

COMPUTING
(Intermediate 2)

Second edition – published 2006

SECOND EDITION PUBLISHED NOVEMBER 2006

COURSE TITLE: **Computing**

COURSE NUMBER: **C206 11**

National Course Specification

Course Details

Core skills statement amended to reflect core skill information.

National Unit Specification(s):

No changes

National Course Specification

COMPUTING (Intermediate 2)

COURSE CODE C206 11

COURSE STRUCTURE

This Course has two mandatory Units and one optional Unit:

Mandatory Units:

<i>Unit Code</i>	<i>Unit Title</i>	<i>Credit and Duration</i>
DF2X 11	Computer Systems (Intermediate 2)	1 credit (40 hours)
DF2Y 11	Software Development (Intermediate 2)	1 credit (40 hours)

Optional Units – one selected from:

<i>Unit Code</i>	<i>Unit Title</i>	<i>Credit and Duration</i>
DF31 11	Artificial Intelligence (Intermediate 2)	1 credit (40 hours)
DF30 11	Computer Networking (Intermediate 2)	1 credit (40 hours)
DF32 11	Multimedia Technology (Intermediate 2)	1 credit (40 hours)

All courses include 40 hours over and above the 120 hours for the Units. This may be used for induction, extending the range of learning and teaching approaches, support, consolidation, integration of learning and preparation for external assessment.

RECOMMENDED ENTRY

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

- ◆ Intermediate 1 Computing Studies
- ◆ Standard Grade Computing Studies at General level

PROGRESSION

This Course or its Units may provide progression in the following way:

- ◆ progression to Higher Computing
- ◆ exit to further education
- ◆ exit to employment

Administrative Information

Publication date: November 2006

Source: Scottish Qualifications Authority

Version: 2

© Scottish Qualifications Authority 2006

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Specification (including Unit Specifications) can be purchased from the Scottish Qualifications Authority for £7.50. **Note:** Unit Specifications can be purchased individually for £2.50 (minimum order £5).

National Course Specification: (cont)

COMPUTING (Intermediate 2)

CORE SKILLS

Achievement of this Course gives automatic certification of the following:

Complete Core Skill: Information Technology at SCQF Level 5

Core Skill component(s) Critical Thinking at SCQF Level 5
Planning and Organising at SCQF Level 4

CREDIT VALUE

The Intermediate 2 Computing Course is allocated 24 SCQF credit points at SCQF level 5.

SCQF points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.

National Course Specification: Course details

COMPUTING (Intermediate 2)

RATIONALE

The development of computing over the last few decades has been significant in terms of speed and scope. It has had an effect on all aspects of our lives, and its future course remains unpredictable. Computing is both a science and a technology, and has wide-ranging social implications. It encompasses a very wide field of study, merging at its boundaries with many other disciplines. It provides us with many increasingly powerful hardware and software tools. Our society requires more and more individuals who have the skills to use these tools, who understand how they work, and who have the ability to develop new and improved tools.

The Intermediate 2 Course in Computing is not only about learning to use current hardware and software. It is designed to provide candidates with both the necessary knowledge and understanding and the practical problem solving skills to enable them to become the ICT tool designers of the future.

The importance of both knowledge and understanding, and related practical skills are reflected in the two Outcomes of each Unit. The ability to combine knowledge and understanding and practical skills to solve practical problems is a key theme of the Course.

AIMS

The aims of the Course are to develop:

- ◆ knowledge and understanding of computing concepts
- ◆ practical skills in the use of computer hardware and software
- ◆ ability to solve problems by applying knowledge, understanding and practical skills
- ◆ awareness of the professional, social, ethical and legal implications of computing
- ◆ ability to communicate computing concepts clearly and concisely using appropriate terminology

Related to these aims, and underlying the study of computing are a number of **unifying themes** which are developed and exemplified throughout the Units of the Course. These themes are:

- ◆ technological development and progress
- ◆ factors affecting system performance
- ◆ objects and operations
- ◆ syntax and semantics
- ◆ social, professional, ethical and legal implications
- ◆ the relationship between software and hardware
- ◆ computing terminology
- ◆ the development process as it applies to software and hardware systems

The Course is designed to build on prior learning at Intermediate 1 and Standard Grade General level (or their equivalents) and to provide progression to Higher Computing and to possible further study of computer science and related subjects.

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

COURSE CONTENT

The Course is made up of two mandatory Units, *Computer Systems* and *Software Development*, and a choice of one from three optional Units.

The *Computer Systems* Unit develops a basic understanding of how computers work. It builds on the foundations laid down in the *Computing and the Internet* Unit at Intermediate 1 level, and in Standard Grade Computing Studies, or other equivalent experience. The *Software Development* Unit develops the candidate's basic knowledge and skills in developing software through the use of a high level programming language. Because Computing is such a wide and rapidly developing field of study, a choice of three optional Units is offered, each one allowing the candidate to relate their learning in the mandatory Units to a contemporary aspect of applied computing — *Artificial Intelligence*, *Computer Networking* or *Multimedia Technology*.

To ensure consistency of terminology, the meanings of the technical terms used throughout this documentation (including the Unit Specifications) were taken from the British Computer Society's publication *A Glossary of Computing Terms*, 10th edition, pub. Addison-Wesley, 2002. This glossary of terms will be used as a reference for all internal and external assessments, and its use is encouraged in all teaching and learning activities.

The Unit Specifications have been fully developed and provide detailed support notes to assist assessors in their understanding of Outcomes and Performance Criteria. The detailed content for each Unit is provided in the form of a table in the content/context section of each Unit Specification.

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

Content statements

The following pages of content statements describe in detail the knowledge and understanding which a candidate should be able to demonstrate in the external Course assessments, which will sample across these content statements. In order to achieve a Course award, candidates must also demonstrate an appropriate level of problem solving skills (application, analysis, synthesis and evaluation) based on these content statements.

This table defines the terms ‘knowledge and understanding’ and ‘problem solving’ as used in these arrangements in terms of the terminology used in Bloom’s Taxonomy of Learning:

Arrangements	Bloom’s Classification	Typical skills/words
<i>Knowledge and Understanding</i>	<i>Knowledge</i>	<i>recall of information (list, state, define, label, describe, name, identify)</i>
	<i>Comprehension</i>	<i>interpreting information in own words, grasping meaning (interpret, explain, discuss, predict, summarise, classify)</i>
<i>Problem Solving</i>	<i>Application</i>	<i>application to new situations (apply, demonstrate, show, relate, explain)</i>
	<i>Analysis</i>	<i>identification of patterns, recognising relationships (analyse, arrange, order, explain, connect, infer, compare, categorise)</i>
	<i>Synthesis</i>	<i>generalise, create new ideas, bring together from different sources, draw conclusions, predict (integrate, modify, design, compose, plan, arrange)</i>
	<i>Evaluation</i>	<i>make judgements, assess ideas, compare ideas, evaluate data (judge, evaluate, recommend, justify)</i>

Throughout the Course, candidates should be made aware of common hardware and software and should be able to resolve common problems as they occur.

National Course Specification: Course details (cont)

Intermediate 2 Computing: Computer Systems (mandatory Unit)

The candidate must demonstrate knowledge and understanding, practical skills and problem solving based on the following content statements:

Data representation

- ◆ Representation of positive numbers in binary using examples up to and including eight bits
- ◆ Advantages of using binary numbers
- ◆ Description of floating point representation of real numbers using the terms mantissa and exponent
- ◆ Description of file sizes, backing storage and main memory capacities using the terms: bit, byte, Kilobyte, Megabyte, Gigabyte, Terabyte (Kb, Mb, Gb, Tb)
- ◆ Description of the ASCII code including control characters
- ◆ Description of the term character set
- ◆ Description of bit map method of graphic representation using examples of black and white bit maps
- ◆ Calculation of storage requirements

Computer structure

- ◆ Description of the purpose of a processor
- ◆ List the parts of a processor as ALU, control unit and registers
- ◆ Representation of the structure of a computer in the form of a simple five box diagram representing: input devices, processor, main memory, output devices, and backing storage
- ◆ Distinction between main memory and backing storage
- ◆ Description of the features and uses of RAM and ROM
- ◆ Description of the uses of embedded, palmtop, laptop, desktop and mainframe computers
- ◆ Comparison of features of embedded, palmtop, laptop, desktop and mainframe computers: type and speed of processor, size of main memory, backing storage, input and output devices
- ◆ Description of clock speed as a simple indicator of system performance

Peripherals

- ◆ Description of the features, functions and uses of the following input devices: keyboard, mouse, microphone, touchpad, digital camera, scanner, webcam
- ◆ Comparison of input devices using appropriate characteristics including resolution, capacity, speed of data transfer, cost
- ◆ Description of the features, functions and uses of a monitor, LCD panel, inkjet and laser printers, loudspeakers
- ◆ Comparison of output devices using appropriate characteristics including resolution, capacity, speed of data transfer, cost
- ◆ Magnetic storage: description of the features, functions and uses of current magnetic storage devices and media including floppy drive, hard drive, zip drive, magnetic tape drive
- ◆ Optical storage: description of the features, functions and uses of current optical storage devices and media including CD-ROM, CD-R, CD-RW, DVD-ROM, rewritable DVD
- ◆ Comparison of storage devices using appropriate characteristics including type of access, capacity, speed of data transfer, cost
- ◆ Description of the need for interfaces with reference to the following functions: compensating for differences in speed between the CPU and peripherals, data conversion from analogue to digital forms and temporary data storage

Networking

- ◆ Description of the following features of LANs, WANs and the Internet: transmission media, bandwidth, geographical spread and functions

National Course Specification: Course details (cont)

Intermediate 2 Computing: Computer Systems (mandatory Unit) (cont)

- ◆ Description of the functions of a client and server on a network
- ◆ Description of the benefits of networks
- ◆ Description of the following features and functions of e-mail: e-mail address, sending, reading, replying, setting up an address book, setting up mailing lists, setting up folders
- ◆ Description of the following features of the World Wide Web: web pages, hyperlinks, browser, search engines
- ◆ Description of the following economic factors which have led to the development of computer networks: falling cost of telecommunication technologies and services, shared access to expensive equipment, geographic spread of organisations, demand for up-to-date information
- ◆ Description of the main features of the Computer Misuse Act, the Copyright Designs and Patents Act and the Data Protection Act

Computer software

- ◆ Distinction between an operating system and an application program with examples of each
- ◆ Explanation of the need for standard file formats
- ◆ Description of the following standard file formats for text files: text, ASCII, rich text file
- ◆ Identification of data objects and operations in the context of word processing, databases, spreadsheets and graphic packages
- ◆ Definition of a virus
- ◆ Description of how a virus operates
- ◆ Description of the following common symptoms of virus infection: displaying unwanted messages, unusual visual/sound effects, computers rebooting unexpectedly, unwanted generation of e-mails
- ◆ Description of how viruses are spread via floppy disk, homemade CDs, 'fun' websites and e-mail attachments
- ◆ Explanation of the need for anti-virus software

National Course Specification: Course details (cont)

Intermediate 2 Computing: Software Development (mandatory Unit)

The candidate must demonstrate knowledge and understanding, practical skills and problem solving based on the following content statements:

Software development process

- ◆ Description of the stages (in order) of the software development process: analysis, design, implementation, testing, documentation, evaluation, maintenance
- ◆ Description and exemplification of pseudocode and one graphical design notation (structure diagram or other suitable)
- ◆ Description and exemplification of appropriate test data (normal, extreme and exceptional)
- ◆ Description of the features of a user guide and a technical guide
- ◆ Evaluation of software in terms of fitness for purpose, user interface and readability

Software development languages and environments

- ◆ Description and comparison of machine code and high level languages
- ◆ Explanation of the need for translation; description of the functioning of interpreters and compilers
- ◆ Description of the process of recording a macro and assigning it to a keystroke
- ◆ Description of a macro, and examples of the use of macros
- ◆ Description of the features and use of a text editor

High level programming language constructs

- ◆ Description and exemplification of the following constructs in an appropriate high level language: input and output, assignment, arithmetical operations (+,-,*,/,^) and logical operators (AND, OR, NOT), fixed loops, conditional loops, simple and complex conditions, conditional statements (IF), nested loops
- ◆ Description and exemplification of numeric and string variables and 1-D arrays
- ◆ Description and exemplification of pre-defined functions

Standard algorithms

- ◆ Description and exemplification of the following standard algorithm in an appropriate high level language: input validation
- ◆ Recognition of appropriate use of the following standard algorithms: input validation, find min/max, count occurrences, linear search

National Course Specification: Course details (cont)

Intermediate 2 Computing: Artificial Intelligence (optional Unit)

The candidate must demonstrate knowledge and understanding, practical skills and problem solving based on the following content statements:

The development of artificial intelligence

- ◆ Description of human intelligence (including the ability to communicate, retain knowledge, solve problems)
- ◆ Description of the Turing test and explanation of its rationale
- ◆ Explanation of the need for a different approach to programming which could represent knowledge
- ◆ Simple description of the development of game playing programs from simple early examples to contemporary complex examples exhibiting intelligence
- ◆ Simple description of the development of language processing from Eliza to chatterbots and contemporary applications
- ◆ Simple description of the development of expert systems
- ◆ Identification of hardware developments (including faster processors, more memory, and increasing backing store capacity) which have assisted the development of AI

Applications and uses of artificial intelligence

Artificial neural systems:

- ◆ Simple description of a neural network as an electronic model of the brain consisting of many interconnected simple processors
- ◆ Description of uses and examples of artificial neural systems (including learning to read postcodes; stock market prediction; debt risk assessment; other examples of pattern recognition)
- ◆ Description of advantages and disadvantages of artificial neural systems

Vision systems:

- ◆ Explanation of the need to interpret/make sense of visual input.
- ◆ Description of applications (including industrial, military use, satellite photo interpretation)

Speech recognition:

- ◆ Description of applications (including word processor, punctuation commands, disabled users, cars, military, mobile phones)
- ◆ Description of characteristics (training for each voice pattern, control instructions, influence of background noise, factors affecting accuracy)

Handwriting recognition:

- ◆ Description of common applications (including palmtops and tablet PCs)
- ◆ Explanation of possible need to train the system

Intelligent robots:

- ◆ Description of types of sensors used
- ◆ Description of contemporary applications (including automated delivery, pipe inspection, bomb disposal, exploration of unknown environments)
- ◆ Description of advantages of intelligent robots

Expert systems:

- ◆ Description of purpose of expert systems
- ◆ Description of advantages of expert systems over human experts, including expertise always available, reduced wage bill, combines expertise of several experts, less chance of errors
- ◆ Description of contemporary applications of expert systems
- ◆ Description of social, legal and ethical issues related to the use of expert systems (including loss of jobs, training issues, public reactions, loss of human expertise)

National Course Specification: Course details (cont)

Intermediate 2 Computing: Artificial Intelligence (optional Unit) (cont)

Search techniques

- ◆ Exemplification of problem solving by search
- ◆ Construction of a simple search tree
- ◆ Description of breadth-first and depth-first search and exemplification on a search tree

Knowledge representation

- ◆ Construction of semantic net to represent simple relationships and facts
- ◆ Description and exemplification of the following features in Prolog (or similar declarative language): simple facts (single/double argument), simple rules (up to two sub-goals), simple queries (true/false, single variable), operators: and, >, <, =
- ◆ Explanation of the concepts of goals and sub-goals
- ◆ Perform simple manual trace: one rule/level

National Course Specification: Course details (cont)

Intermediate 2 Computing: Computer Networking (optional Unit)

The candidate must demonstrate knowledge and understanding, practical skills and problem solving based on the following content statements:

Network applications

- ◆ Description of services provided by the Internet; World Wide Web, electronic mail and file transfer
- ◆ Explanation of the structure of: an e-mail address, a URL (universal resource locator)
- ◆ Explanation of the purpose of a web browser
- ◆ Brief description of the functions of a web browser (access the www, provide facilities including file transfer and e-mail)
- ◆ Description of a web page as a text document with hyperlinks
- ◆ Description of browsers and microbrowsers for use with wireless data (WAP)
- ◆ Description of hyperlinks, search engines and navigation
- ◆ Description of a situation when an ISP (Internet service provider) is required
- ◆ Explanation of the purpose of an ISP
- ◆ Description of e-commerce: the use of the Internet in conducting business and providing a service (e-government, e-business, e-marketing and e-sales)
- ◆ Description of current converging technologies in the home (home appliances with built in internal and external communication capability)
- ◆ Description of the economic implications for business and education of the growth of network technology and the Internet
- ◆ Description of main features of the Regulation of Investigatory Powers Act 2000
- ◆ Description of the need to adhere to a code of conduct governing the use, both in school and at home, of networks and the Internet

Network security

- ◆ Description of security measures: physical, software — password and user ID
- ◆ Brief explanation of the use and advantages of encryption
- ◆ Explanation of the need for filtering Internet contents in education, home and commercial companies
- ◆ Description of potential threats to networks: hardware failure, software failure, data transmission failure, physical disasters
- ◆ Description of the need for a backup strategy

Data transmission

- ◆ Description of the three types of transmission: unicast, broadcast and multicast
- ◆ Description of the dual use made of networks in voice and data transmission
- ◆ Description of modern wireless communication methods: wireless personal area network (WPAN), wireless LAN, wireless WAN
- ◆ Description of the types of connections to the Internet (dialup modem, ADSL, cable modem, leased line and ISDN)
- ◆ Explanation of the term broadband
- ◆ Description of the additional hardware requirements for a wireless LAN (receiver, transmitter and wireless NIC)

Network protocols

- ◆ Description of name services (name resolution); DNS (domain names, host name resolution)

National Course Specification: Course details (cont)

Intermediate 2 Computing: Multimedia Technology (optional Unit)

The candidate must demonstrate knowledge and understanding, practical skills and problem solving based on the following content statements:

Development process for multimedia applications

- ◆ Simple description of the software development process as it applies to the development of multimedia applications
- ◆ Identification of methodologies used in the creation or definition of a multimedia application, including: WYSIWYG editors and text editors to create web pages, authoring software to create multimedia applications, presentation software to create presentations
- ◆ Simple description of the requirements for the display of a multimedia application, including web browser, file 'player' and executable file

Bit-mapped graphic data

- ◆ Simple description of the hardware used to capture still graphic data, including: digital camera (CCD and removable, re-usable storage), scanner (CCD)
- ◆ Simple description of the storage and limitations of graphic data in compressed and uncompressed file formats, including: bitmap (uncompressed), GIF (256 colours, transparency, lossless compression), JPEG (lossy compression)
- ◆ Explanation of the following terms in connection with graphics and description of the relationships between them and their effect on image quality: lossy compression, resolution (number of pixels), colour depth (number of colours), file size (in bytes, Kb, Mb, Gb)
- ◆ Description of the main features and applications of simple bitmap editing and creation software, including: painting programs (paintbrush, fill), image editing programs (decrease resolution, alter colour depth, crop, alter brightness and contrast, re-size or scale an image, special effects)
- ◆ Identification of hardware required to display 2D graphics, including graphics card

Digitised sound data

- ◆ Identification of hardware required to capture sound data, including sound card and microphone
- ◆ Simple description of the storage of sound data in compressed and uncompressed formats, including: RAW (uncompressed), RIFF (compressed) including WAV, MP3 (lossy compression)
- ◆ Explanation of the following terms in connection with sounds, and description of the relationships between them and their effect on sound quality: lossy compression, sampling depth/resolution (bytes), sampling frequency (Hz, KHz), sound time(s), file size (in bytes, Kb, Mb, Gb)
- ◆ Description of the main features and applications of simple sound editing software, including: decrease sampling frequency, decrease sampling depth, crop, effects, echo, reverse, volume
- ◆ Identification of need for sound card to output sound

Video data

- ◆ Simple description of hardware required to capture digital video (digital video camera or web cam)
- ◆ Simple description of the storage of video data in compressed and uncompressed formats, including: uncompressed AVI, MPEG (lossy compression)
- ◆ Explanation of the following terms in connection with videos and description of the relationships between them and their effect on video quality: lossy compression, colour depth (bytes), resolution, frame rate (fps), video time(s), file size (in bytes, Kb, Mb, Gb)
- ◆ Description of the main features and applications of simple video editing software with single clips, including crop (or trimming)
- ◆ Identification of need for graphics card to output video data

National Course Specification: Course details (cont)

Intermediate 2 Computing: Multimedia Technology (optional Unit) (cont)

Vector Graphics Data

- ◆ Description of basic features of vector graphics: scalable (independent of resolution), each object is editable, layering
- ◆ Identification of common attributes of vector graphic objects:
 - drawing (shape, position, size, rotation, line, fill, layer)
 - 3D image (shape, position, size, rotation, texture)
- ◆ Identification of common file types used to store graphics in vector formats, including: SVG (scalable vector graphics), VRML (virtual reality mark-up language (or WRL — world description language)

Synthesised sound data

- ◆ Identification of common attributes of notes stored as MIDI data (instrument, pitch, volume, duration, tempo)
- ◆ Description of use of MIDI keyboard or instrument to create sound data in MIDI format

Implications of the use of multimedia technology

- ◆ Description of contemporary technologies and their uses, that demonstrate convergence of technology in relation to multimedia capabilities, including: smart phone, pocket PC, digital television, virtual reality

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

ASSESSMENT

To achieve the Course award the candidate must pass the Units as well as the Course assessment. The candidate's grade is based on the Course assessment.

The Course is made up of two mandatory Units and one from a choice of three optional Units.

Unit assessment

Unit assessment consists of knowledge tests and a practical skills checklist. The knowledge test is a closed book test, under supervision, lasting no more than 45 minutes. The practical skills can be demonstrated through a single extended task or a number of smaller tasks.

Further details about the Unit assessment can be found in each of the Unit Specifications.

DETAILS OF THE INSTRUMENTS FOR COURSE ASSESSMENT

Course assessment should provide opportunities to demonstrate:

- ◆ retention of knowledge, understanding and skills over a longer period of time
- ◆ integration of knowledge, understanding and skills acquired in the 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 Computing at Intermediate 2 level will consist of two components:

- ◆ practical coursework task
- ◆ question paper

The practical coursework task provides candidates with the opportunity to demonstrate and integrate the practical skills, knowledge and understanding from the Units, and apply these in a more complex practical context.

The purpose of the question paper is to assess the candidate's competence to integrate and retain knowledge and understanding and demonstrate higher order cognitive abilities across the contents of all the Units, and in varied contexts, and to demonstrate the ability to communicate computing concepts clearly.

Practical coursework task

Candidates will undertake a practical coursework task provided by SQA. The task may be undertaken in 'open book' conditions, but under supervision, to ensure that the work presented is the candidate's own work. The task will be marked using a marking scheme provided by SQA, but be subject to moderation. The marking scheme will provide a mark out of 30, which will be submitted directly to SQA.

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

Question paper

The question paper will comprise a single paper of 1 hours and 30 minutes duration. The total marks available will be 70. The examination will be set and marked by SQA. The paper will be composed of three sections:

SECTION 1 (15 marks)

This will consist of objective and short response questions which sample across the content statements of the two mandatory Units. These questions will test both knowledge and understanding and problem solving. Approximately 2/3 of the marks will be for knowledge and understanding, and 1/3 for problem solving. The problem solving will be based in familiar contexts and be of a fairly straightforward nature. Candidates will be expected to tackle all questions.

SECTION 2 (30 marks)

This will consist of questions requiring extended responses requiring structuring and reasoning. These questions will involve both knowledge and understanding and problem solving, and will be set in less familiar and more complex contexts than those in Section 1. Approximately 1/3 of the marks will be for knowledge and understanding and 2/3 for problem solving. The questions will sample across the content statements associated with the mandatory Units, and will require some integration of knowledge across the two Units. Candidates will be expected to tackle all questions.

SECTION 3 (25 marks)

This will have three sub-sections, one for each of the optional Units. Candidates will be expected to tackle all the questions within one sub-section. The questions will require extended responses from candidates. Approximately 1/3 of the marks will be for knowledge and understanding, and 2/3 for problem solving as in section 2, and the questions, which will sample across the content statements for the optional Unit, will also require some integration of knowledge from the mandatory Units.

Note : refer to the table on page 6 of these arrangements for guidance on the meaning of the terms 'knowledge and understanding' and 'problem solving' in this context.

Further details about assessment for this Course can be found in NAB materials, the Course Assessment Specification, the Specimen Question Paper and the specimen coursework task.

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

GRADE DESCRIPTIONS AT A AND C

The candidate's grade will be based on the total score obtained from the Course assessment by adding the marks from the practical coursework task and the question paper. The descriptions below indicate the nature of achievement required for the award at grade C and A in the Course.

GRADE C	GRADE A
♦ retention of knowledge, understanding and skills over a longer period of time	
Candidates are able to describe and explain some of the facts and concepts to the standard defined by the Performance Criteria.	Candidates are able to describe and explain most of the facts and concepts to the standard defined by the Performance Criteria.
Candidates are able to demonstrate some practical skills to the standards defined by the Performance Criteria.	Candidates are able to demonstrate most of the practical skills to the standards defined by the Performance Criteria.
♦ integration of knowledge, understanding and skills acquired in component Units	
Candidates are able to demonstrate their knowledge and understanding in the context of specific Units.	Candidates are able to demonstrate the integration of knowledge and understanding from more than one Unit.
Candidates are able to demonstrate their practical skills in the context of specific Units.	Candidates are able to demonstrate the integration of practical skills from more than one Unit.
♦ application of knowledge, understanding and skills in more complex contexts	
Candidates are able to apply knowledge and understanding to solve problems in straightforward contexts relating to a single Unit.	Candidates are able to apply knowledge and understanding to solve problems in more complex contexts relating to more than one Unit.
Candidates are able to apply practical skills to solve problems in straightforward contexts relating to a single Unit.	Candidates are able to apply practical skills to solve problems in more complex contexts relating to more than one Unit.
♦ application of knowledge, understanding and skills in less familiar contexts	
Candidates are able to apply knowledge, understanding and skills to solve problems in familiar contexts.	Candidates are able to apply and transfer knowledge, understanding and skills to solve problems in less familiar contexts.
Candidates are able to carry out defined tasks to the standards defined in the Performance Criteria.	Candidates are able to resolve non-routine problems that arise during practical activity, by independent research.

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

ESTIMATES AND APPEALS

Estimates

In preparing estimates, evidence of performance should be considered across the breadth of coverage of the content of the Course and must take account of performance in both of the Course components, the practical coursework task and the question paper. Further advice on the preparation of estimates is given in the Course Assessment Specification.

Appeals

Evidence used to support appeals for the question paper component must come from an integrated test (or tests) adequately reflecting the Course content and Grade Descriptions.

Although a 'prelim' examination is not mandatory, it can provide the opportunity for a candidate to demonstrate problem solving skills, integration across Units, and the application of knowledge in more complex and less familiar contexts as in the external examination. Any prelim should replicate the style, level of demand and mark allocation of the specimen SQA examination.

Centres that submit an integrated test or prelim that only covers the knowledge and understanding of Units 1 and 2 should also submit an additional test covering the knowledge and understanding of Unit 3. Furthermore, this additional test must integrate some knowledge and understanding from Unit 1 and Unit 2.

The coursework task which has been completed and marked internally (with the mark submitted to SQA by the due date) is expected to represent a candidate's best practical work. Additional evidence of problem solving in practical contexts does not require to be submitted for appeals.

While it is acceptable for centres generating their own test materials to draw on past SQA question papers or commercial papers from previous years, such papers **must not** be used in their entirety. Where material from past papers is used, a judicious selection of items and/or appropriate adaptation is required to make this acceptable as evidence to support an appeal. Items from past SQA papers may also be supplemented or replaced by internally devised materials.

Whatever approach is taken to the creation of prelim papers or other assessment items, centres must be certain that the material has not been seen previously by the candidates.

NABs are designed to allow candidates to demonstrate the knowledge and understanding and practical skills required to pass the Units. NABs do not provide opportunities for the candidate to demonstrate problem solving skills, integration across Units, and application of knowledge in more complex and less familiar contexts, and therefore do not provide sufficient evidence for appeals.

QUALITY ASSURANCE

All National Courses are subject to external marking and/or moderation. External markers, visiting examiners and moderators are trained by SQA to apply national standards. SQA is currently seeking to assist centres by preparing exemplification of standards materials in a number of subject areas. This will be rolled out to all subjects in due course.

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

The Units of all Courses are subject to internal moderation and may also be chosen for external moderation. This is to ensure that national standards are being applied across all subjects.

Courses may be assessed by a variety of methods. Where marking is undertaken by a trained marker in their own time, markers meetings are held to ensure that a consistent standard is applied. The work of all markers is subject to scrutiny by the Principal Assessor and a PA report is published for all subjects.

APPROACHES TO LEARNING AND TEACHING

The five main aims of the Course are to develop:

- ◆ knowledge and understanding of computing concepts
- ◆ practical skills in the use of computer hardware and software
- ◆ ability to solve problems by applying knowledge, understanding and practical skills
- ◆ appreciation of the professional, social, ethical and legal implications of computing
- ◆ ability to communicate computing concepts clearly and concisely using appropriate terminology

There is no prescriptive ‘best way’ to approach the teaching and learning of this Course. However an integrated approach is recommended which relates each of these aims to the computing facts and concepts being studied. Within each Unit, there is a combination of knowledge and understanding with practical problem solving skills. Teachers and lecturers are encouraged to provide learning experiences which blend together the acquisition of knowledge and understanding, the development of practical skills and opportunities to apply these to solve problems.

Throughout the Course, reference should be made to professional, social, ethical and legal implications where appropriate, and to ‘real world’ applications. Candidates should be encouraged to develop the use of appropriate computing terminology to communicate their understanding.

Related to the Course aims, a number of unifying themes have been identified which should be used to bring a coherence to the Course. Most of these themes can be illustrated and exemplified in each of the Units of the Course. These themes include:

- ◆ technological development and progress
- ◆ factors affecting system performance
- ◆ objects and operations
- ◆ syntax and semantics
- ◆ social, professional, ethical and legal implications
- ◆ the relationship between software and hardware
- ◆ computing terminology
- ◆ the development process as it applies to software and hardware systems

The Course has been designed to articulate with the Higher Computing Course. The content/context grids in the support notes for each Unit in the Higher Course show how the content and contexts at Intermediate 2 extend and deepen the Intermediate 2 Unit content. This should assist assessors who have to work with bi-level classes to design an appropriate Course plan.

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

APPROACHES TO LEARNING AND TEACHING (cont)

Candidates will require individual access to appropriate computer hardware and software throughout the Course. More detailed guidance is given within the support notes for each Unit.

Those who are presenting the Course are encouraged to make use of the wide range of teaching and learning materials (both paper-based and electronic) which have been developed to support this Course.

The Units of the Course may be taught sequentially or in parallel (or a combination of these). When taught sequentially, the two mandatory Units should be taught before the optional Unit, as the optional Units are designed to build on and exemplify key concepts of software development and computer systems within contemporary developing areas of computing. The practical coursework task is designed to allow candidates to demonstrate and integrate practical skills and knowledge they have developed within Units, and so should not be undertaken until at least the two mandatory Units have been covered.

A typical Course plan might therefore take the form:

August — December:	Software Development
August — December	Computer Systems
January	Practical coursework task
January	preparation for prelim examination (s)
February — March	optional Unit
April	flexible time

Preliminary examinations, if used, should be timed to allow maximum coverage of the three Course Units. This can be achieved by holding the prelim as late as possible (end of March), or by having an early prelim covering two Units, with a supplementary prelim later covering the third Unit and integration with the mandatory Units.

The teaching and learning and internal assessment of the three Units of the Course is designed to be completed within 120 hours. This includes practical activities in preparation for the practical coursework task. As centres are advised to allow 160 hours for the delivery of a National Course, this leaves up to 40 hours of flexible time.

Use of the additional 40 hours

Appropriate activities for this time include:

- ◆ an introduction to the Course
- ◆ revision of required prior learning
- ◆ consolidation and integration of learning
- ◆ remediation and re-assessment
- ◆ formative assessment (class tests)
- ◆ preliminary examination(s)
- ◆ preparation for external assessment
- ◆ completion of the practical coursework task
- ◆ extending the range of study

National Course Specification: Course details (cont)

COMPUTING (Intermediate 2)

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 Arrangements* (SQA, September, 2003).

COMPUTING IN A BROADER CONTEXT

A number of national initiatives and programmes have been designed to promote themes that are important to contemporary society such as citizenship and enterprise. These themes contribute to individual subjects and Courses by making connections beyond the subject boundaries and enrich the learning experience. Similarly, the specialist knowledge and skills developed through study of a particular subject contributes to the understanding of these themes.

There are several opportunities within Computing (Intermediate 2) for assessors to help candidates make links to cross-curricular themes. Some suggestions are given below.

Cross-curricular theme	Course content
Enterprise in Education	Understanding the application to the world of work of: <ul style="list-style-type: none">◆ ANS◆ expert systems◆ voice and vision systems Understanding the opportunities presented by e-commerce and converging technologies.
Education for Citizenship	Developing citizenship skills by locating, using and communicating ideas using networks.
Financial Education	Understanding the financial impact of computer viruses on business.
Health Education	Achieving safety by using a code of conduct to ensure open and healthy relationships in e-commerce and WWW chatrooms.

National Unit Specification: general information

UNIT Computer Systems (Intermediate 2)

NUMBER DF2X 11

COURSE Computing (Intermediate 2)

SUMMARY

This Unit is designed to develop knowledge and understanding of the principles of computer systems and practical skills related to computer systems through the use of contemporary hardware and software. This knowledge, understanding and these practical skills may then be applied by the candidate to solve practical problems related to computer systems. It is designed for candidates undertaking the Intermediate 2 Computing Course, but is also suitable for anyone wishing to develop a basic understanding of computer systems and computer terminology

OUTCOMES

1. Demonstrate knowledge and understanding of a range of facts, ideas and terminology related to the principles, features and purposes of computer systems.
2. Demonstrate practical skills in the context of computer systems using contemporary hardware and software.

RECOMMENDED ENTRY

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

- ◆ Intermediate 1 Computing Studies
- ◆ Standard Grade Computing Studies at General level

Administrative Information

Superclass: CD

Publication date: April 2004

Source: Scottish Qualifications Authority

Version: 1

© Scottish Qualifications Authority 2004

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. The cost for each Unit specification is £2.50. (A handling charge of £1.95 will apply to all orders for priced items.)

National Unit Specification: general information (cont)

UNIT Computer Systems (Intermediate 2)

CREDIT VALUE

1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

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

National Unit Specification: statement of standards

UNIT Computer Systems (Intermediate 2)

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

Demonstrate knowledge and understanding of a range of facts, ideas and terminology related to the principles, features and purposes of computer systems.

Performance Criteria

- a) Basic computing terminology is used appropriately.
- b) Simple descriptions and explanations are related to practical and familiar contexts.
- c) Simple conclusions, predictions and generalisations are made from knowledge and understanding.

Evidence Requirements

Written or oral evidence that the candidate can describe and explain the principles, features and purposes of computer systems accurately and concisely. Evidence should be obtained using questions in a closed book test, under supervision, lasting no more than 45 minutes. The test must sample content (see Computing (Intermediate 2) Course content) in each of the following areas:

- ◆ data representation
- ◆ computer structure
- ◆ peripherals
- ◆ networking
- ◆ computer software

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: statement of standards (cont)

UNIT Computer Systems (Intermediate 2)

OUTCOME 2

Demonstrate practical skills in the context of computer systems using contemporary hardware and software.

Performance Criteria

- a) A range of appropriate hardware is used effectively.
- b) Common features of software are selected and used effectively.
- c) Practical tasks are planned and organised with detailed guidance.
- d) Practical tasks are undertaken in an appropriate range of simple contexts.

Evidence Requirements

Observation checklist showing that the candidate has demonstrated practical skills at an appropriate level in four of the following contexts:

- ◆ use of standard OS functions
- ◆ use of main functions and features of a standard application package
- ◆ use of standard file formats for text files
- ◆ accessing a LAN using a network client
- ◆ accessing the Internet for WWW and e-mail

Hard copy evidence should be provided for **one** of these activities.

These practical skills may all be demonstrated in a single extended task, or a number of smaller tasks.

The practical skills should be demonstrated in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content).

The candidate will be allowed access to books, notes and online help while completing the tasks.

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: support notes

UNIT Computer Systems (Intermediate 2)

This part of the Unit Specification is offered as guidance.

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The content for this Unit is detailed below (and also in the National Course Specifications: Course details.)

Content Statement: Data Representation
Representation of positive numbers in binary using examples up to and including 8 bits.
Advantages of using binary numbers.
Description of floating point representation of real numbers using the terms mantissa and exponent.
Description of file sizes, backing storage and main memory capacities using the terms: bit, byte, Kilobyte, Megabyte, Gigabyte, Terabyte (Kb,Mb,Gb,Tb).
Description of the ASCII code including control characters.
Description of the term character set.
Description of bit map method of graphic representation using examples of black and white bit maps.
Calculation of storage requirements.

Content Statement: Computer Structure
Description of the purpose of a processor. List the parts of a processor as ALU, control unit and registers.
Representation of the structure of a computer in the form of a simple five box diagram representing: input devices, processor, main memory, output devices, and backing storage.
Distinction between main memory and backing storage. Description of the features and uses of RAM and ROM.
Description of the uses of embedded, palmtop, laptop, desktop and mainframe computers. Comparison of features of embedded, palmtop, laptop, desktop and mainframe computers: type and speed of processor, size of main memory, backing storage, input and output devices.
Description of clock speed as a simple indicator of system performance.

National Unit Specification: support notes (cont)

UNIT Computer Systems (Intermediate 2)

Content Statement: Peripherals
Description of the features, functions and uses of the following input devices: keyboard, mouse, microphone, touchpad, digital camera, scanner, webcam.
Comparison of input devices using appropriate characteristics including resolution, capacity, speed of data transfer, cost.
Description of the features, functions and uses of a monitor, LCD panel, inkjet and laser printers, loudspeakers.
Comparison of output devices using appropriate characteristics including resolution, capacity, speed of data transfer, cost.
Magnetic storage: description of the features, functions and uses of current magnetic storage devices and media including floppy drive, hard drive, zip drive, magnetic tape drive.
Optical storage: description of the features, functions and uses of current optical storage devices and media including CD-ROM, CD-R, CD-RW, DVD-ROM, rewritable DVD
Comparison of storage devices using appropriate characteristics including type of access, capacity, speed of data transfer, cost.
Description of the need for interfaces with reference to the following functions: compensating for differences in speed between the CPU and peripherals, data conversion from analogue to digital forms and temporary data storage.

Content Statement: Networking
Description of the following features of LANs, WANs and the Internet: transmission media, bandwidth, geographical spread and functions.
Description of the functions of a client and server on a network.
Description of the benefits of networks.
Description of the following features and functions of e-mail: e-mail address, sending, reading, replying, setting up an address book, setting up mailing lists, setting up folders. Description of the following features of the World Wide Web: web pages, hyperlinks, browser, search engines.
Description of the following economic factors which have led to the development of computer networks: <ul style="list-style-type: none"> ◆ falling cost of telecommunication technologies and services ◆ shared access to expensive equipment ◆ geographic spread of organisations ◆ demand for up-to-date information
Description of the main features of the Computer Misuse Act, the Copyright Designs and Patents Act and the Data Protection Act.

National Unit Specification: support notes (cont)

UNIT Computer Systems (Intermediate 2)

Content Statement: Computer Software
Distinction between an operating system and an application program with examples of each.
Explanation of the need for standard file formats. Description of the following standard file formats for text files: text, ASCII, rich text file.
Identification of data objects and operations in the context of word processing, databases, spreadsheets and graphic packages.
Definition of a virus. Description of how a virus operates. Description of the following common symptoms of virus infection: displaying unwanted messages, unusual visual/sound effects, computers rebooting unexpectedly, unwanted generation of e-mails. Description of how viruses are spread via floppy disk, homemade CDs, 'fun' websites, and e-mail attachments.
Explanation of the need for anti-virus software.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates will require individual access to appropriate computer hardware and software throughout this Unit. While the learning may be achieved in the context of one computer system, candidates will benefit from having some experience of an alternative operating system.

The two Outcomes may be delivered in an integrated way rather than sequentially. For Outcome 2, the practical activities should be taught and used to illustrate and exemplify the knowledge and understanding required for Outcome 1.

The amount of time spent on each area of content will vary depending on the teaching methodology used and the ability and prior experience of the candidates. However, the following times may act as a rough guide:

data representation	6 hours
computer structure	6 hours
computer peripherals	8 hours
computer networking	6 hours
computer software	10 hours

1½ hours should be set aside to:

- ◆ administer the Outcome 1 test
- ◆ gather evidence for Outcome 2

A further 2½ hours is allowed for remediation and re-assessment if required.

If the Unit is delivered as part of a Course, the Course documentation will provide further information on teaching and learning in a Course context, including the identification of a number of 'themes' to facilitate holistic learning across the Course.

National Unit Specification: support notes (cont)

UNIT Computer Systems (Intermediate 2)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank tests have been created specifically to assess Outcome 1 of the Unit. This assessment consists of a closed book test, and must be conducted under examination conditions. In order to gain success in this Outcome, the candidate must achieve at least the cut-off score for the test. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard

Outcome 2 requires the candidate to demonstrate practical skills while using contemporary hardware and software. These practical skills will normally be demonstrated in a number of relatively short tasks. However, they may be demonstrated in a single extended task. The tasks will normally be demonstrated by the candidate during the teaching and learning activities of the Unit, rather than as separate formal assessment activities. The candidate will be allowed access to books, notes and online help while completing the tasks.

To gain success in this Outcome, the candidate must demonstrate practical skills at an appropriate level in four of the following contexts, as defined in the content statements (see Computing (Intermediate 2) Course content):

- ◆ use of standard OS functions
- ◆ use of main functions and features of a standard application package
- ◆ use of standard file formats for text files
- ◆ accessing a LAN using a network client
- ◆ accessing the Internet for WWW and e-mail

Hard copy evidence should be provided for any **one** of these activities. Note that this need not be formal documentation — print outs and screen shots showing appropriate activities are adequate.

A pro-forma observation checklist for Outcome 2 is provided in the National Assessment Bank materials.

All evidence must be retained by the centre. The assessment of this Unit is subject to moderation by SQA.

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 special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, September, 2003).

National Unit Specification: general information

UNIT Software Development (Intermediate 2)

NUMBER DF2Y 11

COURSE Computing (Intermediate 2)

SUMMARY

This Unit is designed to develop knowledge and understanding of software development and to develop practical skills in software development through the use of a high level language within an appropriate software development environment. In particular, it will develop familiarity with standard language constructs in the context of short programs. It is not intended that candidates should develop complex programs involving sub-programs and combinations of constructs.

On completion of the Unit, the candidate should be able to apply this knowledge and understanding, and these skills to solve practical problems.

It is designed for candidates undertaking the Intermediate 2 Computing Course, but is also suitable for anyone wishing to develop an understanding of how software is developed using a high level programming language.

OUTCOMES

1. Demonstrate knowledge and understanding of the principles of software development, software development languages and environments, high level language constructs and standard algorithms.
2. Demonstrate practical skills in the context of software development using contemporary hardware and an appropriate software development environment.

RECOMMENDED ENTRY

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

- ◆ Intermediate 1 Computing Studies
- ◆ Standard Grade Computing Studies at General level

Administrative Information

Superclass: CB

Publication date: April 2004

Source: Scottish Qualifications Authority

Version: 01

© Scottish Qualifications Authority 2004

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. The cost for each Unit specification is £2.50. (A handling charge of £1.95 will apply to all orders for priced items.)

National Unit Specification: general information (cont)

UNIT Software Development (Intermediate 2)

CREDIT VALUE

1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

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

National Unit Specification: statement of standards

UNIT Software Development (Intermediate 2)

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

Demonstrate knowledge and understanding of the principles of software development, software development languages and environments, high level language constructs and standard algorithms.

Performance Criteria

- a) Simple computing terminology is used appropriately.
- b) Simple descriptions and explanations are related to practical and familiar contexts.
- c) Descriptions of high level language constructs and standard algorithms are correct.
- d) Simple conclusions, predictions and generalisations are made from knowledge and understanding.

Evidence Requirements

Written or oral evidence that the candidate can describe and explain the principles of software development accurately and concisely. Evidence should be obtained using questions in a closed book test, under supervision, lasting no more than 45 minutes. The test must sample content (see Computing (Intermediate 2) Course content) in each of the following areas:

- ◆ the software development process
- ◆ software development languages and environments
- ◆ high level programming language constructs
- ◆ standard algorithms

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: statement of standards (cont)

UNIT Software Development (Intermediate 2)

OUTCOME 2

Demonstrate practical skills in the context of software development using contemporary hardware and an appropriate software development environment.

Performance Criteria

- a) A range of appropriate hardware is used effectively.
- b) Common features of software are selected and used effectively.
- c) Practical tasks are planned and organised with detailed guidance.
- d) Practical tasks are undertaken in an appropriate range of simple contexts.

Evidence Requirements

Observation checklist showing that the candidate has carried out practical activities, demonstrating all of the following practical skills, as defined in the content statements (see Computing (Intermediate 2) Course content):

- ◆ analysis and design
- ◆ implementation of loops and conditional statements
- ◆ implementation of standard algorithm for input validation
- ◆ testing of software
- ◆ producing user and technical documentation
- ◆ evaluating software

Hard copy evidence should be provided of implementation and **one** other of these skills.

These practical skills may all be demonstrated in a single extended software development task, or in a number of smaller tasks.

The candidate will be allowed access to books, notes and online help while completing the task(s).

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: support notes

UNIT Software Development (Intermediate 2)

This part of the Unit Specification is offered as guidance.

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The content for this Unit is detailed below (and also in the National Course Specifications: Course details.)

Content Statement: software development process
Description of the stages (in order) of the software development process: analysis, design, implementation, testing, documentation, evaluation, maintenance.
Description and exemplification of pseudocode and one graphical design notation (structure diagram or other suitable)
Description and exemplification of appropriate test data (normal, extreme and exceptional)
Description of the features of a user guide and a technical guide
Evaluation of software in terms of fitness for purpose, user interface and readability

Content Statement: software development languages and environments
Description and comparison of machine code and high level languages.
Explanation of the need for translation; description of the functioning of interpreters and compilers.
Description of the process of recording a macro and assigning it to a keystroke; description of a macro, and examples of the use of macros.
Description of the features and use of a text editor.

Content Statement: high level programming language constructs
Description and exemplification of the following constructs in an appropriate high level language: <ul style="list-style-type: none">• Input and output, assignment, arithmetical operations (+,-,*,/,^) and logical operators (AND, OR, NOT).• Fixed loops, conditional loops, simple and complex conditions, conditional statements (IF), nested loops.
Description and exemplification of numeric and string variables and 1-D arrays.
Description and exemplification of pre-defined functions.

National Unit Specification: support notes (cont)

UNIT Software Development (Intermediate 2)

Content Statement: Standard Algorithms
Description and exemplification of the following standard algorithm in an appropriate high level language: <ul style="list-style-type: none">◆ input validation
Recognition of appropriate use of the following standard algorithms: <ul style="list-style-type: none">◆ input validation◆ find min/max◆ count occurrences◆ linear search

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates will require individual access to appropriate computer hardware and an appropriate software development environment throughout this Unit. While the learning will usually be achieved in the context of a single software development environment, candidates will benefit from having some experience of alternative software development environments.

The two Outcomes should be delivered in an integrated way rather than sequentially. For Outcome 2, the practical activities should be taught and used to illustrate and exemplify the knowledge and understanding required for Outcome 1.

The amount of time spent on each topic will vary depending on the teaching methodology used and the ability and prior experience of the candidates. However, the following times are suggested as a rough guide:

software development process	5 hours
languages and environments	5 hours
language constructs	20 hours
standard algorithms	6 hours

1½ hours should be set aside to:

- ◆ administer the Outcome 1 test
- ◆ gather evidence for Outcome 2

A further 2½ hours is allowed for remediation and re-assessment if required.

If the Unit is delivered as part of a Course, the Course documentation will provide further information on teaching and learning in a Course context, including the identification of a number of 'themes' to facilitate holistic learning across the Course.

National Unit Specification: support notes (cont)

UNIT Software Development (Intermediate 2)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank tests have been created specifically to assess Outcome 1 of the Unit. This assessment consists of a closed book test, and must be conducted under examination conditions. In order to gain success in this Outcome, the candidate must achieve at least the cut-off score for the test. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

Outcome 2 requires the candidate to demonstrate practical skills while developing software using an appropriate high level language environment. These practical skills may all be demonstrated in a single extended software development task, or in a number of smaller tasks. The skills will normally be demonstrated by the candidate during the teaching and learning activities of the Unit, rather than as separate formal assessment activities. The candidate will be allowed access to books, notes and online help while completing the task(s).

To gain success in this Outcome, the candidate must demonstrate practical skills in the following contexts and at an appropriate level as defined by the Content Statements (see Computing (Intermediate 2) Course content):

- ◆ analysis and design
- ◆ implementation of two language constructs
- ◆ implementation of the standard algorithm for input validation
- ◆ testing of software
- ◆ producing user and technical documentation
- ◆ evaluating software

A pro-forma observation checklist for Outcome 2 is provided in the National Assessment Bank materials.

Hard copy evidence is required to demonstrate implementation and one other of these skills; this need not be formal documentation – it could include hand-written design notes, hard copy of coding, or screen shots demonstrating implementation and/or testing.

All evidence must be retained by the centre. The assessment of this Unit is subject to moderation by SQA.

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 special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, September, 2003).

National Unit Specification: general information

UNIT Artificial Intelligence (Intermediate 2)

NUMBER DF31 11

COURSE Computing (Intermediate 2)

SUMMARY

This Unit is designed to develop basic knowledge and understanding of the principles of artificial intelligence together with some of the concepts associated with the representation and processing of knowledge. Students are also provided an opportunity to apply this knowledge to solve simple practical problems through the use of contemporary hardware and software. It is designed as an option for candidates undertaking the Intermediate 2 Computing Course, but is also suitable for anyone wishing to develop a basic understanding of artificial intelligence

OUTCOMES

1. Demonstrate knowledge and understanding of a range of basic facts, ideas and terminology relevant to the development, applications and features of artificial intelligence.
2. Demonstrate practical skills in the context of artificial intelligence using contemporary software and hardware.

RECOMMENDED ENTRY

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

- ◆ Intermediate 1 Computing Studies
- ◆ Standard Grade Computing Studies at General level

Administrative Information

Superclass: CB

Publication date: April 2004

Source: Scottish Qualifications Authority

Version: 01

© Scottish Qualifications Authority 2004

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. The cost for each Unit specification is £2.50. (A handling charge of £1.95 will apply to all orders for priced items.)

National Unit Specification: general information (cont)

UNIT Artificial Intelligence (Intermediate 2)

CREDIT VALUE

1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

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

National Unit Specification: statement of standards

UNIT Artificial Intelligence (Intermediate 2)

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

Demonstrate knowledge and understanding of a range of basic facts, ideas and terminology relevant to the development, applications and features of artificial intelligence.

Performance Criteria

- a) Basic computing terminology is used appropriately.
- b) Simple descriptions and explanations are related to practical and familiar contexts.
- c) Simple conclusions, predictions and generalisations are made from knowledge and understanding.

Evidence Requirements

Written or oral evidence that the candidate can describe and explain the development, applications and features of artificial intelligence accurately and correctly. Evidence should be obtained using questions in a closed book test, under supervision, lasting no more than 45 minutes. The test must sample content (see Computing Intermediate 2 Course content) in the following area:

- ◆ the development of artificial intelligence
- ◆ applications and uses of artificial intelligence
- ◆ search techniques
- ◆ knowledge representation

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: statement of standards (cont)

UNIT Artificial Intelligence (Intermediate 2)

OUTCOME 2

Demonstrate practical skills in the context of artificial intelligence using contemporary software and hardware.

Performance Criteria

- a) A range of appropriate hardware and software is used effectively.
- b) Common features of declarative languages are selected and used effectively.
- c) Practical tasks are planned and organised with detailed guidance.
- d) Practical tasks are undertaken in an appropriate range of simple contexts.

Evidence Requirements

Observational checklist showing that the candidate has demonstrated the following skills in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content):

- ◆ construction of a knowledge base of facts and simple rules from a semantic net
- ◆ creation of simple queries to elicit information from a knowledge base
- ◆ testing a knowledge base
- ◆ consulting a simple expert system

Hard copy evidence should be provided of the knowledge base constructed.

The practical skills may all be demonstrated in a single extended task, or in a number of smaller tasks.

The candidate will be allowed access to books, notes and online help while completing the task(s).

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: support notes

UNIT Artificial Intelligence (Intermediate 2)

This part of the Unit Specification is offered as guidance.

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The content for this Unit is detailed below (and also in the National Course Specifications: Course details.)

Content Statement: The Development of Artificial Intelligence
Description of human intelligence (including the ability to communicate, retain knowledge, solve problems).
Description of the Turing test and explanation of its rationale.
Explanation of the need for a different approach to programming which could represent knowledge.
Simple description of <ul style="list-style-type: none">◆ the development of game playing programs from simple early examples to contemporary complex examples exhibiting intelligence◆ the development of language processing from Eliza to chatterbots and contemporary applications◆ the development of expert systems
Identification of hardware developments (including faster processors, more memory, and increasing backing store capacity) which have assisted the development of AI.

Content Statement : Applications and Uses of Artificial Intelligence
Artificial neural systems Simple description of a neural network as an electronic model of the brain consisting of many interconnected simple processors. Description of uses and examples of artificial neural systems (including learning to read postcodes; stock market prediction; debt risk assessment; other examples of pattern recognition). Description of advantages and disadvantages of artificial neural systems.
Vision systems Explanation of the need to interpret/make sense of visual input. Description of applications (including industrial, military use, satellite photo interpretation).
Speech recognition Description of applications (including word processor, punctuation commands, disabled users, cars, military, mobile phones). Description of characteristics (training for each voice pattern, control instructions, influence of background noise, factors affecting accuracy).

National Unit Specification: support notes (cont)

UNIT Artificial Intelligence (Intermediate 2)

Content Statement : Applications and Uses of Artificial Intelligence (cont.)
Handwriting recognition: Description of common applications (including palmtops and tablet PCs). Explanation of possible need to train the system.
Intelligent robots: Description of: <ul style="list-style-type: none">◆ types of sensors used◆ contemporary applications (including automated delivery, pipe inspection, bomb disposal, exploration of unknown environments)◆ advantages of intelligent robots
Expert systems: Description of purpose of expert systems. Description of advantages of expert systems over human experts, including: <ul style="list-style-type: none">◆ expertise always available◆ reduced wage bill◆ combines expertise of several experts◆ less chance of errors Description of contemporary applications of expert systems. Description of social, legal and ethical issues related to the use of expert systems (including loss of jobs, training issues, public reactions, loss of human expertise).

Content Statement: Search techniques
Exemplification of problem solving by search. Construction of a simple search tree. Description of breadth-first and depth-first search and exemplification on a search tree.

Content Statements: Knowledge Representation
Construction of semantic net to represent simple relationships and facts.
Description and exemplification of the following features in Prolog (or similar declarative language): <ul style="list-style-type: none">◆ Simple facts (single/double argument)◆ Simple rules (up to two sub-goals)◆ Simple queries (true/false, single variable)◆ Operators: and, >, <, =
Explanation of the concepts of goals and sub-goals.
Perform simple manual trace: one rule/level.

National Unit Specification: support notes (cont)

UNIT Artificial Intelligence (Intermediate 2)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates will require individual access to appropriate computer hardware and software throughout this Unit.

The two Outcomes should be delivered in an integrated way rather than sequentially. For Outcome 2, the practical activities should be taught and used to illustrate and exemplify the knowledge and understanding required for Outcome 2, whenever this is possible. At the very least, candidates should carry out practical tasks using Prolog, and have experience of consulting a simple expert system system which could be a simple one prepared for the purpose, or a commercial example. Practical illustrations of other applications and uses of artificial intelligence should be provided where suitable hardware and software is available.

The amount of time spent on each area of content will vary depending on the teaching methodology used and the ability and prior experience of the candidates. However, the following times are suggested as a rough guide:

development of artificial intelligence	6 hours
applications and uses of artificial intelligence	12 hours
search techniques	4 hours
knowledge representation	14 hours

1½ hours should be set aside to:

- ◆ administer the Outcome 1 test
- ◆ gather evidence for Outcome 2

A further 2½ hours is allowed for remediation and re-assessment if required.

If the Unit is delivered as part of a Course, the Course documentation will provide further information on teaching and learning in a Course context, including the identification of a number of 'themes' to facilitate holistic learning across the Course.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank tests have been created specifically to assess Outcome 1 of the Unit. This assessment consists of a closed book test, and must be conducted under examination conditions. In order to gain success in this Outcome, the candidate must achieve at least the cut-off score for the test. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard

Outcome 2 requires the candidate to demonstrate practical skills while using contemporary hardware and software. These practical skills will normally be demonstrated in a number of relatively small tasks. The skills will normally be demonstrated by the candidate during the teaching and learning activities of the Unit, rather than during separate formal assessment activities. The candidate will be allowed access to books, notes and online help while demonstrating the skills. The practical skills should be demonstrated in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content).

National Unit Specification: support notes (cont)

UNIT Artificial Intelligence (Intermediate 2)

To gain success in this Outcome, the candidate must demonstrate practical skills in the following contexts:

- ◆ construction of a knowledge base of facts and simple rules from a semantic net
- ◆ creation of simple queries to elicit information from a knowledge base
- ◆ testing a knowledge base
- ◆ consulting a simple expert system

Hard copy evidence should be provided of the knowledge base constructed.

Note: the candidate is only required to test an expert system, not to construct one.

A pro-forma observation checklist for Outcome 2 is provided in the National Assessment Bank materials.

All evidence must be retained by the centre. The assessment of this Unit is subject to moderation by SQA.

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 special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, September, 2003).

National Unit Specification: general information

UNIT Computer Networking (Intermediate 2)

NUMBER DF30 11

COURSE Computing (Intermediate 2)

SUMMARY

This Unit is designed to develop knowledge and understanding of the principles of networking and practical skills related to networking through the use of contemporary hardware and software. This knowledge, understanding and practical skills may then be applied by the candidate to solve practical problems related to networking. It is designed as an option for candidates undertaking the Intermediate 2 Computing Course, but is also suitable for anyone wishing to develop a basic understanding of computer networking.

OUTCOMES

1. Demonstrate knowledge and understanding of a range of facts, ideas and terminology relevant to the principles, features and purposes of networking.
2. Demonstrate practical skills in the context of networking using contemporary hardware and software.

RECOMMENDED ENTRY

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

- ◆ Intermediate 1 Computing Studies
- ◆ Standard Grade in Computing Studies at General level

Administrative Information

Superclass: CB

Publication date: April 2004

Source: Scottish Qualifications Authority

Version: 01

© Scottish Qualifications Authority 2004

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. The cost for each Unit specification is £2.50. (A handling charge of £1.95 will apply to all orders for priced items.)

National Unit Specification: general information (cont)

UNIT Computer Networking (Intermediate 2)

CREDIT VALUE

1 credit at Intermediate 1 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

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

National Unit Specification: statement of standards

UNIT Computer Networking (Intermediate 2)

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

Demonstrate knowledge and understanding of a range of facts, ideas and terminology relevant to the principles, features and purposes of networking.

Performance Criteria

- a) Basic computing terminology is used appropriately.
- b) Simple descriptions and explanations are related to practical and familiar contexts.
- c) Simple conclusions, predictions and generalisations are made from knowledge and understanding.

Evidence Requirements

Written or oral evidence that the candidate can describe and explain the principles, features and purposes of networking correctly. Evidence should be obtained using questions in a closed book test, under supervision, lasting no more than 45 minutes. The test must sample content (see Computing (Intermediate 2) Course content) in each of the following areas:

- ◆ network applications
- ◆ network security
- ◆ data transmission
- ◆ network protocols

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: statement of standards (cont)

UNIT Computer Networking (Intermediate 2)

OUTCOME 2

Demonstrate practical skills in the context of networking using contemporary hardware and software.

Performance Criteria

- a) A range of appropriate hardware is used effectively.
- b) Common features of software are selected and used effectively.
- c) Practical tasks are planned and organised with detailed guidance.
- d) Practical tasks are undertaken in an appropriate range of simple contexts.

Evidence Requirements

Observation checklist showing that the candidate has demonstrated practical skills at an appropriate level in **two** of the following contexts:

- ◆ transferring files across a network using ftp
- ◆ use of encryption software to encrypt a file
- ◆ use of an e-mail application package and its various features
- ◆ creation of a web page
- ◆ implementing a personal backup strategy

Hard copy evidence should be provided for **one** of these activities.

These practical skills may all be demonstrated in a single extended task, or in a number of smaller tasks.

The practical skills should be demonstrated in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content).

The candidate will be allowed access to books, notes and on-line help while completing the tasks.

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: support notes

UNIT Computer Networking (Intermediate 2)

This part of the Unit Specification is offered as guidance.

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The content for this Unit is detailed below (and also in the National Course Specifications: Course details.)

Content Statement: Network Applications
Description of services provided by the Internet; World Wide Web, electronic mail and file transfer.
Explanation of the structure of: <ul style="list-style-type: none">◆ an e-mail address◆ a URL (uniform resource locator)
Explanation of the purpose of a web browser. Brief description of the functions of a web browser (access the www, provide facilities including file transfer and e-mail).
Description of a web page as a text document with hyperlinks.
Description of browsers and microbrowsers for use with wireless data (WAP).
Description of hyperlinks, search engines and navigation.
Description of a situation when an ISP (Internet service provider) is required. Explanation of the purpose of an ISP.
Description of e-commerce: the use of the Internet in conducting business and providing a service (e-government, e-business, e-marketing and e-sales).
Description of current converging technologies in the home (home appliances with built in internal and external communication capability.)
Description of the economic implications for business and education of the growth of network technology and the Internet.
Description of main features of the Regulation of Investigatory Powers Act 2000.
Description of the need to adhere to a code of conduct governing the use, both in school and at home, of networks and the Internet.

National Unit Specification: support notes (cont)

UNIT Computer Networking (Intermediate 2)

Content Statement: Network Security
Description of security measures: <ul style="list-style-type: none">◆ physical◆ software – password and user ID
Brief explanation of the use and advantages of encryption.
Explanation of the need for filtering Internet contents in education, home and commercial companies.
Description of potential threats to networks: <ul style="list-style-type: none">◆ hardware failure◆ software failure◆ data transmission failure◆ physical disasters
Description of the need for a backup strategy.

Content Statement: Data Transmission
Description of the three types of transmission: unicast, broadcast and multicast.
Description of the dual use made of networks in voice and data transmission.
Description of modern wireless communication methods: <ul style="list-style-type: none">◆ wireless personal area network (WPAN)◆ wireless LAN◆ wireless WAN
Description of the types of connections to the Internet (dialup modem, ADSL, cable modem, leased line and ISDN).
Explanation of the term broadband.
Description of the additional hardware requirements for a wireless LAN (receiver, transmitter and wireless NIC).

Content Statement: Network Protocols
Description of name services (name resolution); DNS (domain names, host name resolution).

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates will require individual access to appropriate computer hardware and software throughout this Unit. While the learning may be achieved in the context of one computer system, candidates will benefit from having some experience of alternative operating systems.

The two Outcomes should be delivered in an integrated way rather than sequentially. For Outcome 2, the practical activities should be taught and used to illustrate and exemplify the knowledge and understanding required for Outcome 1.

National Unit Specification: support notes (cont)

UNIT Computer Networking (Intermediate 2)

The amount of time spent on each area of content will vary depending on the teaching methodology used and the ability and prior experience of the candidates. However, the following times are suggested as a rough guide:

network applications	12 hours
network security	10 hours
data transmission	11 hours
network protocols	3 hours

1½ hours should be set aside to:

- ◆ administer the Outcome 1 test
- ◆ gather evidence for Outcome 2

A further 2½ hours is allowed for remediation and re-assessment if required.

If the Unit is delivered as part of a Course, the Course documentation will provide further information on teaching and learning in a Course context, including the identification of a number of ‘themes’ to facilitate holistic learning across the Course.

National Unit Specification: support notes (cont)

UNIT Computer Networking (Intermediate 2)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank tests have been created specifically to assess Outcome 1 of the Unit. This assessment consists of a closed book test, and must be conducted under examination conditions. In order to gain success in this Outcome, the candidate must achieve at least the cut-off score for the test. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard

Outcome 2 requires the candidate to demonstrate practical skills while using contemporary hardware and software. These practical skills will normally be demonstrated as a single task or a number of relatively small tasks undertaken by the candidate during the teaching and learning activities of the Unit, rather than as separate formal assessment activities. The candidate will be allowed access to books, notes and online help while completing the task(s).

To gain success in this Outcome, the candidate must demonstrate practical skills at an appropriate level in **two** of the following contexts, as defined by the content statements (see Computing Intermediate 2 Course content):

- ◆ transferring files across a network using ftp
- ◆ use of encryption software to encrypt a file
- ◆ use of an e-mail application package and its various features
- ◆ creation of a web page
- ◆ implementing a personal backup strategy

Hard copy evidence should be provided for **one** of these activities. Note that this evidence need not be formal reports; it could consist of a printout or a screen shot from any of the practical activities.

A pro-forma observation checklist for Outcome 2 is provided in the National Assessment Bank materials.

All evidence must be retained by the centre. The assessment of this Unit is subject to moderation by SQA.

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 special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, September, 2003).

National Unit Specification: general information

UNIT Multimedia Technology (Intermediate 2)

NUMBER DF32 11

COURSE Computing (Intermediate 2)

SUMMARY

This Unit is designed to develop knowledge and understanding of the principles of multimedia technology and to develop practical skills in the capture, creation and storage of multimedia data through the use of contemporary hardware and software. This knowledge and understanding and these practical skills may then be applied by the candidate to solve practical problems in the context of multimedia applications. It is designed as an option for candidates undertaking the Intermediate 2 Computing Course, but is also suitable for anyone wishing to develop a basic understanding of multimedia technology.

OUTCOMES

1. Demonstrate knowledge and understanding of the principles, features, purposes and implications of the technologies involved in the capture, creation and storage of multimedia data by contemporary multimedia systems.
2. Demonstrate practical skills in the use of multimedia technology using contemporary hardware and software.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following or equivalent.

- ◆ Intermediate 1 Computing Studies
- ◆ Intermediate 1 Multimedia Applications Unit
- ◆ Standard Grade Computing at General level

Administrative Information

Superclass: CE

Publication date: April 2004

Source: Scottish Qualifications Authority

Version: 01

© Scottish Qualifications Authority 2004

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. The cost for each Unit specification is £2.50. (A handling charge of £1.95 will apply to all orders for priced items.)

National Unit Specification: general information (cont)

UNIT Multimedia Technology (Intermediate 2)

CREDIT VALUE

1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

CORE SKILLS

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

National Unit Specification: statement of standards

UNIT Multimedia: Technology (Intermediate 2)

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

Demonstrate knowledge and understanding of the principles, features, purposes and implications of the technologies involved in the capture, creation and storage of multimedia data by contemporary multimedia systems.

Performance Criteria

- a) Basic computing terminology is used appropriately.
- b) Simple descriptions and explanations are related to practical and familiar contexts.
- c) Simple conclusions, predictions and generalisations are made from knowledge and understanding.

Evidence Requirements

Written or oral evidence that the candidate can describe and explain the principles, features and purposes of multimedia technology. Evidence should be obtained using questions in a closed book test, under supervision, lasting no more than 45 minutes. The test must sample content (see Computing (Intermediate 2) Course content) within the following areas:

- ◆ development process for multimedia applications
- ◆ bit-mapped graphic data
- ◆ digitised sound data
- ◆ video data
- ◆ vector graphics data
- ◆ synthesised sound data
- ◆ implications of the use of contemporary multimedia technology

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: statement of standards (cont)

UNIT Multimedia: Technology (Intermediate 2)

OUTCOME 2

Demonstrate practical skills in the use of multimedia technology using contemporary hardware and software.

Performance Criteria

- a) A range of appropriate hardware is used effectively.
- b) An appropriate range of features of software is used effectively.
- c) Practical tasks are planned and organised with detailed guidance.
- d) Practical tasks are undertaken in an appropriate range of simple contexts.

Evidence Requirements

Observation checklist showing that the candidate has demonstrated practical skills in the following **four** contexts:

- ◆ capturing, editing or creating graphic data
- ◆ capturing, editing or creating sound data
- ◆ capturing, editing or creating video data
- ◆ combining two or more data types into a single document or application

Hard copy evidence should be provided for **one** of these activities.

These practical skills may all be demonstrated in a single extended task, or in a number of smaller tasks.

The practical skills should be demonstrated in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content).

The candidate will be allowed access to books, notes and on-line help while completing the task(s).

(The content statements are also reproduced for convenience as a table in the support notes for this Unit).

The standard to be applied is illustrated in the National Assessment Bank items available for this Unit. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

National Unit Specification: support notes

UNIT Multimedia Technology (Intermediate 2)

This part of the Unit Specification is offered as guidance.

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

The content for this Unit is detailed below (and also in the National Course Specifications: Course details.)

Content Statement: Development Process for Multimedia Applications
Simple description of the software development process as it applies to the development of multimedia applications.
Identification of methodologies used in the creation or definition of a multimedia application, including: <ul style="list-style-type: none">◆ WYSIWYG editors and text editors to create web pages◆ authoring software to create multimedia applications◆ presentation software to create presentations
Simple description of the requirements for the display of a multimedia application, including web browser, file 'player' and executable file.

Content Statement: Bit-mapped graphic data
Simple description of the hardware used to capture still graphic data, including: <ul style="list-style-type: none">◆ digital camera (CCD and removable, re-usable storage)◆ scanner (CCD)
Simple description of the storage and limitations of graphic data in compressed and uncompressed file formats, including: <ul style="list-style-type: none">◆ bitmap (uncompressed)◆ GIF (256 colours, transparency, lossless compression)◆ JPEG (lossy compression)
Explanation of the following terms in connection with graphics and description of the relationships between them and their effect on image quality: <ul style="list-style-type: none">◆ lossy compression◆ resolution (number of pixels)◆ colour depth (number of colours)◆ file size (in bytes, Kb, Mb, Gb)
Description of the main features and applications of simple bitmap editing and creation software, including: <ul style="list-style-type: none">◆ painting programs (paintbrush, fill)◆ image editing programs (decrease resolution, alter colour depth, crop, alter brightness and contrast, re-size or scale an image, special effects)
Identification of hardware required to display 2D graphics, including graphics card.

National Unit Specification: support notes (cont)

UNIT Multimedia Technology (Intermediate 2)

Content Statement: Digitised sound data
Identification of hardware required to capture sound data, including sound card and microphone.
Simple description of the storage of sound data in compressed and uncompressed formats, including: <ul style="list-style-type: none">◆ RAW (uncompressed)◆ WAV (compressed) (including WAV)◆ MP3 (lossy compression)
Explanation of the following terms in connection with sounds, and description of the relationships between them and their effect on sound quality: <ul style="list-style-type: none">◆ lossy compression◆ sampling depth/resolution (bytes)◆ sampling frequency (Hz, KHz)◆ sound time(s)◆ file size (in bytes, Kb, Mb, Gb)
Description of the main features and applications of simple sound editing software, including: <ul style="list-style-type: none">◆ decrease sampling frequency◆ decrease sampling depth◆ crop, effects, echo, reverse, volume
Identification of need for sound card to output sound.

Content Statement: video data
Simple description of hardware required to capture digital video (digital video camera or web cam).
Simple description of the storage of video data in compressed and uncompressed formats, including: <ul style="list-style-type: none">◆ uncompressed AVI◆ MPEG (lossy compression)
Explanation of the following terms in connection with videos and description of the relationships between them and their effect on video quality: <ul style="list-style-type: none">◆ lossy compression◆ colour depth (bytes)◆ resolution◆ frame rate (fps)◆ video time (s)◆ file size (in bytes, Kb, Mb, Gb)
Description of the main features and applications of simple video editing software with single clips, including crop (or trimming).
Identification of need for graphics card to output video data.

National Unit Specification: support notes (cont)

UNIT Multimedia Technology (Intermediate 2)

Content Statement: Vector graphics data
Description of basic features of vector graphics: <ul style="list-style-type: none">◆ scalable (independent of resolution)◆ each object is editable◆ layering
Identification of common attributes of vector graphics objects: <ul style="list-style-type: none">◆ drawing (shape, position, size, rotation, line, fill, layer)◆ 3D image (shape, position, size, rotation, texture)
Identification of common file types used to store graphics in vector formats, including: <ul style="list-style-type: none">◆ SVG (scalable vector graphics)◆ VRML (virtual reality mark-up language or WRL — world description language)

Content Statements: Synthesised sound data
Description of use of MIDI keyboard or instrument to create sound data in MIDI format.
Identification of common attributes of notes stored as MIDI data (instrument, pitch, volume, duration, tempo).

Content Statement: Implications of use of multimedia technology
Description of contemporary technologies and their uses, that demonstrate convergence of technology in relation to multimedia capabilities, including: <ul style="list-style-type: none">◆ smart phone◆ pocket PC◆ digital television◆ virtual reality

National Unit Specification: support notes (cont)

UNIT Multimedia Technology (Intermediate 2)

Glossary of abbreviations for this Unit:

AVI	audio video interleaved
CCD	charge coupled device
GIF	graphic interchange format
HTML	hypertext markup language
JPEG	joint photographic experts group
MIDI	musical instrument digital interface
MPEG	motion picture expert group
MP3	MPEG-1 layer-3
RAW	'raw' (uncompressed) data
SVG	scalable vector graphics
VRML	virtual reality markup language
WRL	world description language
WYSIWYG	what you see is what you get

National Unit Specification: support notes (cont)

UNIT Multimedia Technology (Intermediate 2)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

Candidates will require individual access to appropriate computer hardware and software throughout this Unit.

The two Outcomes should be delivered in an integrated way rather than sequentially. For Outcome 2, the practical activities should be taught and used to illustrate and exemplify the knowledge and understanding required for Outcome 1.

The amount of time spent on each area of content will vary depending on the teaching methodology used and the ability and prior experience of the candidates. However, the following times are suggested as a rough guide:

development process for multimedia applications	2 hours
2D graphic data — theory	3 hours
capture, edit or create bitmap graphic data	3 hours
digitised sound data — theory	3 hours
capture, edit or create digitised sound data	3 hours
video data	3 hours
capture, edit or create video data	3 hours
vector graphics	4 hours
synthesised sound	3 hours
implications of the use of contemporary multimedia technology	5 hours
combine multimedia data	4 hours

1½ hours should be set aside to:

- ◆ administer the Outcome 1 test
- ◆ gather evidence for Outcome 2

A further 2½ hours is allowed for remediation and re-assessment if required.

If the Unit is delivered as part of a Course, the Course documentation will provide further information on teaching and learning in a Course context, including the identification of a number of ‘themes’ to facilitate holistic learning across the Course.

National Unit Specification: support notes (cont)

UNIT Multimedia Technology (Intermediate 2)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

National Assessment Bank tests have been created specifically to assess Outcome 1 of the Unit. This assessment consists of a closed book test, and must be conducted under examination conditions. In order to gain success in this Outcome, the candidate must achieve at least the cut-off score for the test. If a centre wishes to design its own assessments for this Unit, they should be of a comparable standard.

Outcome 2 requires the candidate to demonstrate practical skills while using contemporary hardware and software. These practical skills may be demonstrated in a single extended task or a number of relatively small tasks. The skills will normally be demonstrated by the candidate during the teaching and learning activities of the Unit, rather than during separate formal assessment activities. The candidate will be allowed access to books, notes and on-line help while demonstrating the skills. The practical skills should be demonstrated in the context and at a level defined by the content statements (see Computing (Intermediate 2) Course content).

To gain success in this Outcome, the candidate must demonstrate practical skills in the following **four** contexts:

- ◆ capturing, editing or creating graphic data
- ◆ capturing, editing or creating sound data
- ◆ capturing, editing or creating video data
- ◆ combining two or more data types into a single document or application

Hard copy evidence should be provided for **one** of these activities. Note that this need not be formal documentation — simple print outs or screen are suitable evidence.

A pro-forma observation checklist for Outcome 2 is provided in the National Assessment Bank materials.

All evidence must be retained by the centre. The assessment of this Unit is subject to moderation by SQA.

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 special alternative Outcomes for Units. For information on these, please refer to the SQA document *Guidance on Special Assessment Arrangements* (SQA, September, 2003).