National Unit Specification: general information

UNIT   Multimedia Technology (Higher)

NUMBER   DF32 12

COURSE   Computing (Higher)

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 for candidates undertaking the Higher Computing Course, but is also suitable for anyone wishing to extend and deepen their experience of multimedia technology beyond Intermediate 2 level, or those who have practical experience in multimedia applications wishing to develop a secure understanding of the underlying 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 2 Computing
♦   Intermediate 2 Multimedia Technology Unit
♦   Standard Grade Computing at Credit level

Administrative Information

Superclass: CE

Publication date: April 2004

Source: Scottish Qualifications Authority

Version: 01

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)

CREDIT VALUE

1 credit at Higher (6 SCQF credit points at SCQF level 6*).

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 (Higher)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit Specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1
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)   A range of computing terminology is used appropriately.
b)   Technically accurate descriptions and explanations are related to practical and familiar contexts.
c)   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 (Higher) 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 (Higher)

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 and efficiently.
b)   An appropriate range of features of software is used effectively and efficiently.
c)   Practical tasks are planned and organised with minimal guidance.
d)   Practical tasks are undertaken in an appropriate range of familiar contexts.

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

♦   use of file formats and settings for graphic bit-mapped graphic data
♦   use of file formats and settings for video data
♦   use of file formats and settings for digitised sound data
♦   use of file formats and settings for vector graphic data or synthesised sound 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 (Higher) Course content).

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   Multimedia Technology (Higher)

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 statements in the left–hand column describe the content covered in the corresponding Unit at Intermediate 2 level, and are included here to clarify the context for the new learning for this Unit. They indicate the prior learning required by the candidate before undertaking new learning within this Unit.

Content statements in the right–hand column define the new content for this Unit.

Content Statements: Development process for multimedia applications	
Intermediate 2	Higher
Simple description of the software development process as it applies to the development of multimedia applications.	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*	Description 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.	Description of the methodologies and requirements for the display of a multimedia application, including streaming of multimedia data and embedded files.
	Explanation and exemplification of the terms 'codec' and 'container' file.

National Unit Specification: support notes (cont)

UNIT   Multimedia Technology (Higher)

Content Statements: Bit-mapped graphic data	
Intermediate 2	Higher
Simple description of the hardware used to capture still graphic data, including: ♦ *digital camera (CCD and removable, re-usable storage)* ♦ *scanner (CCD)*	Description of the hardware used to capture still graphic data, including: ♦ digital camera (array CCD, memory card storage medium) ♦ scanner (linear CCD) ♦ role of ADC
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)*	Description of the storage of graphic data in compressed and uncompressed file formats, including simple description of the techniques used within each file for compression and data storage, including: ♦ bitmap (indexed colour or CLUT) ♦ 24-bit bitmap and compressed bitmap (RLE) ♦ GIF (animation, (non)-interlaced, LZW) ♦ JPEG (description of factors involved) ♦ PNG (CLUT or RGB, transparency, compressed)
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 RGB colour codes and their effect on the overall colour produced. Calculations using the relationship: File Size = resolution pixels x colour depth (bits). Calculation of number of pixels from height, width and resolution.
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)*	Explanation of the following image related terms: ♦ dithering ♦ anti-aliasing ♦ increase resolution (re-sampling)
Identification of hardware required to display 2D graphics, including graphics card.	Description of features of graphics cards involved in displaying 2D graphics, including: ♦ role of DAC ♦ role of GPU/DSP (to allow effects to be applied by hardware)

National Unit Specification: support notes (cont)

UNIT   Multimedia Technology (Higher)

Content Statements: Digitised sound data	
Intermediate 2	Higher
Identification of hardware required to capture sound data, including sound card and microphone.	Description of soundcard in its use to capture sound data including role of ADC.
Simple description of the storage of sound data in compressed and uncompressed formats, including: ♦ *RAW (uncompressed)* ♦ *RIFF (compressed) (includes WAV)* ♦ *MP3 (lossy compression)*	Description of the storage of sound data in compressed and uncompressed file formats, including simple description of the techniques used within each file for compression and data storage, including: ♦ RAW (PCM) ♦ RIFF (ADPCM) (including WAV) ♦ MP3 (description of factors involved)
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 following terms in relation to audio files: ♦ bit-rate to describe data throughput for a sound file ♦ normalising sound files Calculations using the relationship: File Size (bytes) = Sampling Frequency (Hz) x Sound Time (s) x Sampling Depth (bytes) x Channels.
Description of the main features and applications of simple sound editing software, including: ♦ *decrease sampling frequency* ♦ *decrease sampling depth* ♦ *crop, effects, echo, reverse, volume*	Explanation of the following sound related terms: ♦ clipping ♦ stereo ♦ surround sound ♦ fade
Identification of need for sound card to output sound.	Description of features of sound cards, including: ♦ role of DAC ♦ role of DSP (to allow hardware decoding of sound files)

National Unit Specification: support notes (cont)

UNIT   Multimedia Technology (Higher)

<table>
<tr><th colspan="2">Content Statements: Video data</th></tr>
<tr><th>Intermediate 2</th><th>Higher</th></tr>
<tr>
<td>Simple description of hardware required to capture digital video (digital video camera or web cam).</td>
<td>Technical description of hardware required to capture digital and analogue video:

digital video camera (array CCD)
web cam (array CCD)
video capture card (role of ADC and role of DSP to allow hardware encoding of data stream including into MPEG format)
</td>
</tr>
<tr>
<td>Simple description of the storage of video data in compressed and uncompressed formats, including:

uncompressed AVI
MPEG (lossy compression)
</td>
<td>Description of the storage of video data in compressed and uncompressed file formats, including simple description of the techniques used within each file for compression and data storage and the inclusion of sound within the file, including:

uncompressed AVI
MPEG (description of factors involved)
</td>
</tr>
<tr>
<td>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)
</td>
<td>Description of term bit-rate to describe data throughput for a video file.

Calculations using the relationship:
File Size (bytes) = pixels per frame x Colour Depth (bytes) x Video Time (s) x Frame Rate (fps).</td>
</tr>
<tr>
<td>Description of the main features and applications of simple video editing software with single clips, including crop (or trimming).</td>
<td>Description of the main features and applications of video editing software with multiple clips, including:

timeline
transition
sequencing
</td>
</tr>
<tr>
<td>Identification of need for graphics card to output video data.</td>
<td>Description of features of graphics cards for output of video, including:

role of DAC
role of DSP (to allow hardware decoding of data stream including MPEG files)
</td>
</tr>
</table>

UNIT Multimedia Technology (Higher)

Content Statements: Vector graphics data	
Intermediate 2	Higher
Description of basic features of vector graphics: ♦ *scalable (independent of resolution)* ♦ *each object is editable* ♦ *layering*	Description of features of vector graphics: ♦ object oriented data storage ♦ more storage efficient than bit-mapped ♦ output quality matches hardware capability ♦ conversion to bitmap formats
Identification of common attributes of vector graphic objects: ♦ *drawing (shape, position, size, rotation, line, fill, layer)* ♦ *3D image (shape, position, size, rotation, texture)*	Description of common attributes of vector graphic objects: ♦ drawing (shape, position, size, rotation, line, fill) ♦ 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)*	Description of basic features and structures of vector graphic file types, including methods used to implement common attributes listed above for these file types: ♦ SVG ♦ VRML/WRL

Content Statements: Synthesised sound data	
Intermediate 2	Higher
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).	Description of common attributes of notes stored as MIDI data (instrument, pitch, volume, duration, tempo).
	Description of advantages and disadvantages of storing sound as MIDI data.

National Unit Specification: support notes (cont)

UNIT   Multimedia Technology (Higher)

Content Statements: Implications of use of multimedia technology	
Intermediate 2	Higher
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*	Description of trends and changes in contemporary technologies that facilitate the convergence of technologies in relation of multimedia capabilities, including: ♦ communications (buses, wireless standards, increasing bandwidth), including USB, Firewire, WiFi, Bluetooth ♦ storage technologies (decreasing size and price, increasing capacity), including optical, magnetic, holographic ♦ processor (increasing power) ♦ display technologies, including real and virtual 3D displays, and flat displays

UNIT   Multimedia Technology (Higher)

Glossary of abbreviations:

ADC	Analogue to Digital Converter
API	Applications Program Interface
AVI	Audio Video Interleaved
CCD	Charge Coupled Device
CLUT	Colour Lookup Table
DAC	Digital to Analogue Converter
DSP	Digital Signal Processing
GIF	Graphic Interchange Format
GPU	Graphics Processing Unit
HTML	Hypertext Markup Language
JPEG	Joint Photographic Experts Group
IEEE	Institute of Electronic and Electrical Engineers
LZW	Lempel, Ziv, Welch (compression algorithm)
MIDI	Musical Instrument Digital Interface
MPEG	Motion Picture Expert Group
MP3	MPEG-1 audio layer - 3
PCM	Pulse Code Modulation
PNG	Portable Network Graphics
RAW	"raw" (unprocessed) data
RGB	Red Green Blue
RIFF	Resource Interchange File Format
RLE	Run-Length Encoding
SVG	Scalable Vector Graphics
USB	Universal Serial Bus
VRML	Virtual Reality Markup Language
WRL	World Description Language
WYSIWYG	What You See Is What You Get

UNIT   Multimedia Technology (Higher)

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.

Candidates who have completed the *Multimedia Technology* Unit at Intermediate 2 level should already have covered the content listed in the left–hand column of the content grids, but may need to revise this material before progressing to the right–hand column.

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
effective use of file formats and settings (2D graphic)	3 hours
sound data — theory	4 hours
effective use of file formats and settings (sound)	3 hours
video data	3 hours
effective use of file formats and settings (video)	3 hours
vector graphics data	3 hours
MIDI sound data	3 hours
implications of the use of contemporary multimedia technology	4 hours
combine multimedia data	5 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 (Higher)

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT
National Assessment Bank tests have been created specifically to assess Outcome1 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 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 (Higher) Course content).

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

♦ use of file formats and settings for bit-mapped graphic data
♦ use of file formats and settings for video data
♦ use of file formats and settings for digitised sound data
♦ use of file formats and settings for vector graphic data or synthesised sound data
♦ combining two or more data types into a single document or application

Hard copy evidence must 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).