery and assessment of this unit within the context of a coherent course.

Corresponding to Outcomes 1-4

In the context of this unit, the term 'expert system' is taken to mean the combination of 'computer software' and associated 'documentation' - no reference is made in the unit to the underlying hardware. The term 'expert' refers to the fact that the software contains expert human knowledge within a restricted specialist area.

Outcome 1

This outcome relates to the identification of the purpose and limitations of an expert system. The outcome aims to familiarise candidates with terminology associated with expert systems as well as providing candidates with the opportunity to consider the social implications of using expert systems. Candidates are required to describe the purpose of an expert system. This description could include the following terminology:

- contains expert knowledge
- knowledge is represented as facts and rules
- provides the user with advice
- contains knowledge on a restricted domain
- provides justification for the questions asked and advice given
- best used when human knowledge is scarce

Candidates are expected to describe the components of an expert system. These should be described in generic terms rather than related to a specific expert system (PC (b)).

In categorising an expert system, candidates are required to consider several different expert systems and then to categorise each depending on the type of output provided. Examples of each category of expert system could include:

- advise   — video watching expert system; magazine buying system
- classify   — yacht type expert system; dinosaur identification expert system
- diagnose   — machine fault testing expert system; soil analysis expert system
- plan   — organising a school trip expert system; menu planning expert system

Candidates would not be required to have personal experience of all the above expert systems, but it would be useful for them to have access to a variety of different types of expert system to allow the varying forms of output to become familiar.

National Unit Specification: support notes (cont)

UNIT   Expert Systems (Higher)

All expert systems are limited in the amount of knowledge they contain and the breadth of their domain. Candidates should show an understanding of this by providing written commentary, but it is not necessary for candidates to explain why this is the case. There are many social implications of using expert systems and candidates must show an appreciation of many of these. It is not necessary to draw on personal experience of, say, medical expert systems, investment advisors or automatic pilot systems. Candidates' knowledge of such products could be derived from published information, but they would be expected to comment on the effects of using such expert systems.

Comments should typically mention:

- liability for bad advice
- dependence on advice provided
- scarcity of human knowledge
- breadth of knowledge base

Outcome 2

This outcome relates to the use of expert systems. It aims to familiarise the candidate with the practical use of an expert system. The performance criteria relate only to the user interface of existing expert systems. There is no need for candidates to add to a knowledge base. Candidates should be provided with opportunities to access several different types of expert systems with varying levels of complexity. From the outset, candidates are expected to use expert systems to problem solve. This means that test data appropriate to a particular problem must be generated by the candidate and the results of testing should be noted in each case.

The justification features how and why should be demonstrated and candidates given the opportunity to make use of these features. Candidates should be able to describe the use of both of these features and should be able to state when each would be used.

Outcome 3

This outcome relates to the creation of an expert system. Candidates are expected to construct a working expert system, and to keep details of each stage of its development. In order to do this, candidates must first understand how to form facts and rules in the chosen KRL. It is envisaged that most candidates will create their expert systems using an expert system shell, thereby removing the need to worry about creating a user interface and a control mechanism. Candidates should be able to make a free choice of the purpose of the expert system but it is likely that guidance may be necessary - it may be appropraite to have a list of suggested topics available.

The acquisition of domain knowledge should be methodical and all sources of knowledge must be stated. These are likely to include:

- interviewing a human domain expert
- consulting appropriate reference material

National Unit Specification: support notes (cont)

UNIT   Expert Systems (Higher)

The complexity of the knowledge base created by candidates would depend on the software facilities available within the chosen KRL, but could typically include:

- simple ADVISE rules possibly combining IF, AND and OR
- use of NOT
- use of regular rules
- use of QUESTIONS
- use of internal commentary

The testing carried out should ensure the correctness of the expert system - in other words, the advice produced by the expert system is indeed the advice expected in each case.

Outcome 4

This outcome relates to the evaluation of an existing expert system. Candidates are expected to evaluate a working expert system. There is no need for the candidate to evaluate the expert system created at Outcome 3 but by doing so, the candidate would gain a broader experience of the software development process. In the case, where candidates are evaluating an expert system not created by themselves, the full documentation for the expert system and the expert system itself must be provided - the detail of this documentation is described in the evidence requirements for Outcome 3.

Candidates are expected to comment on the domain and purpose stated - does the domain match the knowledge base? does the expert system provide the output described? Additionally, candidates are expected to compare the advice produced by the expert system to that provided by a human expert. This comparison should be in terms of:

- the amount of advice
- the scope of the advice

Candidates are expected to suggest limitations of and improvements to the expert system. An obvious limitation of all expert systems is their restricted domain but this should be described in relation to the expert system being evaluated rather than in generic terms. Improvements suggested should not be the same as the limitations but could include improvements to the running of the expert system, such as:

- improving the wording of particular questions
- giving an indication of the certainty of the advice being suggested

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

A candidate-centred, resource-based learning approach is recommended. While the distribution of time between the outcomes will vary, candidates may be expected to complete each outcome within the following timescale:

Outcome 1	6 hours
Outcome 2	14 hours
Outcome 3	16 hours
Outcome 4	4 hours

National Unit Specification: support notes (cont)

UNIT   Expert Systems (Higher)

A range of expert systems will be required to deliver this unit. The recommended teaching approach requires candidate access to a number of different types and varying complexities of expert systems. Candidates must have access to each category of expert system. These expert systems, however, do not need to be on the scale of, say, a medical expert system. Rather, they should reflect the interests of the candidates. For example:

Title of Expert System	Category
Planning a Holiday	Plan
Careers Advisor	Advise
Faulty Printer Adviser	Diagnose
Rock Identifier	Classify

While Outcome 1 can be wholly undertaken in a theoretical context, it is recommended that candidates learn to categorise expert systems by using them. The experience gained in Outcome 2 would allow candidates to undertake the categorising required in Outcome 1. It is recommended, therefore, that Outcome 2 be completed before outcome 1. Outcome 3 (creating) and Outcome 4 (evaluating) would then follow on.

Appropriate video material or newspaper articles could be used as a stimulus for discussion on social implications (Outcome 1).

If this unit is delivered as part of a course (or programme of units) then the course documentation will provide further information on teaching and learning in a course context. This documentation will identify a number of 'themes' to facilitate holistic teaching and learning across the course.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Centres may use the instruments of assessment which are considered to be most appropriate. Examples of instruments of assessment which could be used are as follows:

Outcome 1   Written assignment on the characteristics of an expert system including its function, components, categorisation, limitations and social implications.

Outcome 2   IA 1 - Written assignment on use of justification features together with log book of expert systems used.
IA 2 - Candidate maintains a log book of results.
IA 3 - Practical assignment on the use of two expert systems to solve problems.

Outcome 3   IA 1 - Written assignment relating to the documentation of an expert system. This could be in the form of a log book.
IA 2 - Practical assignment relating to the creation of an expert system.

Outcome 4   Written assignment relating to the evaluation of an expert system.

During the work of the unit, candidates should have several opportunities to develop their practical skills and should be assessed at appropriate points. Terminology should be presented in context throughout the unit. Where the candidate is unsuccessful in achieving an outcome, provision should be made for remediation and re-assessment.

National Unit Specification: support notes (cont)

UNIT   Expert Systems (Higher)

There are opportunities to integrate assessment within this unit. For example, Outcomes 1 and 2 and Outcomes 3 and 4 could be combined to permit the four outcomes to be assessed using two instruments of assessment. The first assessment (covering Outcomes 1 and 2) would combine the description of an expert system with the use of one; and the second assessment (encompassing Outcomes 3 and 4) would combine the construction of an expert system with its evaluation.

Written evidence may take various forms including handwriting and word processed text or other forms of written communication that are more suited to candidates with physical disabilities.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special 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 Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).

National Unit Specification: general information

UNIT   Hypermedia (Higher)

NUMBER   D305 12

COURSE   Information Systems (Higher)

SUMMARY

This unit is designed to introduce candidates to the historical development of hypermedia, together with the underlying models and structures, as well as allowing them to develop a hypermedia product.

OUTCOMES

1   Describe the historical development of hypermedia systems.
2   Describe the architecture of hypermedia systems.
3   Construct a hypermedia product.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates will normally be expected to have attained one of the following:

- *Multimedia (Int 2)* unit
- Information Systems course at Intermediate 2 level
- Standard Grade in Computing Studies (Grade 1 or 2)

CREDIT VALUE

1 credit at Higher.

National Unit Specification: general information (cont)

UNIT   Hypermedia (Higher)

CORE SKILLS

There is no automatic certification of core skills or core skills components in this unit.

Additional information about core skills is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National Unit Specification: statement of standards

UNIT   Hypermedia (Higher)

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 the Scottish Qualifications Authority.

OUTCOME 1

Describe the historical development of hypermedia systems.

Performance criteria
(a)   The generations of hypermedia systems are correctly described.
(b)   Current applications are correctly described.
(c)   Contemporary developments are correctly described.
(d)   Stimuli to developments are correctly described.

Note on range for the outcome
Generations of hypermedia systems: first generation; second generation; third generation.
Current applications: reference materials; online documents; learning systems; collaborative work; software engineering.

Evidence requirements
Written or oral evidence that the candidate can describe the historical development of hypermedia as detailed in PCs (a) - (d) for all classes in the range.

OUTCOME 2

Describe the architecture of hypermedia systems.

Performance criteria
(a)   Reference models are accurately described.
(b)   Data structures are accurately described.
(c)   Processes are accurately described.
(d)   User interfaces are accurately described.

Note on range for the outcome
Reference models: Dexter model; Amsterdam model, World Wide Web model.
Data structures: nodes; links; anchors.
Processes: searching; navigation.
User interfaces: text; windows; frames.

Evidence requirements
Written or oral evidence that the candidate can describe the architecture of hypermedia as detailed in PCs (a) - (d) for all classes in the range.

National Unit Specification: statement of standards (cont)

UNIT   Hypermedia (Higher)

OUTCOME 3

Construct a hypermedia product.

Performance criteria
(a)   A suitable development environment is selected.
(b)   Appropriate data structures are defined.
(c)   A suitable user interface is selected.
(d)   Completed product is well structured and user-friendly.

Note on range for the outcome
Data structures: nodes; links; anchors.
User interfaces: text; windows; frames.

Evidence requirements
Performance evidence that the candidate can construct a hypermedia product as detailed in PCs (a) - (d) for all classes in the range.

National Unit Specification: support notes

UNIT　　　Hypermedia (Higher)

This part of the unit specification is offered as guidance. The support notes are not mandatory.

While the time allocated to this unit is at the discretion of the centre, the notional design length is 40 hours.

GUIDANCE ON CONTENT AND CONTEXT FOR THIS UNIT

This unit may be delivered as a stand-alone unit or in combination with other units as part of the Information Systems course at Higher level. The details of content given earlier provide information on the delivery and assessment of this unit within the context of a coherent course.

Corresponding to Outcomes 1-3

This unit is one of a series of units relating to multimedia (corresponding units exist at Access, Intermediate 1, Intermediate 2 and Advanced Higher levels).

Candidates should be aware that hypermedia has been in existence for almost as long as computers themselves and is a well established field of academic research with a substantial literature. They should also be aware that existing real-world systems do not always conform well to the theoretical models established by research.

Current applications of hypermedia include reference materials, online documents and learning systems. It is likely that the most familiar implementation of hypermedia will be the World Wide Web, which covers several of the above areas. While this can frequently be used to illustrate important aspects of hypermedia it should not be seen as the only important application or be allowed to detract from the significance of other applications.

Outcome 1

This outcome relates to the historical development of hypermedia systems. Coverage of different systems need not be in great depth, but should highlight the differences between the succeeding generations of systems and the most important features of the systems within each generation.

Coverage of first-generation systems should include at least the following: Memex, NLS/Augment, Xanadu, ZOG and FRESS. Coverage of second-generation systems should include Notecards, KMS, Hyperties, Guide and Hypercard. Coverage of third-generation systems should include the World Wide Web, alpha Trellis, ExperText and Hyperframe.

Candidates should be familiar with the current applications of hypermedia systems, including reference materials, such as encyclopaedias, dictionaries, manuals and handbooks as well as online documents, eg, those available on the World Wide Web.

Learning Systems should include hypermedia-based Computer Assisted Learning packages, as well as more restricted applications, such as museum exhibits and interactive kiosks. Collaborative working and computer-mediated communication are becoming increasingly important application areas.

National Unit Specification: support notes (cont)

UNIT   Hypermedia (Higher)

Many contemporary developments will relate to user productivity, particularly in terms of making more information available, or even new types of information, eg, virtual reality simulations. Developments may also relate to ease of use and ease of accessibility of information, eg, the 'Internet-enabled' versions of many software packages which are now becoming available.

Candidates should have a sufficient awareness of technical issues to discuss whether proposed developments are technically feasible. They should also be aware of the possible stimuli to developments, including social and economic stimuli.

Outcome 2

This outcome relates to the architecture of hypermedia systems. Candidates should be aware of the principal reference models for hypermedia systems, particularly the Dexter model and the Amsterdam model derived from it. They should also be aware of the practical applications, such as the World Wide Web and the relationship between these and the reference models. Although the World Wide Web is not truly a reference model in the sense of, say, the Dexter model, it can be usefully classed alongside these for comparison purposes.

Consideration should be given to the role of data structures in the different models, with particular reference to nodes, links and anchors.

Outcome 3

This outcome relates to the construction of a hypermedia product. A suitable development environment must be selected. This might be an HTML authoring tool (such as Hot Dog) or could be a stand-alone hypermedia development environment (such as Microcosm) or a multimedia authoring package (such as Toolbook) which fully supports hypermedia features.

Appropriate data structures must be defined for any hypermedia system. These will consist of the nodes which store the information content (including text, sounds and graphics), the links between these nodes and the anchors, or reference to links contained within nodes.

Depending on the development environment selected, a variety of user interfaces may be possible. Early systems used a purely text-based interface, whereas later ones have tended towards a windows-based interface. Recently there has been a trend (especially on the World Wide Web) to move towards frames-based interfaces.

The completed product should be well structured and user-friendly. There should be no dead-end routes and users should always have a reasonable range of choices available (eg, go back to previous page, go on to next page, go back to top of section, go back to top of document, exit).

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

A candidate-centred, resource-based learning approach is recommended. To enliven learning, the use of video, audio and multimedia learning aids is recommended.

National Unit Specification: support notes (cont)

UNIT   Hypermedia (Higher)

While the distribution of time between the outcomes will vary, candidates might be expected to complete each outcome within the following timescale:

Outcome 1   15 hours
Outcome 2   10 hours
Outcome 3   15 hours

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Centres may use the instruments of assessment which are considered to be most appropriate. Examples of instruments of assessment which could be used are as follows:

Outcome 1   Short answer questions on the historical development of hypermedia.

Outcome 2   Short answer questions on the architecture of hypermedia systems.

Outcome 3   A practical exercise on the construction of a hypermedia project, including a brief report on the various decisions made and the reasons for them.

During the work of the unit, candidates should have several opportunities to develop their practical skills and should be assessed at appropriate points. Terminology should be presented in context throughout the unit. Where the candidate is unsuccessful in achieving an outcome, provision should be made for additional support and re-assessment.

Written evidence may take various forms including handwriting and word processed text or other forms of written communication that are more suited to candidates with physical disabilities.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special 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 Special Assessment and Certification Arrangements for Candidates with Special Needs/Candidates whose First Language is not English* (SQA, 1998).