



Arrangements for:
HNC Computer Games Development
at SCQF level 7
Group Award Code: G9NX 15
HND Computer Games Development
at SCQF level 8
Group Award Code: G9NY 16

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Acknowledgement

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

History of changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. This document is the latest version and incorporates the changes summarised below. Centres are advised to check SQA's APS Navigator to confirm they are using the up to date qualification structure.

NOTE: Where a Unit is revised by another Unit:

- ◆ No new centres may be approved to offer the Unit which has been revised.
- ◆ Centres should only enter candidates for the Unit which has been revised where they are expected to complete the Unit before its finish date.

Version number	Description	Date
14	G9NX and G9NY 16 Revision of Units: F8HC 34 Structured Programming for Games has been replaced by HH57 34 Computer Games: Programming Fundamentals. F6B6 35 Showreel, Portfolio and Curriculum Vitae has been replaced by HH58 35 Creating a Showreel and Portfolio for both HNC and HND	21/12/16
13	G9NX 15 and G9NY 16 Revision of Units: F871 35 Artificial Intelligence and Critical Thinking has been replaced by HH3D 35 Artificial Intelligence for Computer Games. F8M3 34 Game Technology has been replaced by HH3F 34 Game Technology. F88D 34 Games Design: Pitch to Treatment has been replaced by HH3G 34 Games Design: Pitch a Treatment. F8L2 35 Game Customisation and Scripting has been replaced by HH3E 35 Game Customisation and Scripting and will finish 31/07/2019. H4L6 34 Computer Games Development Graded Unit 1 has been replaced by HH3M 34. H4LE 35 Computer Games Development Graded Unit 2 has been replaced by HH3M 35 Computer Games Development: Graded Unit 2	18/11/16
12	Revision of Units: F20C 34 Digital Media: Audio has been replaced by HF50 34. F1VV 34 User Interface Design has been replaced by HF55 34.	12/07/16
11	Developing Software: Introduction H173 34 added as an optional unit	
10	Revision of Unit: DE1K 33 Workplace Communication in English has been revised by H8T2 33 and finishes on 31/07/2016.	19/05/15
09	Addition of Optional Units: H17W 34 Software Development: Developing Small Scale Standalone Applications	10/04/15
08	<i>Building an e-Business</i> (F6JJ 34), <i>Mobile Technology</i> (H17R 35) and <i>Showreel, Portfolio and Curriculum Vitae Creation</i> (F6B6 35) added as optional Units to both the HNC and HND frameworks.	30/06/14
07	<i>Software Development: Object Oriented Analysis and Design</i> (H172 35) added as an optional Unit to HND framework. Articulation routes section updated.	06/06/14
06	Revision of Unit: F8VG 34 Computer Games Development: Graded Unit 1 has been revised by H4L6 34. F8VG 34 Computer Games Development: Graded Unit 2 has been revised by H4L6 34. Both Units will finish on 31/07/2016.	10/09/13
05	Changes to code and title: Software Development: Object Oriented	27/08/12

	Programming from DH3C 35 (lapse date 31/07/2013, finish date 31/07/2015) to H171 35.	
04	Game Development: Character creation and storytelling Unit amended credit value.	18/10/10
03	Game Design Theory Unit amended credit value.	03/09/10
02	Updated optional list of Units in HNC and HND structures.	29/07/10

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1 Introduction

This is the Arrangements Document for the new Group Awards in HNC/HND Computer Games Development, which was/were validated in March 2010. This document includes: background information on the development of the Group Award, its aims, guidance on access, details of the Group Award structure, and guidance on delivery.

These qualifications revise the existing HNC Computer Games Development (2005) and integrate it seamlessly into the new HND Computer Games Development.

These awards have been developed by a Qualification Design Team commissioned by the SQA and composed of lecturers from six different Scottish colleges. It has been developed in consultation with industry and academia with a view to producing successful candidates capable of further study in the fields of games and software development or an entry level position in an industry developer.

Members of the Qualification Design Team (QDT) were:

Name	Position	Role
Pauline Belford	Edinburgh's Telford College	Core Team Member
Caroline Douglas	SQA	
Bobby Elliot	SQA	
Scott Fleming	West Lothian College	Core Team Member
Gillian Flockhart	Dundee College	Core Team Member
Fiona Jackson	Forth Valley College	Core Team Member
Nigel Kennington	Edinburgh's Telford College	Core Team Lead
Iain McArthur	Jewel & Esk College	Core Team Member
David Renton	Reid Kerr College	Core Team Member
Fiona Rushton	James Watt College	Core Team Member
Ian Tyson	James Watt College	Core Team Member

2 Rationale for the development of the Group Awards

Background to the development

In 1995, computer games were a \$3 billion industry. The traditional market for computer games was teenage boys who were still in high-school and had few aspirations towards higher or further education.

Ten years later, and the computer games development industry has become a valid contributor to the Scottish, UK, European and global economies. According to the Entertainment and Leisure Software Publishers Association (ELSPA), the Computer Games industry's turnover worldwide was \$18.2 billion in 2003. In fact, according to the UK Department of Business, Innovation and Skills (BIS):

'the world market for games and edutainment software grew to \$18.2 billion in 2003, up from \$16.9 billion in 2002. It is predicted that by 2007, the global market will be worth \$21.1 billion. Within the UK, leisure software sales grew again in 2003 to reach £1.68 billion and we continue to have the third largest market in the world for games after the US and Japan, whilst remaining comfortably the largest market in Europe'. [www.berr.gov.uk]

In 1998, the University of Abertay Dundee offered the first computer games degree in Europe. Now, there are over two hundred universities worldwide (81 in the UK) offering games degrees and yet we have industry lobby groups releasing statements claiming that:

‘95 per cent of video gaming degrees are simply not fit for purpose. Without some sort of common standard, like Skillset accreditation, these degrees are a waste of time for all concerned’

[*David Breben, Chairman, Frontier Developments*]

The sector skills council for creative media, SkillSet, has identified a number of areas for skills development in relation to the design of computer games courses. Within the gaming industry there are skills shortages in lead roles, games design, management and production. The gaming industry recruits mostly graduates from traditional computing areas and develops skills in the areas identified by SkillSet. However, it would make sense for any gaming course to be designed to incorporate these skills shortages to increase the value of any such qualification.

As to the need for the qualification development itself, although the project initialisation meeting was very positive and well attended it was felt that the initial survey should poll the need for the qualification to develop in a formal manner.

The survey results showed that 83.8% of respondents agreed or strongly agreed with the statement that the new qualification “is a good addition to the SQA catalogue”, 97.7% agreed or strongly agreed that it ‘will be attractive to candidates’ and 49.4% that ‘it will be attractive to employers’. (Although this last figure seems low, there are contributing factors which make it acceptable. These are discussed in the *Consultation with Employers* section below.)

The development of awards

The HND Computer Games Development described in this document is intended as a targeted response to the weaknesses identified by the ever growing games industry and has been designed to provide a real, practical skill-set for candidates to take forward into either further, specialised study or employment at a junior or ‘intern’ level in the games industry.

The revised HNC Computer Games Development builds upon the existing centre devised HNC Computer Games Development which was validated in 2005 and has been designed to elaborate and support the work pioneered by that development team.

The new HND incorporates and builds upon the revised HNC and has been designed to fit into the national qualifications framework, providing clear opportunities for progression within the SCQF framework.

Both qualifications incorporate the successful and current elements from their predecessor whilst introducing new elements that reflect the rapidly changing nature of the sector. The Awards content and structure have been designed to map primarily to the National Occupational Standards produced by Skillset in consultation with industry, but has also been influenced by the NOS for IT and Telecoms published by e-skills uk. This ensures, as far as possible, that it is attuned to the needs of the industry. Further information on the NOS embedding can be found in section 5.2 and appendices 3 and 4.

Further consultation was completed with a number of stakeholders at both formal events and direct communication. The formal ‘event’ consultations are summarised in the table below:

Event name	Date
Heads of Computing	Dec 12 2008
Blog launch	Jan 26 2009
Dundee Meeting	Mar 14 2009
Project Initialisation Survey	Apr 30 2009
Dissemination Event & Focus Group	June 4 2009
Scottish Annual Computing & ICT Forum	June 25 2009
Draft Framework Survey and wiki launch	Sept 30 2009
SkillSet Meeting	Oct 23 2009
Visit: Stow College	Nov 26 2009
Heads of Computing	Dec 4 2009

More detail on these and the other consultations is found below.

Access to the award is achieved through a variety of routes including the possession of the National Certificate in Digital Media Computing at SCQF level 6. (See Section 4 Access for further detail). These awards are popular with younger candidates and should provide a sound introduction to the reality of the games industry as well as a strong foundation in generic multimedia computing.

Initial phase review

Appropriate themes were identified by the Qualification Design Team and an initial analysis of the existing SQA Unit catalogue to identify suitable Units was completed in order to feed the initial consultation survey.

The primary purpose of the survey was to gather feedback on the proposed aims of the award, the content of new Units, the balance of Units within the Group Award and the division of the mandatory/optional structure.

The survey received 151 responses from across all stakeholder groups, industry, higher education, further education and prospective candidates.

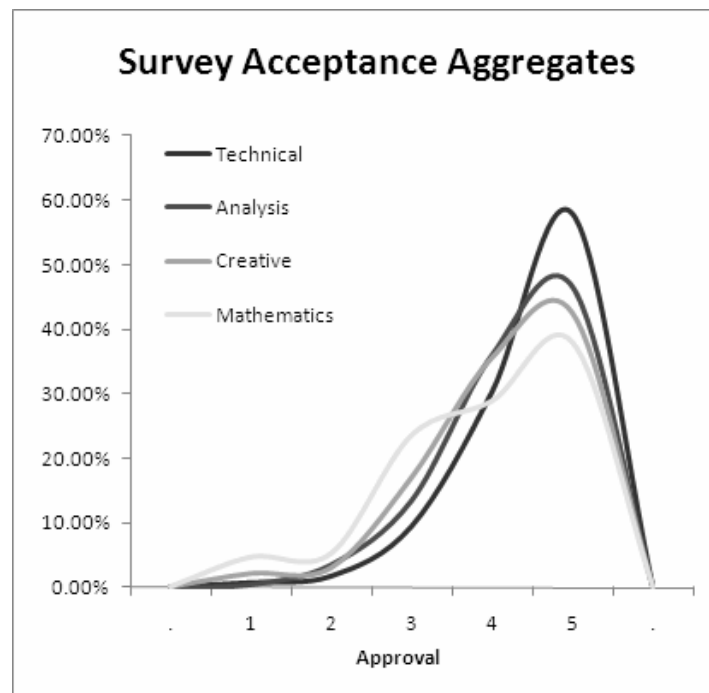
After the close of the survey, the results were collated and used to shape a draft framework. The headline findings of the survey are as follows:

Top 5 Themes	Approval
Programming	72%
Game Physics	63%
Analysis and Design Skills	63%
Project Skills	58%
Creativity	56%

Top 5 Proposed Units	Approval
Game Scripting	71%
Object Animation	70%
Game Design –from Pitch to Treatment	66%
Games for the Web	63%
Storytelling/Character creation	59%

Top 5 Existing Units	Approval
DE2N 35 3D Modelling and Animation	76%
D76V 35 Software Development: Object Oriented Programming	67%
F1VV 34 User Interface Design	64%
DE30 35 Narrative and Genre in Computer Games	60%
DE33 35 User Interface: Testing and Evaluation	59%

From these, those topics that rated well were grouped into four broad themes: Analysis, Technical, Creative and Mathematics; the intention being to balance these themes across the Units selected. The overall approval of these themes from survey is presented in the following graph:



Of these, the technical theme (a composite of programming, scripting and modelling) was perceptibly the highest overall followed by the analysis and then creative themes. The mathematics theme showed less ‘certainty’, with its curve presenting a wider spread over the generally positive responses although this varies considerably when the data is filtered by stakeholder group (see below).

Ongoing consultation process

In order to provide transparency for stakeholders during development, three avenues of continuing communication and consultation were established.

- 1 Extended QTD** — All original attendees of the project initialisation meeting were invited to join the primary discussion mailing list so that they could participate in the wider discussions on content as well as keep abreast of developments as they happened. The extended QTD brought the development team up to 18 members representing 12 institutions.
- 2 Development Blog & SQA Computing Blog** — A blog specifically for the QDT Team to make announcements and encourage participation was launched in January 2009 at <http://hndgames.blogspot.com>. The major announcements were also published on the main SQA Computing Team Blog.
- 3 Frameworks Wiki** — With the development of the draft framework, the Frameworks Wiki was developed and launched in September 2009 to stimulate discussion on the proposals and feed the draft frameworks survey. After completion of the survey, the wiki remained and has been continually updated to reflect the current state of the qualification.

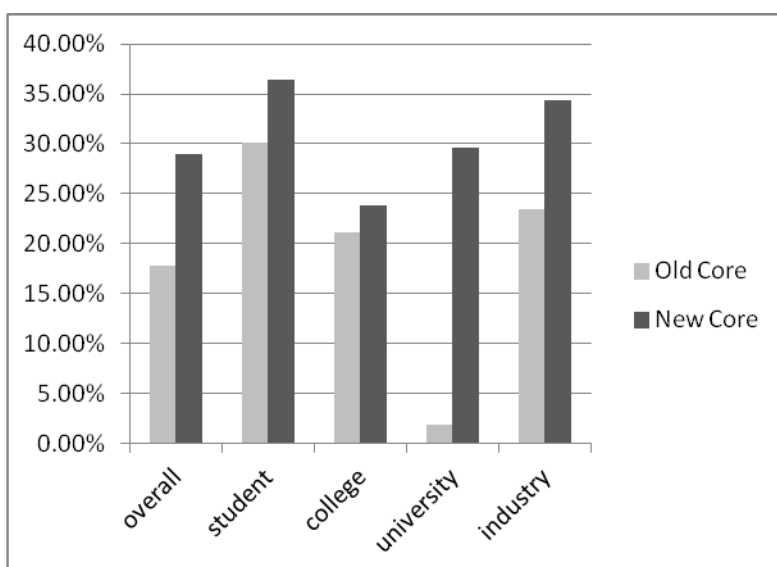
All three of these have successfully stimulated ongoing consultation.

In particular, the Extended QTD has provided valuable feedback from members currently delivering the 2005 HNC Computer Games Development and the Frameworks Wiki has generated valuable, detailed feedback from many sources with an interest in the topic as well as proving to be a well used resource (3,202 hits since launch).

Draft framework review

In order to validate the conclusions drawn from the initial consultation, on the completion of the first public draft framework a second survey was produced and distributed. This survey gave much more detail on the proposed Units and focussed on the respondents opinion of the appropriateness of the core Units and whether they would choose each Unit if they were to deliver such a course.

Overall results from this survey were positive. However when the data was filtered by stakeholder group, the university respondents were clearly not happy with the core Unit selections as shown by the light ‘Old Core’ bars in the following graph:



As a result, the ‘systems’ and ‘mathematics’ topic selections were introduced which improved acceptance across the board, but most noticeably for the university respondents. This can be seen in the graph above as the ‘new core’.

In addition, proposed language options were dropped from the draft after uniformly poor responses.

Consultation with employers

During the initial consultation survey, 22 of the 151 respondents identified themselves as belonging to the ‘Games Industry’ group, whereas for the draft framework survey, 8 of the 59 respondents were identified as belonging to the ‘Games Industry’ group.

As a group, the industry respondents to the surveys tended to be ‘cautious but positive’.

For example, although the overall agreement with the statement that ‘[the new qualifications] will be attractive to employers’ was only 49.4%, only 15.7% disagreed with the statement. The remainder were ‘unsure’ and this can be attributed to the same problem that has caused the decay of many of the new courses being delivered by non-accredited centres. Furthermore, if the survey data is filtered to industry respondents only, that figure rose to 63.6% - implying that industry itself isn’t as negative about non-graduate level qualifications as other groups perceive them to be.

Consultation with higher education establishments

During the initial consultation survey, 34 of the 151 respondents identified themselves as belonging to the ‘higher education’ group, whereas for the draft framework survey, 7 of the 59 respondents were identified as belonging to the ‘higher education’ group.

As a group, the university respondents were universally in support of the inclusion of a strong mathematics element, a strong programming element and made frequent mention in comments of underlying principles being more important than transient skills. They were also the only group to prefer a qualification that was ‘as focussed as possible’ over flexibility. In response, Mathematics was made core in the HND and new programming Units have been developed to emphasis fundamental knowledge.

Beyond these key a clear division was found amongst the respondents depending on their specialisms. Individual respondents tended to approve of most of the design/creativity Units and disapprove of the highly technical Units or vice versa. This disparity caused a general ‘cooling’ of the approval of individual Units when looking at the statistics for the group as a whole.

Consultation with candidates

During the initial consultation survey, 64 of the 151 respondents identified themselves as belonging to the ‘candidate’ group, whereas for the draft framework survey, 31 of the 59 respondents were identified as belonging to the ‘candidate’ group.

All groups overwhelmingly agreed (>95%) that the qualification would be ‘attractive to candidates’ including 100% in the candidate groups (though ultimately in such a self-selecting survey this is to be expected — candidates not interested in the qualification would not complete the survey).

Initial consultation showed a strong preference for project work for Graded Units and flexibility overall.

During all consultation, candidate showed a surprisingly realistic view of the qualification and its place in the industry along with some genuinely insightful analysis of the options.

Furthermore, respondees from the candidate group appear willing to tackle hard subjects within the specialism: *Game Physics* achieved the highest approval during the framework survey of any of the proposed Units, followed by *Artificial Intelligence and Critical Thinking* and then *Game Customisation and Scripting*.

Summary of consultation and feedback

These are the main findings of the Market Research and consultation processes:

- ◆ Demand and support exists for the development of an HND Award as well as revision of the 2005 HNC
- ◆ Demand from candidates exists to provide articulation for progression into Higher Education
- ◆ Although demand for flexibility exists, in order to assist articulation a strong identity must be maintained
- ◆ Existing university articulation agreements for the 2005 HNC must be preserved
- ◆ Many candidates will wish to articulate from the 2005 HNC to the second year of the HND
- ◆ Education professionals, employers and candidates believe that the proposed content of the award is relevant to the needs of the sector
- ◆ Candidates appear willing to embrace the challenges of advanced study of games technology
- ◆ Over-generalisation will damage employment prospects of graduating candidates

These findings have influenced the qualifications in a number of ways:

- ◆ Close attention has been paid to the structure of the first two years of key university games courses (Abertay's *Computer Games Technology* and Glasgow Caledonian's *Computer Games (Software Development)*)
- ◆ A strong core and additional "core selection" groups have been included in the framework
- ◆ No Unit that was core for the 2005 HNC or required for an articulation agreement has been removed from the revised HNC
- ◆ The qualifications concentrate on the programmer and designer roles in the games industry to ensure strong focus

3 Aims of the Group Awards

The titles of the awards are HNC Computer Games Development and HND Computer Games Development.

3.1 General aims of the Group Awards

These HNC and HND awards have a range of broad aims, which are generally applicable to all equivalent Higher Education qualifications. The general aims are:

- 1 To develop candidates' knowledge and skills in planning, designing, developing and analysing.
- 2 Develop employment skills and enhance candidates' employment prospects.
- 3 To enable progression within the SCQF.
- 4 To develop study, research and interpersonal skills.
- 5 To develop learning and transferable skills (including Core Skills).
- 6 Provide academic stimulus and challenge, and foster an enjoyment of the subject.

3.2 Specific aims of the Group Awards

The specific aims of revised **HNC** are:

- 1 Prepare candidates for employment as a tester, level designer or intern within the computer games industry or a junior software developer role within the IT industry generally.
- 2 Introduce a range of contemporary vocational skills relating to the development of computer games appropriate to employment at junior developer (or equivalent) level.
- 3 Provide a flexible curriculum to allow diverse occupational destinations within the computer games industry and interactive media generally.
- 4 Prepare candidates for progression to further study in Computer Games Development or a related discipline.
- 5 Develop candidates ability to work collaboratively on interactive media projects.

The specific aims of **HND** are:

- 1 Prepare candidates for employment in a level design, scripter or junior developer role within the computer games industry or a junior software developer role within the IT industry generally.
- 2 Develop a range of contemporary vocational skills relating to the development of computer games appropriate to employment at junior developer (or equivalent) level.
- 3 Provide a flexible curriculum to meet the needs of candidates in employment to continually revise and update their skill-set.
- 4 Prepare candidates for progression to further study in Computer Games Development or a related discipline.
- 5 To enhance employability through engagement with National Occupational Standards.

Relationship of Mandatory Units to aims of the HNC and HND

The aims of the award are met within the mandatory Units of these awards. A table showing where the individual aims are met within Units is given in Appendix 1.

For each Unit a description is given of the salient points within the Unit which support the general and specific aims of the award. It should be noted that the Units have been selected in such a way that the aims permeate the Units rather than having individual Units target specific aims.

Computer Games Development: Graded Unit 1

This Unit is designed to provide evidence that the candidate has consolidated their knowledge and skills relating to planning, analysing, synthesising in a groupwork environment, developed their study, research and interpersonal skills and is prepared for progression to further study. The Evidence Requirements of this Unit require at least a partial element of every one of both the general and specific aims of the award.

Computer Games Development: Graded Unit 2

This Unit provides candidates with the opportunity to enhance their skills and combine their knowledge from Units within the Award framework, by undertaking an individual project to produce an interactive game suitable for use as a portfolio demonstration of ability. Due to the individual nature of this Unit, the only aim which will not be directly evidenced in this Unit is General aim 4 — Develop study, research and interpersonal skills.

3D Modelling and Animation

This Unit is contained within the mandatory section of the HND Computer Games Development Award. It provides strong technical skills to meet elements of each of the specific aims as well some of the general aims.

Computing: Planning

Key to many of the generic aims and wider scoped specific aims, the ability to understand the techniques and theory behind proper planning was identified as necessary to produce employable candidates.

Structured Programming for Games

Providing technical skills to meet elements of the specific aims, this mandatory Unit (and the Object Oriented Programming Unit below) gives the qualification a strong sense of identity as a software development award.

Games Development: Object Oriented Programming

This mandatory Unit is contained in the mandatory section of the HND Computer Games Development Award. It provides technical skills to meet elements of the specific aims, as well as giving the qualification a strong sense of identity as a software development award.

Game Technology

This highly technical knowledge directly addresses the specific aims of this qualification. In particular Specific aim 1 (prepare for employment), Specific aim 2 (vocational skills) and Specific aim 5 (NOS) are strongly embedded in this Unit.

Working Within A Project Team

This Unit is designed to provide candidates with the experience of working in a team to negotiate goals, roles and responsibilities, support co-operative working and present agreed project Outcomes within the timescale prescribed by the team. It has been included as a mandatory Unit as it directly and strongly addresses the aims General aim 4 (interpersonal skills), General aim 5 (transferable skills) and Specific aim 5 (NOS) as well as developing skills in relation to nearly all of the other aims.

3.3 Target groups

Further details of entry requirements are given in the section on Access.

Entry to the award is at the discretion of a centre, but it is particularly suited to the following groups:

- ◆ School leavers wishing to pursue a career path in video games
- ◆ Candidates wishing to progress on to degree level study
- ◆ Candidates progressing from the 2005 HNC Computer Games Development
- ◆ National Certificate in Digital Media Computing (SCQF level 6) candidates wishing to develop their skills and knowledge
- ◆ Candidates from creative backgrounds who wish to gain complementary technical skills

It is anticipated that one of the main sources of applicants will be school leavers from 5th or 6th year who have achieved at higher level (SCQF levels 5 and 6) and can demonstrate ability within the computing, science, mathematics or creative subject areas.

Other related qualifications

Given the upcoming development of the NPAs in Computer Games Development at SCQF levels 4, 5 and 6 and the strong link identified between game based learning and the Curriculum for Excellence, it can reasonably be anticipated that more interest in these topics as academic areas of study will be fostered at an earlier age, giving a larger uptake for the relevant higher-level courses.

4 Access to Group Awards

As with all SQA qualifications, access will be at the discretion of the centre and the following recommendations are for guidance only. However, delivering centres should note the high level of technical demand of this course, as reflected in the Recommended Core Skills Entry Profile below, as well as the concentration on project work. As such, regardless of qualification, delivering centres should ensure that potential candidates demonstrate a strong motivation, enthusiasm and/or passion for computer games.

Note that the Arrangements for the 2005 HNC Computer Games Development strongly recommended proven Mathematics ability. The QDT for the revised HNC and HND in Computer Games Development endorses and makes the same recommendation.

Formal qualifications

Some examples of appropriate formal entry qualifications are specified below. They are not exhaustive or mutually exclusive and may be offered in a variety of combinations.

- (a) Mathematics and any other National Course at Higher, with a minimum Grade C, together with three Standard Grade passes at level 3 or above.
- (b) National Certificate in Digital Media Computing (SCQF level 6) to include a Mathematics Unit of SCQF level 5 or above.
- (c) An SVQ at level 3 in Information Technology or other relevant area together with Higher Mathematics, at minimum Grade C, or equivalent.
- (d) Relevant National Units at appropriate levels, including an equivalent to Higher Mathematics, and Core Skills Units at Intermediate 2 or Higher.
- (e) HNC Computer Games Development [2005] (entry to second year of HND).

Different combinations of relevant National Qualifications, Vocational Qualifications and equivalent qualifications from other awarding bodies may also be acceptable, as would suitable vendor qualifications at an appropriate level.

Work experience

Although actual work experience in the games industry would be unlikely mature candidates with suitable work experience in computing or IT may be accepted for entry provided the enrolling centre believes that the candidate is likely to benefit from undertaking the award and believes they have sufficient understanding of the principles of mathematics required for the course content.

Sector Skills

Candidates able to provide evidence of suitable experience in the form of a portfolio of work (eg a substantial, completed game modification ('mod')) should be considered. This is based on the philosophy that entry is open to anyone who can show a reasonable potential for success through formal qualifications, accreditable experience or otherwise.

Candidates Whose First Language is Not English

The centre should ensure that candidates whose first language is not English and who have not been through the British School system can demonstrate good communication skills (oral and written) in English. The candidate must also demonstrate the appropriate Core Skill level.

Ideally the candidate should have a suitable English for Speakers of Other Languages (ESOL) qualification. The QDT recommends that the candidate has the SQA Higher ESOL Unit or equivalent. Suitable equivalents are an IELTS score of 6+ or possession of the Cambridge ESOL Certificates; CPE, CAE or FCE.

Recommended Core Skills Entry Profile

The Qualification Design Team considered it appropriate to recommend the Core Skills entry levels detailed below, taking into consideration the requirements of employers, demands of the course and for progression to further study. It is recognised that many candidates, particularly adult returners, may not possess a specific Core Skills Profile on entry and hence entry level is recommended only.

It would be beneficial if candidates possessed the following Core Skills:

Core Skill or component	SCQF Level
Communication	
Oral Communication	5
Written Communication	5
Numeracy	
Using Graphical Information	5
Using Number	6
ICT	6
Problem Solving	
Critical Thinking	5
Planning and Organising	5
Reviewing and Evaluating	5
Working with Others	5

5 Group Awards structure

To attain the award of HNC Computer Games Development a candidate must achieve all Mandatory Units totalling 7 credits, one credit from a ‘content’ cluster, one credit from a ‘mathematics’ cluster and the remainder as Optional Units to bring the total to 12 credits.

5.1 Framework (HNC — G9NX 15)

Mandatory Units — all 7 credits required

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Computer Games Development: Graded Unit 1	HH3M 34*	8	7	1
Computing: Planning	DH35 34	8	7	1
Game Technology	HH3F 34*	8	7	1
Structured Programming for Games	HH57 34*	24	7	3
Working Within A Project Team	DH21 34	8	7	1

‘Content’ Selection — 1 credit minimum required

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
2D Animation	F209 34	16	7	2
3D Level Editing	F869 34	8	7	1
User Interface Design	HF55 34*	8	7	1

‘Mathematics’ Selection — 1 credit minimum required

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Mathematics for Interactive Computing: Fundamental Techniques	F20A 33	8	6	1
Introductory Mathematics for Computing	A5NY 34	8	7	1
Mathematics for Interactive Computing: Essential Techniques	F20B 34	8	7	1
Mathematics for Computing 1	D76E 34	8	7	1
Mathematics: Calculus and Matrices for Computing	DP8F 34	8	7	1

*Refer to History of Changes for revision changes.

Optional Units — remainder to total 12 credits

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Software Development: Developing Small Scale Standalone Applications	H17W 34	16	7	2
3D Modelling and Animation	DE2N 35	16	8	2
Artificial Intelligence for Computer Games	HH3D 35*	16	8	2
Art and Design: Creative Process	DV5T 34	8	7	1
Computer Architecture 1	DH2T 34	8	7	1
Digital Imaging: Bitmap and Vector	F1YX 34	8	7	1
Digital Media: Audio	HF50 34*	8	7	1
Software Development: Event Driven Programming	DH34 35	16	8	2
Game Customisation and Scripting	HH3E 35*	16	8	2
Game Design Theory	F8R6 34	16	7	1
Game Physics	F86H 35	16	8	2
Games Design: Pitch a Treatment	HH3G 34*	8	7	1
Games Development: Character Creation and Storytelling	F8R5 34	8	7	1
Games Development: Object Oriented Programming	F86A 35	24	8	3
History, Evolution and Impact of Computer Games	F86J 34	8	7	1
Information Technology: Applications Software 1	D75X 34	8	7	1
Computer Operating Systems 1	DH33 34	8	7	1
Narrative and Genre in Computer Games	F6BX 35	16	8	2
Personal Development Planning	DE3R 34	8	7	1
Professional Issues In Computing	F0N0 35	16	8	2
Project Management for IT	F1W0 34	8	7	1
Scripting for Interactivity	DE32 35	16	8	2
Software Development: Abstract Data Structures	D76L 35	24	8	3
Software Development: Developing for the World Wide Web	D76P 35	16	8	2
Software Development: Rapid Applications Development and Prototyping	DM3F 35	16	8	2
Specialist Illustration	DV93 34	8	7	1
Workplace Communication in English	H8T2 33*	8	6	1
Interactive Fiction	DE2X 35	16	8	2
Game Design	F1GW 35	16	8	2
Software Development: Object Orientated Programming	H171 35*	16	8	2
Building an e-Business	F6JJ 34*	8	7	1
Mobile Technology	H17R 35*	8	8	1
Creating a Showreel and Portfolio	HH58 35*	16	8	2
Developing Software: Introduction	H173 34*	8	7	1

5.2 Framework (HND — G9NY 16)

To attain the award of HND Computer Games Development a candidate must achieve all Mandatory Units totalling 15 credits, one credit from a ‘content’ cluster, two credits from a ‘systems’ cluster, two credits from a ‘mathematics’ cluster and the remainder as Optional Units to bring the total to 30 credits. There must be a minimum of 64 SCQF points at level 8 included within this achievement.

Mandatory Units — all 15 credits required

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Computer Games Development: Graded Unit 1	HH3M 34*	8	7	1
Computer Games Development: Graded Unit 2	HH3N 35*	16	8	2
3D Modelling and Animation	DE2N 35	16	8	2
Computing: Planning	DH35 34	8	7	1
Games Development: Object Oriented Programming	F86A 35	24	8	3
Game Technology	HH3F 34*	8	7	1
Structured Programming for Games	HH57 34*	24	7	3
Working Within A Project Team	DH21 34	8	7	1
Project Management for IT	F1W0 34	8	7	1

‘Content’ Selection — 1 credit minimum required

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
2D Animation	F209 34	16	7	2
3D Level Editing	F869 34	8	7	1
User Interface Design	HF55 34*	8	7	1

‘Mathematics’ Selection — 2 credits minimum required

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Mathematics for Interactive Computing: Fundamental Techniques	F20A 33	8	6	1
Introductory Mathematics for Computing	A5NY 34	8	7	1
Mathematics for Interactive Computing: Essential Techniques	F20B 34	8	7	1
Mathematics for Computing 1	D76E 34	8	7	1
Mathematics: Calculus and Matrices for Computing	DP8F 34	8	7	1

*Refer to History of Changes for revision changes.

‘Systems’ Selection — 2 credits minimum required

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Artificial Intelligence for Computer Games	HH3D 35*	16	8	2
Game Customisation and Scripting	HH3E 35*	16	8	2
Game Physics	F86H 35	16	8	2
Scripting for Interactivity	DE32 35	16	8	2

Optional Units — remainder to total 30 credits

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Software Development: Developing Small Scale Standalone Applications*	H17W 34	16	7	2
Game Design Theory	F8R6 34	16	7	1
Games Design: Pitch a Treatment	HH3G 34*	8	7	1
Games Development: Character Creation and Storytelling	F8R5 34	8	7	1
History, Evolution and Impact of Computer Games	F86J 34	8	7	1
Art and Design: Creative Process	DV5T 34	8	7	1
Computer Architecture 1	DH2T 34	8	7	1
Digital Imaging: Bitmap and Vector	F1YX 34	8	7	1
Digital Media: Audio	HF50 34*	8	7	1
Software Development: Event Driven Programming	DH34 35	16	8	2
Information Technology: Applications Software 1	D75X 34	8	7	1
Computer Operating Systems 1	DH 33 34	8	7	1
Narrative and Genre in Computer Games	F6BX 35	16	8	2
Personal Development Planning	DE3R 34	8	7	1
Professional Issues In Computing	F0N0 35	16	8	2
Software Development: Abstract Data Structures	D76L 35	24	8	3
Software Development: Developing for the World Wide Web	D76P 35	16	8	2
Software Development: Rapid Applications Development and Prototyping	DM3F 35	16	8	2
Specialist Illustration	DV93 34	8	7	1
Workplace Communication in English	H8T2 33*	8	6	1
Interactive Fiction	DE2X 35	16	8	2
Game Design	F1GW 35	16	8	2
Software Development: Object Orientated Programming	H171 35*	16	8	2
Systems Development: Object Orientated Analysis and Design	H172 35*	16	8	2

Optional Units — remainder to total 30 credits (cont)

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Building an e-Business	F6JJ 34*	8	7	1
Mobile Technology	H17R 35*	8	8	1
Creating a Showreel and Portfolio	HH58 35*	16	8	2
Developing Software: Introduction	H173 34*	8	7	1

*Refer to History of Changes for revision changes.

Core Skills Exit Profile

On completion of the mandatory Units in the HND Computer Games Development, candidates entering with the recommended Core Skills profile in section 4.

Recommended Core Skills Entry Profile will exit with the following Core Skills profile:

Core Skill or component	SCQF Level	Notes
Communication		
Oral communication	6	Embedded ¹
Written communication	6	Embedded ¹
Numeracy		
Using graphical information	5	Embedded ¹
Using number	6	See notes ²
ICT	6	See notes ³
Problem Solving		
Critical Thinking	6	Embedded ¹
Planning and Organising	6	Embedded ¹
Reviewing and Evaluating	6	Embedded ¹
Working with Others	6	Embedded ¹

Notes

- 1 These Core Skills are embedded in a mandatory Unit.
- 2 Using Number at SCQF level 6 is embedded some of the mathematics options from which the candidate must achieve 2 credits. It is also embedded in a mandatory Unit at SCQF level 5.
- 3 *ICT* at SCQF level 6 is drawn from the Core Skills entry requirements. It is also embedded in a number of optional Units listed below.

Candidates accepted who lack elements of the Core Skills entry profile have opportunities to attain in a number of optional Units. The following list is non-exhaustive and is intended to highlight key Units suitable for this purpose:

Communications

Additional opportunities to attain the Core Skill of *Communications* exist in the following Units:

- ◆ DE1K 33 *Workplace Communication in English*
(embedded — SCQF level 5)
- ◆ DV5T 34 *Art and Design: Creative Process* (signposted — SCQF level 6)
- ◆ F88D 34 *Games Design: Pitch to Treatment* (signposted — SCQF level 6)
- ◆ F86J 34 *History, Evolution and Impact of Computer Games*
(signposted — SCQF level 6)
- ◆ DV93 34 *Specialist Illustration* (signposted — SCQF level 6)

Numeracy

Additional opportunities to attain the Core Skill of *Numeracy* exist in the following Units:

- ◆ DP8F 34 *Mathematics: Calculus and Matrices for Computing*
(embedded — SCQF level 6)
- ◆ F86H 35 *Game Physics* (embedded — SCQF level 6)
- ◆ DH2T 34 *Computer Architecture 1* (embedded — SCQF level 5)
- ◆ D76E 34 *Mathematics for Computing 1*
(Using Number embedded — SCQF level 6, Using Graphical Information embedded — SCQF level 5)
- ◆ F20A 33 *Mathematics for Interactive Computing: Fundamental Techniques*
(signposted — SCQF level 5)
- ◆ F20B 34 *Mathematics for Interactive Computing: Essential Techniques*
(signposted — SCQF level 6)
- ◆ F8M3 34 *Game Technology* (signposted — SCQF Level 5)

Information and Communication Technology

Additional opportunities to attain the Core Skill of *Information and Communication Technology* exist in the following Units:

- ◆ D75X 34 *Information Technology: Applications Software 1*
(embedded — SCQF level 6)
- ◆ F88D 34 *Games Design: Pitch to Treatment* (signposted — SCQF level 6)
- ◆ DV5T 34 *Art and Design: Creative Process* (signposted — SCQF level 6)

Problem Solving

Additional opportunities to attain the Core Skill of *Problem Solving* exist in the following Units:

- ◆ D76P 35 *Software Development: Developing for the World Wide Web* (Critical Thinking and Planning and Organising embedded — SCQF level 6)
- ◆ F86H 35 *Game Physics* (Critical Thinking embedded — SCQF level 6)
- ◆ F869 34 *3D Level Editing* (Critical Thinking and Planning and Organising embedded — SCQF level 5)
- ◆ F86J 34 *History, Evolution and Impact of Computer Games* (Critical Thinking embedded — SCQF level 5)
- ◆ F8VH 35 *Computer Games Development: Graded Unit 2* (embedded — SCQF level 6)
- ◆ F8VG 34 *Computer Games Development: Graded Unit 1* (embedded – SCQF level 6)
- ◆ F86A 35 *Games Development: Object Oriented Programming* (signposted — SCQF level 6)
- ◆ F871 35 *Artificial Intelligence and Critical Thinking* (signposted — SCQF level 6)
- ◆ F8L2 35 *Game Customisation and Scripting* (signposted — SCQF level 6)
- ◆ DV5T 34 *Art and Design: Creative Process* (signposted — SCQF level 6)
- ◆ DV93 34 *Specialist Illustration* (signposted — SCQF level 6)
- ◆ F20B 34 *Mathematics for Interactive Computing: Essential Techniques* (signposted — SCQF level 6)
- ◆ F20A 33 *Mathematics for Interactive Computing: Fundamental Techniques* (signposted — SCQF level 5)
- ◆ F20C 34 *Digital Media: Audio* (signposted — SCQF level 5)

Working with Others

Additional opportunities to attain the Core Skill of *Working with Others* exist in the following Units:

- ◆ F871 35 *Artificial Intelligence and Critical Thinking* (signposted — SCQF level 6)
- ◆ F8R6 34 *Game Design Theory* (signposted — SCQF level 6)

5.3 Mapping information

The primary source of relevant National Occupational Standards for the HNC/HND Computer Games Development naturally comes from the *National Occupational Standards: Interactive Media* published by Skillset, the Sector Skills Council for Creative Media (June 2009). Within these Standards, the core Units IM20 and IM21 have been identified as being core to these qualifications, while elements have been also drawn from IM22 and the basic IM1 where appropriate.

In addition, the *National Occupational Standards: IT and Telecoms* published by e-skills uk, The Sector Skills Council for Business and Information Technology has been examined and the sub-disciplines 5.2 and 4.6 have been applied to the qualifications.

The following table summarises the relevant Units/sub-disciplines that have influenced the design of the HNC/HND Computer Games Development (in rough order of importance/relevance)

Code	Source	Name
IM21	Skillset	Program Electronic Games To Develop Functionality
IM20	Skillset	Design Electronic Games
5.2	e-skills uk	Software Development
IM1	Skillset	Work Effectively In Interactive Media
IM22	Skillset	Test Electronic Games
4.6	e-skills uk	HCI Design

The full specifications of these standards are included in Appendix 4.

Comparison of these standards from different bodies demonstrated that the relevant elements of e-skills uk's sub-disciplines in Software Development and HCI Design are analogous to those included in Skillset's more targeted core Units, thus the following breakdown will concentrate on the Skillset NOS Units.

The elements of the NOS competencies are directly supported by a number of Units. As an illustration, the following lists the most relevant carrier Units for the three most relevant standards.

IM1 Work Effectively In Interactive Media

Game Design Theory
Game Design: Pitch to Treatment
Game Technology
Working within a Project Team
Computing: Planning
Game Customisation and Scripting

IM20 Design Electronic Games

Game Design Theory
Game Design: Pitch to Treatment
History, Evolution and Impact of Computer Games
Game Technology
User Interface Design

IM21 Program Electronic Games To Develop Functionality

Structured Programming for Games
Games Development: Object Oriented Programming
Computing: Planning
Working within a Project Team
Game Technology
Game Design: Pitch to Treatment

A finer grade breakdown of this Unit mapping can be found in Appendix 3.

5.4 Articulation, professional recognition and credit transfer

HNC

The existing articulation agreements as specified in the 2005 arrangements document with Glasgow Caledonian University and University of the West of Scotland is unaffected by the revised framework.

As discussed previously, the revised HNC has been created with careful consideration of the existing articulation agreements that exist between centres delivering the 2005 HNC and higher education establishments. As demonstrated within section 6 *Delivery Methods* there is a very close mapping from the 2005 to the revised HNC and centres wishing to continue delivering only the HNC will be able to maintain existing agreements.

In addition, articulation agreements with University of Abertay (which require Higher Mathematics in addition to the HNC) are better supported by the revised HNC through the inclusion of the optional Units F20A 33 *Mathematics for Interactive Computing: Fundamental Techniques* and F20B 34 *Mathematics for Interactive Computing: Essential Techniques*. The content of these Units strongly complements concurrent study of Higher Mathematics.

HND

Glasgow Caledonian University have agreed in principle to accept successful candidates onto level 2 or 3 of their *Computer Games (Design)* or *Computer Games (Software Development)* courses on an individual review basis (to ensure the HN options align to the degree course streams).

University of West of Scotland have agreed that articulation onto level 2 or 3 of their *Computer Games Development* or *Computer Games Technology* courses is possible on a case by case basis but have noted that current candidates articulating from 2005 HNC Computer Games Development to level 2 of their Computer Games Technology course are struggling with the transition process.

University of Abertay have agreed in principle that candidates who successfully complete the HND Computer Games Development course and have a Higher (min Grade B) Mathematics would be considered for entry to the first year of BSc (Hons) Computer Games Technology. Candidates who successfully complete the HND Computer Games Development course and have a standard grade Mathematics at credit level (Standard Grade 1 or 2) would be considered for entry to the first year of BSc (Hons) Computer Games Applications Development. If the candidate has a Higher Grade Mathematics they would be considered for entry into the second year of this course. Candidates who successfully complete the HND Computer Games Development course and have a Higher English and Mathematics would be considered for entry to the second year of BA (Hons) Game Design and Production Management.

Napier University have agreed direct entry into Stage 3 (level 9) of BSc Games Development with a sufficient pass mark in the Graded Unit and having undertaken a majority of Units focusing on programming and mathematics.

Credit transfer

Transition arrangements have been created to allow credit transfer of Units from the original HNC Computer Games Development (2005) to the new HNC/HND Group Awards.

Units		Equivalent old Unit or parts and combinations of Units		Credit transfer proposed	Audit result
Unit code	Unit title	Unit code	Unit title		
F86A 35	Games Development: Object Oriented Programming	D76V 35	Software Development: Object Oriented Programming	2	Partial (See Notes)
F86A 35	Games Development: Object Oriented Programming	DH3C 35	Software Development: Object Oriented Programming	2	Partial (See Notes)
F8HC 34	Structured Programming for Games	DH3E 35	Software Development: Structured Programming	2	Partial (See Notes)
F1W0 34	Project Management for IT	D76J 35	Project Management	1	Full
	Same Unit in new framework	DH21 34	Working within a Project Team	1	Full
	Same Unit in new framework	DH2T 34	Computer Architecture 1	1	Full
	Same Unit in new framework	D75X 34	Information Technology: Application Software 1	1	Full
	Same Unit in new framework	DE2N 35	3D Modelling and Animation	2	Full
	Same Unit in new framework	DP8F 34	Mathematics: Calculus and Matrices	1	Full
	Same Unit in new framework	DH35 34	Computing: Planning	1	Full
F8VG 34	Computer Games: Graded Unit 1	DP8G 34	Computer Games: Graded Unit 1	1	Full
	Same Unit in new framework	D76P 35	Software Development: Developing for the World Wide Web	2	Full

Units		Equivalent old Unit or parts and combinations of Units		Credit transfer proposed	Audit result
Unit code	Unit title	Unit code	Unit title		
	Same Unit in new framework	D76L 35	Software Development: Abstract Data Structures	3	Full
	Same Unit in new framework	DE3R 34	Personal Development Planning	1	Full
	Same Unit in new framework	F0N0 35	Professional Issues in Computing	2	Full

Credit transfer notes

D76V 35 & DH3C 35 *Software Development: Object Oriented Programming* → F86A 35 *Games Development: Object Oriented Programming*

These Units are very similar in terms of vocational competence, but carry different credit values. Outcome 1 and 2 of DH3C 35 map very well to Outcomes 2 and 3 of F86A 35. However, DH3C 35 does not explicitly request that the candidate create appropriate UML documentation for the program. It states that: 'The design to be implemented is either derived in the HN Unit: DH35 34 *Computing: Planning* or provided by the assessor.' This means that candidates possessing DH3C 35 may not have created the storyboards, a UML Use Case model, and UML Class Diagram requested as Evidence Requirements for F86A 35. Additionally, DH3C 35 does not require the use of pre-defined interface components and implementation of event-driven interaction which are required for F86A 35.

Full credit transfer may only be awarded where there is additional evidence to demonstrate that candidates are competent in designing and producing design documentation for programs using an event-driven interface. This could involve the candidate performing a task whereby they produce storyboards, a Use Case model and a Class Diagram for a program, based on a given problem brief/specification. Evidence generated as part of HN Unit DH3G 34 *Systems Development: Object Oriented Design (Introduction)* or a similar Unit may be acceptable for this purpose.

They would not be required to implement the whole program. However, they would have to produce, as a minimum, the main user interface screen for the program, to demonstrate their ability to use pre-defined interface components and the ability to implement event-driven interaction.

DH3E 35 *Software Development: Structured Programming* → F8HC 34 *Structured Programming for Games*.

These Units are very similar in terms of vocational competence, but carry different credit values and SCQF level. The substantive difference in assessment being that DH3E 35 includes an objective question assessment whereas F8HC 34 includes a short portfolio and active demonstration of the project produced.

Given the essential nature of delivering a contextualized project (ie ‘a game’) for DH3E 35, it is likely that candidates will have exceeded the basic requirements for DH3E 35 sufficient to meet the requirements of the project and portfolio of F8HC 34. However, centres must ensure that the project produced for DH3E 35 covers in particular the Knowledge and Skills relating to data types, arrays, use of comments and nesting as specified in F8HC 34.

In order to award full credit transfer, candidates should also complete an observed demonstration and evaluation report as specified in Outcome 4 of F8HC 34.

6 Approaches to delivery and assessment

Content and context

The awards have been developed with strong guidance given by the sector skills recommendations to reflect industry working standards. As such emphasis has been given, particularly in the first year, to group based project work and collaborative working and centres should ensure that facilities are made available to the candidates for independent study and group meetings in appropriately equipped facilities.

Sequence of delivery

The order in which Units within the Award are delivered is at the discretion of the centre and should be appropriate to local staffing and timetabling considerations. The following delivery sequence is offered for guidance only. Where the Award is being delivered on a part-time basis, the subjects recommended for the first semester within the full-time model of delivery should be delivered in the first academic session of the part-time delivery. Subjects recommended for semester two delivery in the full-time model should be delivered in the second academic session of the part-time delivery model.

During year one, it is recommended that *Structured Programming for Games* be delivered in conjunction with *User Interface Design* and *2D Animation* in order to provide opportunities to produce a coherent project.

Computing: Planning, Game Technology and Working within a Project Team should be delivered before *Computer Games Development: Graded Unit 1* to allow candidates time to assimilate the skills required for the Graded Unit.

Structured Programming for Games allows for introductory learning of programming concepts and as such should commence before other more specialised programming Units.

Centres intending to deliver the HND should include one Unit of mathematics (*Mathematics for Interactive Computing: Fundamental Techniques* or *Mathematics for Computing 1*) in the first year in order to spread the mathematics content evenly across both years.

During year two, it is recommended that *Game Development: Object Oriented Programming* be delivered in conjunction with *3D Modelling and Animation* again to provide cross-assessment integration opportunities.

3D Level Editing should be delivered prior to *Game Customisation and Scripting* as there is a natural progression of complexity and skills.

Games Development: Object Oriented Programming, 3D Modelling and Animation and *Project Management for IT* should be delivered before *Computer Games Development: Graded Unit 2* to allow candidates time to assimilate the skills required for the Graded Unit.

Delivery methods

Options should be selected that complement centre strengths. Centres strong in multi/new media should concentrate on content generation options while centres with strong software development resources should concentrate on technical Units. Three case studies follow showing how these specialisms can be accommodated. Note that these cases have been selected to demonstrate extremes. A more balanced approach to the award themes, taking into account local articulation requirements is strongly recommended.

Case Study 1 — Code Heavy

This framework will give the candidate the most exposure to different programming languages, environments and concepts possible in the framework. They could easily develop skills in three different programming languages and a further two scripting languages as well as experiencing the extended challenges of AI, physics and web programming.

Year 1

Semester 1

Structured Programming for Games

Game Technology

Computing: Planning

User Interface Design

Working Within a Project Team

Artificial Intelligence and Critical Thinking

Semester 2

Structured Programming for Games (continues)

Artificial Intelligence and Critical Thinking (continues)

Mathematics for Interactive Computing: Fundamental Techniques.

Scripting for Interactivity

Game Customisation & Scripting

Computer Games Development: Graded Unit 1

Case Study 1 — Code Heavy (continued)

Year 2

Semester 1

Game Development: Object Oriented Programming
3D Modelling and Animation
Project Management for IT
Software Development Abstract Data Structures
Software Development: Event Driven Programming
Game Physics

Semester 2

Game Development: Object Oriented Programming (continues)
Software Development: Event Driven Programming (continues)
Game Physics (continues)
Mathematics for Interactive Computing: Essential Techniques
Computer Games Development: Graded Unit 2

Case Study 2 — Design Heavy

This framework provides the candidate with detailed technical knowledge, but concentrates on developing their design and creativity skills. For candidates wishing to build a portfolio suitable for applying for designer jobs and articulation towards degree's like University of Abertay's Games Applications course, this is framework will be more suitable than the Code Heavy example.

Year 1

Semester 1

Structured Programming for Games
Game Technology
Computing: Planning
Working Within a Project Team
2D Animation
Artificial Intelligence and Critical Thinking
Game Design: Pitch to Treatment

Semester 2

Structured Programming for Games (continues)
User Interface Design
Mathematics for Interactive Computing: Fundamental Techniques.
3D Level Editing
2D Animation (continues)
Artificial Intelligence and Critical Thinking (continues)
Computer Games Development: Graded Unit 1

Case Study 2 — Design Heavy (continued)

Year 2

Semester 1

Game Development: Object Oriented Programming
3D Modelling and Animation
Project Management for IT
Game Customisation and Scripting
Narrative and Genre in Computer Games
Game Design Theory

Semester 2

Game Development: Object Oriented Programming (continues)
Computer Games Development: Graded Unit 2
Game Customisation and Scripting (continues)
Games Development: Character Creation and Storytelling
Mathematics for Interactive Computing: Essential Techniques
Narrative and Genre in Computer Games (continues)

Case Study 3 — 2005 HNC Delivery

This illustration mimics the 2005 HNC as much as possible for a one year, revised HNC in order to demonstrate how much work would be involved in a 'straight swap' transition between the two.

The substantial changes to core Units one should be aware of are that Computer Architecture 1 (DH2T 34) has been replaced with Game Technology and Object Oriented Programming has been replaced with Structured Programming. Where centres are required to include object-oriented concepts beyond the scope of the Structured Programming Unit, there is still scope in the options to include it either from the HND core Unit, or from one of the other options such as Software Development: Event Driven Programming.

The remainder of the core Units from the 2005 HNC have been included as options, though it is strongly recommended that centres considering such a path replace ITAS 1 with 3D Level Design where possible.

Year 1

Semester 1

Structured Programming for Games
Game Technology
Computing: Planning
Working Within A Project Team
3D Modelling and Animation
Information Technology: Applications Software 1

Semester 2

Structured Programming for Games (continues)
User Interface Design
3D Modelling and Animation (continues)
Mathematics: Calculus and Matrices

Guidance on Open and Distance Learning

Full details on the suitability of individual Units for Open Learning are contained in each individual Unit specification. Overall the Qualification Design Team are aware that aspects of many Units could be delivered on an Open Learning basis but that special arrangements would be required to ensure that any assessments were the candidate's own work.

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative assessment arrangements.

7 General information for centres

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.

Internal and external verification

All instruments of assessment used within this/these Group Award(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

External verification will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

Further information on internal and external verification can be found in *SQA's Guide to Assessment* (www.sqa.org.uk).

8 Glossary of terms

SCQF: This stands for the Scottish Credit and Qualification Framework, which is a new way of speaking about qualifications and how they inter-relate. We use SCQF terminology throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at www.scqf.org.uk

SCQF credit points: One HN credit is equivalent to 8 SCQF credit points. This applies to all HN Units, irrespective of their level.

SCQF levels: The SCQF covers 12 levels of learning. HN Units will normally be at levels 6–9. Graded Units will be at level 7 and 8.

Subject Unit: Subject Units contain vocational/subject content and are designed to test a specific set of knowledge and skills.

Graded Unit: Graded Units assess candidates' ability to integrate what they have learned while working towards the Units of the Group Award. Their purpose is to add value to the Group Award, making it more than the sum of its parts, and to encourage candidates to retain and adapt their skills and knowledge.

Dedicated Unit to cover Core Skills: This is a non-subject Unit that is written to cover one or more particular Core Skills.

Embedded Core Skills: This is where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level.

Signposted Core Skills: This refers to the opportunities to develop a particular Core Skill at a specified level that lie outwith automatic certification.

Qualification Design Team: The QDT works in conjunction with a Qualification Manager/Development Manager to steer the development of the HNC/HND from its inception/revision through to validation. The group is made up of key stakeholders representing the interests of centres, employers, universities and other relevant organisations.

Consortium-devised HNCs and HNDs are those developments or revisions undertaken by a group of centres in partnership with SQA.

Specialist single centre and specialist collaborative devised HNCs and HNDs are those developments or revisions led by a single centre or small group of centres who provide knowledge and skills in a specialist area. Like consortium-devised HNCs and HNDs, these developments or revisions will also be supported by SQA.

10 Appendices

Appendix 1: Mapping of aims to mandatory Units

Appendix 2: Outline structure of Group Awards

Appendix 3: Mapping of National Occupational Standards to Units

Appendix 4: National Occupational Standards relevant to the HNC/HND Awards

Appendix 5: Suggested delivery schedule

Appendix 1: Mapping of aims to mandatory Units

Group Award: HNC Computer Games Development

Unit code	Unit title	General and Specific Aims										
		G1	G2	G3	G4	G5	G6	S1	S2	S3	S4	S5
F8VG 34	Computer Games Development: Graded Unit 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
DH35 34	Computing: Planning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
F8M3 34	Game Technology		✓	✓			✓	✓	✓	✓	✓	
F8HC 34	Structured Programming for Games	✓	✓	✓			✓	✓	✓	✓	✓	
DH21 34	Working Within A Project Team		✓	✓	✓	✓	✓	✓		✓	✓	✓

Group Award: HND Computer Games Development

Unit code	Unit title	General and Specific Aims										
		G1	G2	G3	G4	G5	G6	S1	S2	S3	S4	S5
F8VG 34	Computer Games Development: Graded Unit 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
F8VH 35	Computer Games Development: Graded Unit 2	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
DE2N 35	3D Modelling and Animation	✓	✓	✓			✓	✓	✓	✓	✓	✓
DH35 34	Computing: Planning	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
F86A 35	Games Development: Object Oriented Programming	✓	✓	✓			✓	✓	✓	✓	✓	✓
F8M3 34	Game Technology		✓	✓			✓	✓	✓	✓	✓	✓
F8HC 34	Structured Programming for Games	✓	✓	✓			✓	✓	✓	✓	✓	✓
DH21 34	Working Within A Project Team		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
F1W0 34	Project Management for IT	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Appendix 2: Outline structure of the Group Award

Group Award: HNC Computer Games Development

Unit code	Unit title	Credit value	SCQF level				Mandatory or Optional	
			6	7	8	9	Mandatory	Optional
F209 34	2D Animation	2		✓				✓
F869 34	3D Level Editing	1		✓				✓
DE2N 35	3D Modelling and Animation	2			✓			✓
F871 35	Artificial Intelligence and Critical Thinking	2			✓			✓
DV5T 34	Art and Design: Creative Process	1		✓				✓
DH2T 34	Computer Architecture 1	1		✓				✓
DH35 34	Computing: Planning	1		✓			✓	
F1YX 34	Digital Imaging: Bitmap and Vector	1		✓				✓
F20C 34	Digital Media: Audio	1		✓				✓
DH34 35	Software Development: Event Driven Programming	2			✓			✓
F8L2 35	Game Customisation and Scripting	2			✓			✓
F8R6 34	Game Design Theory	1		✓				✓
F86H 35	Game Physics	2			✓			✓
F8M3 34	Game Technology	1		✓			✓	
F88D 34	Games Design: Pitch to Treatment	1		✓				✓
F86A 35	Games Development: Object Oriented Programming	3			✓			✓
F8R5 34	Games Development: Character Creation and Storytelling	1		✓				✓
F8VG 34	Computer Games Development: Graded Unit 1	1		✓			✓	
F86J 34	History, Evolution and Impact of Computer Games	1		✓				✓
D75X 34	Information Technology: Applications Software 1	1		✓				✓
DH33 34	Computer Operating Systems 1	1		✓				✓
A5NY 34	Introductory Mathematics for Computing	1		✓				✓
D76E 34	Mathematics for Computing 1	1		✓				✓
DP8F 34	Mathematics: Calculus and Matrices for Computing	1		✓				✓
F20B 34	Mathematics for Interactive Computing: Essential Techniques	1		✓				✓
F20A 33	Mathematics for Interactive Computing: Fundamental Techniques	1	✓					✓

Group Award: HNC Computer Games Development (continued)

Unit code	Unit title	Credit value	SCQF level				Mandatory or Optional	
			6	7	8	9	Mandatory	Optional
F6BX 35	Narrative and Genre in Computer Games	2			✓			✓
DE3R 34	Personal Development Planning	1		✓				✓
F0N0 35	Professional Issues In Computing	2			✓			✓
F1W0 34	Project Management for IT	1		✓			✓	
DE32 35	Scripting for Interactivity	2			✓			✓
D76P 35	Software Development: Developing for the World Wide Web	2			✓			✓
DM3F 35	Software Development: Rapid Applications Development and Prototyping	2			✓			✓
D76L 35	Software Development: Abstract Data Structures	3			✓			✓
DV93 34	Specialist Illustration	1		✓				✓
F8HC 34	Structured Programming for Games	3		✓			✓	
F1VV 34	User Interface Design	1		✓				✓
DH21 34	Working Within a Project Team	1		✓			✓	
DE1K 33	Workplace Communication in English	1	✓					✓
DE2X 35	Interactive Fiction	2			✓			✓
F1GW 35	Game Design	2			✓			✓
H172 35	Systems Development: Object Oriented Analysis and Design	2			✓			✓
Total		59	2	25	15	0	6	35

Group Award: HND Computer Games Development

Unit code	Unit title	Credit value	SCQF level				Mandatory or Optional	
			6	7	8	9	Mandatory	Optional
F209 34	2D Animation	2		✓				✓
F869 34	3D Level Editing	1		✓				✓
DE2N 35	3D Modelling and Animation	2			✓		✓	
F871 35	Artificial Intelligence and Critical Thinking	2			✓			✓
DV5T 34	Art and Design: Creative Process	1		✓				✓
DH2T 34	Computer Architecture 1	1		✓				✓
DH35 34	Computing: Planning	1		✓			✓	
F1YX 34	Digital Imaging: Bitmap and Vector	1		✓				✓
F20C 34	Digital Media: Audio	1		✓				✓
DH34 35	Software Development: Event Driven Programming	2			✓			✓
F8L2 35	Game Customisation and Scripting	2			✓			✓
F8R6 34	Game Design Theory	1		✓				✓
F86H 35	Game Physics	2			✓			✓
F8M3 34	Game Technology	1		✓			✓	
F88D 34	Games Design: Pitch to Treatment	1		✓				✓
F86A 35	Games Development: Object Oriented Programming	3			✓		✓	
F8R5 34	Games Development: Character Creation and Storytelling	1		✓				✓
F8VG 34	Computer Games Development: Graded Unit 1	1		✓			✓	
F8VH 35	Computer Games Development: Graded Unit 2	2			✓		✓	
F86J 34	History, Evolution and Impact of Computer Games	1		✓				✓
D75X 34	Information Technology: Applications Software 1	1		✓				✓
DH33 34	Computer Operating Systems 1	1		✓				✓
A5NY 34	Introductory Mathematics for Computing	1		✓				✓
D76E 34	Mathematics for Computing 1	1		✓				✓
DP8F 34	Mathematics: Calculus and Matrices for Computing	1		✓				✓
F20B 34	Mathematics for Interactive Computing: Essential Techniques	1		✓				✓
F20A 33	Mathematics for Interactive Computing: Fundamental Techniques	1	✓					✓

Group Award: HND Computer Games Development (continued)

Unit code	Unit title	Credit value	SCQF level				Mandatory or Optional	
			6	7	8	9	Mandatory	Optional
F6BX 35	Narrative and Genre in Computer Games	2			✓			✓
DE3R 34	Personal Development Planning	1		✓				✓
F0N0 35	Professional Issues In Computing	2			✓			✓
F1W0 34	Project Management for IT	1		✓			✓	
DE32 35	Scripting for Interactivity	2			✓			✓
D76P 35	Software Development: Developing for the World Wide Web	2			✓			✓
DM3F 35	Software Development: Rapid Applications Development and Prototyping	2			✓			✓
D76L 35	Software Development: Abstract Data Structures	3			✓			✓
DV93 34	Specialist Illustration	1		✓				✓
F8HC 34	Structured Programming for Games	3		✓			✓	
F1VV 34	User Interface Design	1		✓				✓
DH21 34	Working Within a Project Team	1		✓			✓	
DE1K 33	Workplace Communication in English	1	✓					✓
DE2X 35	Interactive Fiction	2			✓			✓
F1GW 35	Game Design	2			✓			✓
H172 35	Systems Development: Object Oriented Analysis and Design	2			✓			✓
Total		64	2	25	16	0	9	34

Group Award title: HND Computer Games Development

Unit code	Unit title	NOS Reference (IM20 — Design Electronic Games)																												
		a	b	c	d	e	f	g	h	i	j	k	l	i	ii	iii	iv	v	vi	vii	viii	ix	1	2	3	4	5	6	7	
F8M3 34	Game Technology		✓																	✓		✓								
DH21 34	Working within a Project Team																											✓		
F8HC 34	Structured Programming for Games											✓																		
DH35 34	Computing: Planning											✓																		
F1VV 34	User Interface Design									✓																				
F88D 34	Games Development: Pitch to Treatment				✓							✓										✓				✓	✓		✓	✓
F8R5 34	Games Development: Character Creation & Storytelling					✓																								
F86J 34	History, Evolution and Impact of Computer Games								✓			✓							✓	✓				✓						
F8R6 34	Game Design Theory			✓	✓		✓		✓		✓							✓	✓		✓		✓	✓						

Group Award title: HND Computer Games Development

Unit code	Unit title	NOS Reference (IM21 Program Electronic Games to Develop Functionality)																											
		a	b	c	d	e	f	g	h	i	i	ii	iii	iv	v	vi	vii	viii	ix	1	2	3	4	5	6	7	8		
F8M3 34	Game Technology									✓	✓				✓														
DH21 34	Working within a Project Team		✓													✓	✓										✓		
F8HC 34	Structured Programming for Games			✓	✓	✓	✓	✓	✓				✓								✓	✓	✓	✓	✓				
DH35 34	Computing: Planning	✓	✓							✓		✓	✓	✓															
F86A 35	Games Development: Object Oriented Programming			✓	✓	✓	✓	✓	✓				✓								✓	✓	✓	✓	✓				
F82L 35	Game Customisation and Scripting	✓		✓	✓	✓	✓	✓	✓				✓								✓	✓	✓	✓	✓				
F88D 34	Games Development: Pitch to Treatment	✓										✓																	

Appendix 4: National Occupational Standards relevant to these awards

IM1 Work Effectively In Interactive Media (Skillset NOS)

Overview

This Unit is about the core competence that everyone working in interactive media needs, regardless of their role or function.

You will need to be able to:

- ◆ understand the medium in which you are working
- ◆ keep your skills and knowledge up-to-date

You must be familiar with up-to-date industry-standard software tools in the following categories:

- ◆ Word Processors
- ◆ Spreadsheets
- ◆ Web Browsers
- ◆ Email Clients
- ◆ Anti-Virus Software
- ◆ Personal Firewalls

Knowledge and Understanding

- (a) The nature, constraints, opportunities and parameters of the platforms, technologies and media you are working with.
- (b) How to present ideas to colleagues and gain their support.
- (c) How to make the most effective use of resources and other materials at your disposal.
- (d) How to encourage people to give frank and constructive feedback about your work.
- (e) How to give as well as receive feedback, whether negative or positive.
- (f) Principles and methods of version control, and why it is important.
- (g) How to clarify timescales and budgets and how to assess the impact these have on your work.
- (h) The kind of common problems, design changes and contingencies that may occur in your work and how to minimise their impact.
- (i) Who needs to be informed if you anticipate any difficulties in carrying out your work.
- (j) How to use relevant hardware and software effectively and efficiently.
- (k) How to carry out research effectively using the internet.
- (l) Safe and healthy use of computer equipment, including seating, posture and screen-breaks.
- (m) How to explain technical or specialist issues in your area or work to non-technical people or to specialists in other areas.
- (n) How to protect your computer from viruses and hackers and why it is important to do so.

Awareness

- (i) Relevant sources of information to help you keep your skills and knowledge up-to-date.
- (ii) Appropriate resources such as newsgroups, mailing lists, web sites, seminars, courses, networking opportunities etc.
- (iii) Available technologies, tools, and approaches, and when it might be appropriate to use them.
- (iv) Relevant standards, guidelines and best practice.
- (v) The inter-relations between content, design and technology.
- (vi) Balancing creative needs with budgetary constraints.
- (vii) The overall project life-cycle and where you fit into it.
- (viii) How your role relates to those of others working with you.
- (ix) How others may need to use the work you produce.
- (x) The various disciplines and skill sets that are relevant to interactive media but which may be outside your own background or experience.
- (xi) The relevant authority from whom you may need to get approval for your work.
- (xii) Project schedules and deadlines.
- (xiii) The aims, values, direction and priorities of your organisation.
- (xiv) Legal issues relating to copyright and intellectual property.
- (xv) Ethical issues such as privacy, confidentiality and data protection.

Performance Statements

- 1 Manage your own continuing professional development.
- 2 Maintain up-to-date awareness of market developments, new technologies, techniques and best practice.
- 3 Proactively communicate and work with other specialists.
- 4 Make backup copies of your work at appropriate intervals and store them securely.
- 5 Produce work to the required standard within relevant timescales and budgets.
- 6 Save your work using appropriate file names and/or naming conventions so that they can be easily identified by yourself or others later on.
- 7 Devise and implement contingency plans for reasonably foreseeable setbacks that might affect your ability to deliver your work on time.
- 8 Seek and respond constructively to advice or feedback from appropriate people concerning the quality, fitness for purpose, or any other aspect of, your work.
- 9 Conduct discussions and negotiations in a way that promotes co-operation and goodwill.
- 10 Use industry-standard office software.
- 11 Comply with copyright law.

IM20 Design Electronic Games (Skillset NOS)

Example job titles: Game Designer

Overview

This Unit is about your ability to design games, typically in response to a provided high-level concept.

You will need to draw on your creativity and innovative ideas in order to ‘flesh out the detail’ so that the game can be realised by others, such as artists, modellers, programmers, and so on. You will be expected to convey ideas clearly and concisely.

While not essential, art skills, such as drawing and 3D modelling, and programming and scripting skills, are often considered desirable in candidates for game design roles.

Knowledge and Understanding

- (a) How to obtain and analyse product information to determine relevant design parameters.
- (b) The impact on the product’s design of technical parameters such as the target device’s processing power, memory, bandwidth, screen size, resolution, colour depth, input device etc.
- (c) Theories of game design and game mechanics.
- (d) How to establish game-play and environment parameters.
- (e) The various different styles and genres of game.
- (f) The concepts of game progression, difficulty ramping and reward systems.
- (g) The history and heritage of video game development.
- (h) What makes an electronic game engaging and compelling.
- (i) Interface design concepts relating to graphical user interfaces and input controllers.
- (j) Techniques for teaching the user how to play the game.
- (k) How to document specifications and designs in appropriate formats, such as text, drawings, storyboards, maps or diagrams etc.
- (l) The relevant principles and methodology of software engineering.

Awareness

- (i) Different genres of game and the types of audience they appeal to.
- (ii) Project parameters and constraints including target platforms and their capabilities.
- (iii) Intellectual property issues, particularly relating to any constraints or processes that are dictated in license terms and which need to be complied with.
- (iv) The target audience and their expectations and preferences.
- (v) Appropriate content for different age groups.
- (vi) Cultural issues, local sensibilities and the way relevant legislation can differ between countries.
- (vii) Established conventions, such as controller setup, relating to the platform for which you are designing.
- (viii) The different types of appropriate documentation that you may need to use.
- (ix) Emerging gaming technologies and platforms.

Performance Statements

- 1 Analyse, deconstruct and learn from existing game designs.
- 2 Devise and document game rules.
- 3 Specify the characteristics of the game world in sufficient detail for realisation by others.
- 4 Specify the attributes and behaviours of objects and characters in the game world in sufficient detail for realisation by others.
- 5 Liaise with other colleagues involved in the creative or quality assurance process to ensure the game design can be realised effectively.
- 6 Prototype design ideas and develop proofs of concept.
- 7 Effectively present games to appropriate stakeholders.

IM21 Program Electronic Games to Develop Functionality (Skillset NOS)

Example job titles: Game Programmer

Overview

This Unit is about your ability to use a programming language to develop the product's functionality. Note that this is typically an iterative process involving constant feedback and revision, so patience and a willingness to be objective about your work are vital.

Some industry-standard languages you might use are:

- ◆ C++
- ◆ C#

Some valuable foundation languages that individuals might be familiar with are:

- ◆ Java
- ◆ Pascal
- ◆ Smalltalk

Knowledge and Understanding

- (a) How to interpret, follow and write specifications or other briefs.
- (b) How, and to whom, to ask questions to clarify requirements or raise issues in response to the specification or brief.
- (c) Relevant programming principles and best practice (such as object-oriented and/or procedural programming).
- (d) The functions and syntax of the programming language you are using.
- (e) How to write efficient code that is also readable and maintainable.
- (f) Why it is important to clearly and professionally document your code so that others can read and understand it.
- (g) How to test and debug your code efficiently, effectively and thoroughly.
- (h) How and when to write custom debugging code.
- (i) How to use appropriate software for asset management, code version control and bug tracking.

In addition you may need to specialise in one of the following areas:

- (j) Physics programming.
- (k) Graphics programming.
- (l) Network programming;
- (m) Artificial Intelligence programming.
- (n) User interface programming.
- (o) Audio programming.
- (p) Logic/mathematical skills.

Awareness

- (i) Project parameters and constraints including target platforms and their capabilities.
- (ii) The overall structure of the game being developed.
- (iii) Sources of information for help, tips and tricks for making most effective use of the programming language and development environment you are using.
- (iv) The implications of later requests for changes to functionality or other aspects of the product.
- (v) The technical and logistical issues surrounding development for crossplatform delivery.
- (vi) The expectations of others who may be involved in debugging, using or modifying your code.
- (vii) Who wrote the specification, who designed the relevant part of the game, and who is responsible for decision making.
- (viii) An understanding of the nature of a code-base, which is subject to constant revision and ongoing development.
- (ix) The commercial value of software code.

Performance Statements

- 1 Use the specified development environment or coding tool effectively.
- 2 Code programs or program components to provide specified functionality.
- 3 Produce modular code.
- 4 Clearly document and comment your code so that others can understand it.
- 5 Create efficient code that is easy to read and maintain.
- 6 Liaise with colleagues to ensure designs and specifications are correctly implemented.
- 7 Respond positively to requests for changes to work schedules, timescales and product features.
- 8 Use version control and asset management systems to ensure full back-up of your work.

IM22 Test Electronic Games (Skillset NOS)

Example job titles: Tester, QA Technician

Overview

This Unit is about your ability to test games to ensure they work correctly and provide an engaging experience for players. Testing can often be a repetitive process, so patience is an important attribute.

Knowledge and Understanding

- (a) How to interpret and follow verbal or written instructions.
- (b) How, and to whom, to ask questions to clarify requirements or raise issues in response to the instructions.
- (c) How to use relevant game consoles, computer hardware, input devices etc.
- (d) The lifecycle of a bug from discovery to closure.
- (e) How and when to use bug tracking software.
- (f) How to carry out testing, and give feedback, that is appropriate for the game's stage of development.
- (g) How to define and articulate the quality of the gaming experience.
- (h) The importance of accountability for bug reports.
- (i) Why bug reports need to be clear and concise and contain all relevant information.
- (j) Relevant technical, platform, or legal/compliance standards and how these may differ between territories.
- (k) The difference between playing and testing a game.

Awareness

- (i) The instructions and rules of the game you are testing.
- (ii) The overall design aim of the game being tested.
- (iii) The purpose of the testing (eg bug elimination, standards compliance, acceptance testing).
- (iv) The need to re-check things that have already been tested.
- (v) The politics of testing, particularly the need to separate test requirements from those of management.
- (vi) The need to be willing to report problems or negative feedback even when this will not be welcomed.
- (vii) The concept of grading bugs, and industry standards for doing so.
- (viii) The person to whom you should submit the results of your testing.
- (ix) Your company's definitions of key milestone stages such as 'Alpha', 'Beta' and 'Master Submission'.
- (x) Different types of testing, and when it is appropriate to use them.

Performance Statements

- 1 Follow the test brief or other provided instructions accurately.
- 2 Identify and communicate clearly and constructively any problems with specific aspects of the product, as per the evaluation criteria.
- 3 Report any bugs that you encounter in the software in a clear, concise and logical manner.
- 4 Report bugs using the appropriate method and procedure.
- 5 Respond constructively to written or verbal communications regarding submitted bug reports from other members of the development team.
- 6 Follow any specified bug reporting process.
- 7 Be patient, persistent, professional and systematic.

Software Development (e-skills UK NOS)

This sub discipline covers the core competencies required to create software to address the needs of business problems and opportunities, resulting in a variety of software solutions, ranging from operating and control software to web based or specialist applications, such as accounting software and games software.

Development activities produce software that translates the design deliverables from HCI design, data design and software design, into working software. These designs will include, at a detailed level, functions and processing, interfaces, data handling and storage needs and how the system will be used by and interact with people, as appropriate. Development involves the translation of the designs into working software solutions that meet the business needs.

There is a wide range of software development activities that may be undertaken in a variety of environments appropriate to both the business and technical contexts in which they will be used. The software development environments used will be selected and specified during the design phase when the physical models are produced.

In some organisations, software development may be undertaken as part of a holistic life cycle approach where one individual or team may complete all stages; whereas in other organisations, each stage of development may be undertaken by individuals or teams or as part of projects and/or programmes.

Pre-Entry/Junior Technician Role:

Competence (5.2.J.1): Perform specified software development activities

This competence will be demonstrated by the following **Performance Criteria (5.2.J.1.C):**

- (a) Follow organisational standards for the systems development lifecycle.
- (b) Use given information relating to IT architecture models together with business, data and HCI design deliverables to inform software development and testing activities.
- (c) Correctly use specified software development procedures, tools and techniques to create software that meets given designs.
- (d) Functionally test that given designs have been met.
- (e) Use naming conventions and standards in line with organisational standards.
- (f) Use appropriate programming constructs to produce effective software.
- (g) Document own software development activities.

Competent performance requires **Understanding (5.2.J.1.U)** of:

- (a) What is meant by software development and the stages of activity that constitute it.
- (b) The fact that many developers may work together to develop differing elements of a total software solution and these individual software elements need to work coherently together.
- (c) The importance of the systems development lifecycle as it relates to software development activities.
- (d) The relationship between physical software design, data and HCI design and software development.
- (e) The value and role of software development in addressing business problems and opportunities.
- (f) The fact that new software may need to be developed or existing software enhanced or adapted to take account of changing business needs.
- (g) The fact that software solutions must combine data and the commands to manipulate it in the most effective manner to meet the business requirements.
- (h) The relationship between programming languages and file/database structures.
- (i) Data types that can be used and how they can be represented and manipulated in software development work.
- (j) Programming constructs available and the uses they can be put to.
- (k) The activities and tasks involved in software development.
- (l) Why naming conventions and standards are used during software development work.
- (m) The importance of documenting software development and testing activities in a clear and understandable manner that will allow further development, amendments and updates to be made to solutions.

Competent performance requires **Knowledge (5.2.J.1.K)** of how to:

- (a) Operate with reference to organisational standards for software development activities.
- (b) Use and apply the systems development lifecycle as appropriate to software development activities.
- (c) Identify:
 - ◆ the functional requirements for individual software components
 - ◆ information required to perform functional testing
 - ◆ functional and Unit testing which will be required as an integral part of development work
 - ◆ appropriate programming constructs to produce effective software.
- (d) Use and apply:
 - ◆ specified software development procedures, tools and techniques
 - ◆ naming conventions and standards in line with organisational standards
 - ◆ appropriate programming constructs to produce effective software
 - ◆ information relating to data and HCI design deliverables in order to inform software development activities
 - ◆ the procedures, tools and techniques to undertake functional testing.
- (e) Document software development and testing activities accurately and clearly to allow further development, amendments and updates to be made to solutions.

4.6 Human computer interaction/interface (HCI) design (e-skills UK NOS)

This sub-discipline is concerned with the competencies involved with the design of processes and information technology systems so that they are adopted and used correctly by humans. In order for information technology systems to be successful and allow the maximisation of their potential benefits, user interaction and the interfaces enabling it must be attractive to all users of the systems.

Human interaction and interface (HCI) design may be undertaken as part of a wider systems design or may be undertaken as the result of a need to improve particular processes and procedures within an information technology system.

Designing for human needs requires particular competencies, both technical and personal and the transferable competencies associated with communication should be a precursor to acquiring competencies in this sub-discipline.

The Outcomes of human interaction and interface (HCI) design are used to inform the overall systems design of information technology systems and their implementation.

Pre-entry/Junior Technician Role:

Competence (4.6.J.1) — Follow, under supervision, organisational policies for human interaction and interface (HCI) design activities

This competence will be demonstrated by the following **Performance Criteria (4.6.J.1.C.)**:

- (a) Correctly follow the processes, tools and techniques to conduct human interaction and interface (HCI) design activities.
- (b) Fully comply with all organisational strategy, policies and standards in human interaction and interface (HCI) design activities.
- (c) Accurately gather and collate information, relating to available interfaces, equipment and environments of use, under direction.
- (d) Design effective elements for any HCI design delegated by superiors, assuming full accountability for the quality and effectiveness of the design deliverables.

Competent performance requires **Knowledge (4.6.J.1.K.)** of how to:

- (a) Comply with any relevant legislation, regulations and external standards in human interaction and interface (HCI) design activities.
- (b) Use the processes, tools and techniques for undertaking human interaction and interface (HCI) design.
- (c) Operate with:
 - ◆ reference to organisational strategy, policies and standards in human interaction and interface (HCI) design activities
 - ◆ reference to professional and ethical standards in human interaction and interface (HCI) design activities
 - ◆ integrity and confidentiality during human interaction and interface (HCI) design activities.
- (d) Collate information relating to available interfaces, equipment and environments of use.
- (e) Develop elements of HCI designs.
- (f) Be accountable for own HCI designs.

Competent performance requires **Understanding (4.6.J.1.U.)** of:

- (a) The processes, tools and techniques that can be used to undertake human interaction and interface HCI design activities.
- (b) What is meant by:
 - ◆ the term user experience
 - ◆ an human interaction and interface HCI
 - ◆ a graphical user interface (GUI)
 - ◆ a web user interface (WUI)
 - ◆ what is the range of input/output devices that users can use to interact with IT/technology systems, services and assets
- (c) What are the industry and vendor standards, conventions and ‘norms’ associated with particular user interfaces on commonly used devices and platforms.
- (d) The fact that:
 - ◆ different types of HCI exist
 - ◆ HCI design activities and their deliverables must support the identified business requirements
 - ◆ a range of different input/output devices and/or IT/technology platforms may need to be considered as part of the design of the user experience with IT/technology systems, services and assets, in order to meet the business and user needs
 - ◆ the designed HCI associated with any IT/technology should be easy to use/intuitive
 - ◆ there are industry and vendor standards, conventions and ‘norms’ associated with user interfaces that are readily understandable by and familiar to a wide range of individuals.
- (e) Why:
 - ◆ different types of HCI exist
 - ◆ a range of different devices may need to be considered as part of the design of the user experience with IT/technology systems, services and assets.
- (f) The importance of incorporating the desired user experience into any system/solution/service design.

Competence (4.6.J.2) — Document specified information relating to human interaction and interface (HCI) design

This competence will be demonstrated by the following **Performance Criteria (4.6.J.2.C.):**

- (a) Accurately document elements of HCI designs, under direction.
- (b) Accurately document all naming conventions and standards used during HCI design activities, under direction.
- (c) Accurately document and collate feedback from sample target users on any human interaction and interface (HCI) design, under direction.

Competent performance requires **Knowledge (4.6.J.2.K.)** of how to:

- (a) Document and collate:
 - ◆ elements of HCI designs
 - ◆ naming conventions and standards used during HCI design activities
 - ◆ feedback from sample target users on any human interaction and interface (HCI) design.

Competent performance requires **Understanding (4.6.J.2.U.)** of:

- (a) The importance of documenting the deliverables from human interaction and interface (HCI) design activities.

Competence (4.6.J.3) — Assist others with human interaction and interface (HCI) designs
This competence will be demonstrated by the following **Performance Criteria (4.6.J.3.C.)**:

- (a) Assist others in soliciting feedback on human interaction and interface (HCI) designs from sample target users, under direction.
- (b) Assist others in sourcing and gathering information gained from analysis activities during human interaction and interface (HCI) design activities, under direction.
- (c) Assist others in identifying the information gained from analysis activities during human interaction and interface (HCI) design activities, under direction.

Competent performance requires **Knowledge (4.6.J.3.K.)** of how to:

- (a) Provide elements for an HCI design.

Competent performance requires **Understanding (4.6.J.3.U.)** of:

- (a) The fact that different individuals respond differently to particular interfaces.