Higher National Unit specification

General information for centres

Unit title: Game Technology

Unit code: F8M3 34

Unit purpose: This Unit is designed to give candidates a broad general knowledge and understanding of the technology behind game consoles and gaming computers. This will include the functions, concepts and mechanisms of internal system components and external peripheral devices. This includes the way in which the internal representation used within the machine can be translated to give human readable values. The study of this Unit is primarily intended for candidates who intend to follow a career within the computer games development industry, however it would also be of benefit to those studying technical support or computer programming.

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

1 Demonstrate an ability to manipulate and translate data representations.
2 Demonstrate an understanding of the functions of the internal system components and external peripheral devices which make up gaming consoles and personal computers.
3 Investigate and compare current technologies in gaming.

Credit points and level: 1 HN Credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

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

Recommended prior knowledge and skills: Access to this Unit is at the discretion of the centre. However, it is recommended that candidates should possess some numeracy skills. This could be demonstrated by the achievement of the Core Skills component *Numeracy: Using Number* at SCQF level 4.

Core Skills: There are opportunities to develop the Core Skill of *Numeracy: Using Number* at SCQF level 5 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

General information for centres (cont)

Context for delivery: This Unit is included in the framework for the HNC/D Computer Games Development and can be delivered as part of that Award. It is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: Outcome 1 is a closed-book assessment and should take the form of a set of 20 objective questions. This assessment must be carried out under supervised, closed-book conditions. This assessment can be paper based or carried out via an on-line assessment.

Outcome 2 is a closed-book assessment and should take the form of a set of 30 objective questions. This assessment must be carried out under supervised, closed-book conditions. This assessment can be paper based or carried out via an on-line assessment.

If a centre is presenting the closed-book assessments for Outcome 1 and 2 on-line the following assessment methods, where appropriate, may be selected:

- Multiple-choice
- Drag and drop
- Multiple response
- Mix and match
- A combination of the above

Outcome 3 should be assessed by the production of a report on current technologies in gaming. This assessment should be carried out under open-book conditions.

Assessors should ensure themselves of the authenticity of the Candidate's evidence.

Higher National Unit specification: statement of standards

Unit title: Game Technology

Unit code: F8M3 34

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Demonstrate an ability to manipulate and translate data representations

Knowledge and/or Skills

- Convert between different number bases using integer numbers
- Perform arithmetic operations in different number bases
- Carry out Boolean logic operations
- Representation of American Standard Code for Information Interchange (ASCII) characters in computer storage
- Application of ODD and EVEN parity at the binary level to ASCII
- Character representation using modern character encoding standards such as Unicode
- File formats for representing images, audio and movies
- Units of storage bits and bytes and metric prefixes' kilo, mega, giga, tera, peta

Higher National Unit specification: statement of standards (cont)

Unit title: Game Technology

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they have the ability to manipulate and translate data representations. Evidence for all the knowledge and/or skills in this Outcome will be assessed using a representative sample of 20 questions. All evidence requirements listed below must be covered **at least** once with additional questions at the discretion of the centre:

1 Perform addition between two 8-digit binary numbers.
2 Perform subtraction between two 8-digit binary numbers.
3 Perform addition between two 4-digit hexadecimal numbers.
4 Perform subtraction between two 4-digit hexadecimal numbers.
5 Convert a 4-digit base ten (denary) number to base sixteen (hexadecimal).
6 Convert a 4-digit base sixteen (hexadecimal) number to base ten (denary).
7 Convert an 8-digit base two (binary) number to base ten (denary).
8 Convert a 4-digit base ten (denary) number to base two (binary).
9 Convert an 8-digit base two (binary) number to base sixteen (hexadecimal).
10 Convert a 4-digit base sixteen (hexadecimal) number to base two (binary).
11 Apply a Boolean AND operation with binary inputs of not less than eight bits.
12 Apply a Boolean OR operation with binary inputs of not less than eight bits.
13 Apply a Boolean NOT operation with binary inputs of not less than eight bits.
14 Apply a Boolean XOR operation with binary inputs of not less than eight bits.
15 Convert a 7-bit ASCII character to an 8-bit binary value applying ODD or EVEN parity to it.
16 Convert a binary value to a 7-bit ASCII character.
17 Answer a question about a multimedia file format.
18 Answer a question about units of storage, such as Megabytes, gigabytes, kilobits, megabits.

The assessment will be supervised, controlled and under closed-book conditions and should last no more than 1 hour. Candidates may not bring to the assessment event any notes, textbooks, handouts, calculators or other material, nor may candidates use an on-screen or on-line calculator.

The instrument of assessment must provide opportunities for the Outcome to be fulfilled by means of sampling across the range of the content of Outcome 1. This assessment must change on **each** assessment occasion. Achievement can be decided by use of a 60% cut-off score.

Assessment Guidelines

If a centre is presenting this assessment on-line the following assessment methods, where appropriate, may be selected:

- Multiple-choice
- Drag and drop
- Multiple response
- Mix and match
- A combination of the above

Higher National Unit specification: statement of standards (cont)

Unit title: Game Technology

Unit code: F8M3 34

Outcome 2

Demonstrate an understanding of the functions of the internal system components and external peripheral devices which make up gaming consoles and personal computers

Knowledge and/or Skills

- Functions of the main hardware components in gaming consoles and computers
- Functions of the main input output peripheral devices that are used with gaming consoles and computers
- Central processing Unit (CPU) fetch execute cycle and the registers inside CPUs
- Control Unit and the internal buses
- Instruction sets and the purpose of the main instructions

Higher National Unit specification: statement of standards (cont)

Unit title: Game Technology

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they understand the functions of the internal system components and external peripheral devices which make up gaming consoles and personal computers.

Evidence of all the Knowledge and/or Skills in this Outcome will be assessed using a representative sample covering the bullet points below:

- Functions of the main hardware components in gaming consoles and computers including:
  - Motherboards
  - Central processing units (CPU)
  - Random Access Memory (RAM)
  - Read only memory (ROM)
  - Cache memory
  - Arithmetic and Logic Units (ALU)
  - Graphics processing units (GPU)
  - Video cards or onboard video
  - Sound cards or onboard sound
  - Networking cards or onboard networking
  - Hard drives, optical drives, flash drives and media
- Functions of the main input output peripheral devices that are used with gaming consoles and computers including:
  - Game controllers
  - Web cameras
  - Keyboard
  - Mice
  - Headsets
  - Monitors and televisions
- Central processing Unit (CPU) fetch execute cycle and the registers inside CPUs, such as:
  - Memory Address Register (MAR)
  - Memory Data Register (MDR)
  - Instruction Register (IR)
  - Program Counter (PC)
- Control Unit and the internal buses (control bus, front-side bus, data bus and address bus) and how they communicate with the CPU and the Random Access Memory (RAM).
- Instruction sets and the purpose of the main instructions such as MOV, ADD and SUB.

Evidence for all Knowledge and Skills in this Outcome will be assessed using a representative sample of 30 questions. The assessment will be supervised, controlled and under closed-book conditions and should last no more than 1 hour. Candidates may not bring to the assessment event any notes, textbooks, handouts, calculators or other material, nor may candidates use an on-screen or online calculator.

The instrument of assessment must provide opportunities for the Outcome to be fulfilled by means of sampling across the range of the content of Outcome 2. This assessment must change on **each** assessment occasion. Achievement can be decided by use of a 60% cut-off score.

Higher National Unit specification: statement of standards (cont)

Unit title: Game Technology

Assessment Guidelines

If a centre is presenting this assessment on-line the following assessment methods, where appropriate, may be selected:

- Multiple-choice
- Drag and drop
- Multiple response
- Mix and match
- A combination of the above

Higher National Unit specification: statement of standards (cont)

Unit title: Game Technology

Outcome 3

Investigate and compare current technologies in gaming

Knowledge and/or Skills

- Current key developments in game technology hardware.
- Current key developments in game technology software.

Evidence Requirements

Candidates will need to provide evidence to demonstrate their knowledge and/or skills by showing that they can investigate and compare current technologies in gaming. A candidates' response can be judged to be satisfactory where the evidence provided shows the candidate is able to:

- Describe and compare two current key developments in game technology including:
  - How the technologies works.
  - What they do and how they are likely to change the way games are played in the present or will be played in the future.
  - Which one is likely to have a bigger influence on the gaming industry.

This assessment is open-book and should take the form of a report equivalent to 1,500 words. The report should contain a title page, table of contents, conclusions and a bibliography. The report should contain both text and graphics to illustrate the developments.

Assessment Guidelines

The Outcome should be assessed by means of a written report describing the findings of research into current key developments in Game technology. The report must describe at least two key developments in game technology. If a development in game technology involves both hardware and software, it is acceptable that the same development be used for either hardware or software. The report must also explain how these developments are changing or will change the way games are played.

Assessors must assure themselves of the authenticity of each candidate's submission.

Administrative Information

Unit code: F8M3 34

Unit title: Game Technology

Superclass category: CA

Original date of publication: August 2009

Version: 05 (January 2015)

History of changes:

Version	Description of change	Date
05		26/01/15
04	Removal of Northbridge and Southbridge chips wording from Outcome 2 Evidence Requirements and rewording of Evidence Requirements for Outcome 3 following QST feedback.	16/06/14
03	Changes made to evidence requirements for Outcome 2 and 3 (ie additional functions added etc.)	06/08/10
02	Changes made to evidence requirements for Outcome 1 to allow for core skills signposting	28/04/10

Source: SQA

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

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

Higher National Unit specification: support notes

Unit title: Game Technology

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

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

Guidance on the content and context for this Unit

This Unit has been developed to form part of the HNC/HND Computer Games Development award and is suitable for candidates who are proposing to follow a career in the games industry, although the topics covered would also be applicable to candidates studying computer hardware. It is anticipated that the Unit would be delivered in the first year of the award if traditional delivery schedules are being observed.

The Unit is intended to provide an insight into the operation and functionality of current games consoles and gaming computer systems. The Unit will provide candidates with information about the inner working of a central processing Unit, such as the fetch execute cycle and general knowledge of instruction sets. Candidates will gain an increased understanding of the functionality and relationships between all of the main internal and external components which make up current games consoles and computer gaming systems.

The Unit will also cover the relevant numbering systems that computers use and how basic arithmetic and logical operations are carried out. This is relevant to software developers who need to understand the implications of number systems so that informed decisions can be made about the choice of variable types when programming.

The precise content of this Unit will change over time, as technologies develop and new devices are introduced. The following guidance exemplifies the standards in terms of contemporary technology.

Guidance on the delivery and assessment of this Unit

It is anticipated that this Unit will be delivered as a stand alone Unit in the context of the HNC/HND Computer Games Development award.

This Unit could be delivered on a daily, weekly or bi-weekly basis at the discretion of the centre.

Higher National Unit specification: support notes (cont)

Unit title: Game Technology

Outcome 1

Demonstrate an ability to manipulate and translate data representations.

Delivery

A typical delivery and assessment pattern for this Outcome might be:

Topic 1 (4 hours) — Numbering systems

Candidates should be taught how to convert between different number bases using integer numbers. These should include denary to hexadecimal, hexadecimal to denary, denary to binary, binary to denary, binary to hexadecimal and hexadecimal to binary.

Candidates should be set a number of exercises in which they must carry out all of the conversions mentioned above.

Topic 2 (4 hours) — Arithmetic operations in different number bases

Candidates should be taught how to perform arithmetic operations in different number bases. These should include addition and subtraction in binary, as well as addition and subtraction in hexadecimal.

Candidates should be set a number of exercises in which they must carry out all of the arithmetic operations mentioned above.

Topic 3 (3 hours) — Boolean logic operations

Candidates should be taught how to perform Boolean logic operations. These should include Boolean AND, OR, NOT and XOR operations on binary inputs of not less than eight bits.

Candidates should be set a number of exercises in which they must carry out all of the logic operations mentioned above.

Topic 4 (1.5 hours) — Character encoding standards

Candidates should be taught about different character encoding standards and how they are represented in computer storage. American Standard Code for Information Interchange (ASCII) and Unicode should be covered. This should include teaching them how to read ASCII and Unicode look up tables. How ODD and EVEN parity is applied at the binary level to ASCII should also be covered.

Candidates should be set the task of converting a character from ASCII into binary and binary into ASCII, taking account of ODD or EVEN parity at the same time.

Higher National Unit specification: support notes (cont)

Unit title: Game Technology

Topic 5 (1.5 hours) — File formats and sizes

Candidates must gain knowledge of the main units of storage including bits, bytes, kilobits, gigabits, megabits, gigabits, kilobytes, megabytes, terabytes, petabytes and so on. The various multimedia file formats for graphics, audio and movies used within games should also be covered.

Candidates should be able to identify multimedia file formats from file extensions. They should also be able to understand file sizes, for instance can a 4GB high definition.wmv file fit on a 700MB CDR disk. Exercises on these tasks should be set for the candidates.

Assessment (1 hour)

This Outcome should be assessed by a single closed-book test (multiple-choice would be acceptable), consisting of 20 questions which sample the topics listed above. The test must contain questions from each topic, but does not need to contain questions on every sub-topic listed above. All items listed earlier in the evidence and requirements section should be included.

Candidates should complete the test within **1 hour** and should answer at least **60%** of the questions correctly.

Higher National Unit specification: support notes (cont)

Unit title: Game Technology

Outcome 2

Demonstrate an understanding of the functions of the internal system components and external peripheral devices which make up gaming consoles and personal computers.

Delivery

A typical delivery and assessment pattern for this Outcome might be:

Topic 1 (4 hours) — Hardware Components

Candidates should gain knowledge of the functions and relationships between the main hardware components within gaming consoles and computers. These should include motherboards, Central processing units (CPU), Random Access Memory (RAM), Read only memory (ROM), Cache memory, Arithmetic and Logic Units (ALU), Graphics processing units (GPU), video cards, sound cards, networking cards, hard drives, optical drives, flash drives and media.

Topic 2 (2 hours) — Input/Output peripherals

Candidates should gain knowledge of the functions of the input/output peripheral devices used in gaming. These should include game controllers, web cameras, keyboard, mice, headsets, monitors and televisions.

Topic 3 (6 hours) — Central processing Unit fetch execute cycle

Candidates should gain knowledge of the Central processing Unit (CPU) fetch execute cycle and the registers inside CPUs, such as Memory Address Register (MAR), Memory Data Register (MDR), Instruction Register (IR), Program Counter (PC). They should learn about the control Unit and the internal system buses (control bus, front-side bus, data bus and address bus) and how they communicate with the CPU and the Random Access Memory (RAM). They should also gain knowledge of instruction sets and the purpose of the main instructions such as MOV, ADD and SUB.

Assessment (1 hour)

This Outcome should be assessed by a single closed-book test (multiple-choice would be acceptable), consisting of 30 questions which sample the topics listed above. The test must contain questions from each topic, but does not need to contain questions on every sub-topic listed above. It is recommended that 20 of the questions should contain questions from topics 1 and 2 and that the remaining 10 questions should cover topic 3.

Candidates should complete the test within **1 hour** and should answer at least **60%** of the questions correctly.

Outcome 3

Investigate and compare current technologies in gaming.

Delivery

A typical delivery and assessment pattern for this Outcome might be:

Topic 1 (4 hours) — Current technologies in gaming

Discuss with candidates the latest technologies in gaming, including developments in both software and hardware. Some current examples of developments in game technology are motion sensing controllers, Unreal Engine 3, DirectX 11, True 3D games, online avatars, full body motion capture, facial recognition, voice recognition, Microsoft Kinect, Playstation Move and Massively multiplayer online games (MMOG).

Candidates should research this topic and identify game technologies that they deem to be important, interesting and revolutionary.

Assessment (8 hours)

This Outcome should be assessed by a single open-book assessment, in which the candidates are required to identify, research and evaluate current key developments in software and hardware game technology. The findings should be reported in a written report of 1,500 words. The report should contain a title page, table of contents, conclusions and a bibliography.

Higher National Unit specification: support notes (cont)

Unit title: Game Technology

Opportunities for developing Core Skills

There are opportunities to develop the Core Skill of *Numeracy: Using Number* at SCQF level 5 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Candidates could meet the *Numeracy: Using Number* component by performing conversions between different number bases and by performing arithmetic on hexidecimal and binary numbers, as required in Outcome 1.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance. A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**

General information for candidates

Unit title: Game Technology

In this Unit you will acquire a broad general knowledge and understanding of the technology behind game consoles and gaming computers. This will include the functions, concepts and mechanisms of internal system components and external peripheral devices. This includes the way in which the internal representation used within the machine can be translated to give human readable values. The study of this Unit is primarily intended for those who intend to follow a career within the computer games development industry; however it would also be of benefit to those studying technical support or computer programming.

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

1 Demonstrate an ability to manipulate and translate data representations.
2 Demonstrate an understanding of the functions of the internal system components and external peripheral devices which make up gaming consoles and personal computers.
3 Investigate and compare current technologies in gaming.

This Unit requires no previous knowledge, however it is recommended that you should have some basic knowledge of computer hardware and have some basic numeracy skills. Numeracy skills could be demonstrated by the achievement of the Core Skills component *Numeracy: Using Number* at SCQF level 4.