Next Generation Higher National Unit Specification

Professional Practice in Computer Science (SCQF level 8)

Unit code: J7DX 48

SCQF level: 8 (32 SCQF credit points)

Valid from: session 2023 to 24

Prototype unit specification for use in pilot delivery only (version 1.1) January 2024

This unit specification provides detailed information about the unit to ensure consistent and transparent assessment year on year.

This unit specification is for teachers and lecturers and contains all the mandatory information required to deliver and assess the unit.

This edition: January 2024 (version 1.1)

Unit purpose

This unit is for learners with an interest in computer science who wish to integrate their knowledge and skills by participating in and contributing to a computing team project.

It is a mandatory unit in the HND Computer Science, in which learners combine the knowledge and skills they have gained during the qualification and put them into practice to solve a significant computing problem or conduct research into an aspect of computer science, such as artificial intelligence. The unit also contributes to qualification grading for the HND Computer Science.

Before starting the unit, learners should have programming experience and be familiar with at least one high-level programming language. It is beneficial if learners have completed one or more of the following units (all at SCQF level 8):

- Computer Science
- Computer Programming
- Software Engineering Methods
- Object-Oriented Programming

During the unit, learners:

- apply their understanding of computer science topics to investigate and solve a computer science problem or research an aspect of computer science
- incorporate skills from project management, team working and computer programming into a holistic project
- work in a team to produce a holistic piece of work
- self-assess their meta-skills, plan for their improvement, and reflect on their progress

On completion of the unit, learners understand and appreciate the skills they need for professional practice in a computer science project and use problem solving and programming skills to demonstrate this. Learners can progress to further study in computer science at SCQF level 9, to a relevant degree programme, or into employment in a computer science role.

Unit outcomes

Learners who complete this unit can:

1 formulate a computer science problem from a given scenario
2 design a solution to the problem using an appropriate methodology
3 plan and implement the project in a team using project management methods
4 work in a team to create and implement a solution
5 prepare a project report that describes the problem, its solution and an evaluation of the project outcomes
6 present findings and documentation to an audience
7 reflect critically on their work in the project
8 develop meta-skills in a vocational or academic context
9 develop sustainability knowledge and understanding, and skills, in a vocational context

Evidence requirements

This unit involves a computer science project. This may be the solution to a computer science problem or research into an aspect of computer science.

Learners must provide both product and performance evidence. Knowledge is inferred from the product evidence.

Product evidence

Learners produce product evidence in the context of a computer science project that you set. This project must have a real-world context and be sufficiently large and/or complex to require a team approach and a significant amount of work in its investigation and solution.

Learners can present their product evidence as a single document. There should be scope for other presentation formats, such as an e-portfolio detailing the elements of the project and how it is progressing. This e-portfolio might contain other media, such as images, audio and video.

The project team must produce:

- a project plan containing a project timeline, project diary and recordings of project meetings
- a report on problem investigation
- a specification of the proposed solution
- a report detailing the problem and the solution
- evidence of solution implementation
- technical documentation relating to the solution
- conclusions and recommendations

Each individual learner must produce:

- a reflection on how the project went, the challenges met and overcome, and the ethical considerations of the team, including:
  - their reflection on how the project went, and their individual input in its delivery
  - a self-assessment of their meta-skills

Performance evidence

Learners' performance evidence must include:

- a team demonstration of the final solution to the computer science problem
- a team presentation of 30 minutes or more that explains the challenges met and overcome in the project, along with ethical and sustainability considerations

The presentation must involve all team members and be made to a client audience.

You record your observations of each individual learner's participation over the course of the project, including the value of their contributions and evidence of professional behaviours. The standard of evidence should be consistent with the SCQF level of the unit.

Outcome 8

Learners develop meta-skills in the course of doing all the units as part of this HND. In this unit, you also assess their meta-skills development as an outcome, following the evidence requirements set out below.

This meta-skills outcome is the same for the HNC (SCQF level 7) and the HND (SCQF level 8). Learners who progress from the HNC to the HND should continue to develop their meta-skills. They should gather evidence in line with the outcome requirements as they work through units and projects at HND level.

Evidence

Learners must gather evidence that shows they have:

- self-assessed their meta-skills baseline
- created a plan for their own meta-skills development
- carried out activities to develop and demonstrate their meta-skills
- used reflective practice to monitor and assess the meta-skills they have improved and developed

Skills 4.0: A skills model to drive Scotland's future, outlines three categories of meta-skills:

- self-management
- social intelligence
- innovation

Each of these comprises four meta-skills and a number of sub-skills.

There are many interrelationships and dependencies between these skills and, at SCQF level 7 and 8, learners should focus on holistic development relevant to their vocational or academic context.

See the Educator Guide for more information.

Outcome 9 (Learning for Sustainability)

Learners gather evidence that demonstrates they can:

- identify and describe sustainability in the context of the United Nations Sustainable Development Goals (UN SDGs)
- explain how one product or process relevant to networking and cloud infrastructure could be made more sustainable and help meet the aims of at least two selected UN SDGs

The evidence for this unit also contributes to whole qualification grading for learners who are carrying out the HND Computer Science at SCQF level 8.

Knowledge and skills

The following table shows the knowledge and skills covered by the unit outcomes:

Knowledge	Skills
Learners should understand: ♦ programming in a high-level language ♦ the use of integrated development environments (IDEs) ♦ how to create functions, classes and methods ♦ how to implement a requirement specification ♦ agile working methodologies ♦ project management of software projects ♦ methods for creating software solutions ♦ version and source control ♦ code review methods ♦ code refinement ♦ creation of algorithms ♦ computational thinking ♦ how to create effective documentation ♦ how to communicate problems to team members ♦ report writing ♦ the roles and responsibilities of working in a project team ♦ research methods ♦ meta-skills, specifically: — the categories of self-management, social intelligence and innovation, and associated meta-skills, as described in Skills 4.0 — the importance of developing meta-skills, including employability, adaptability, and effectiveness — what meta-skills are most relevant to the learner's vocational context	Learners can: ♦ write computer programs ♦ write readable and understandable code ♦ work as part of a project team ♦ implement solutions ♦ carry out problem solving ♦ overcome software bugs and issues ♦ apply version control and collaboration techniques ♦ apply project management techniques ♦ create project plans ♦ participate in team meetings ♦ create test plans ♦ implement test plans ♦ work to deadlines with milestones and checkpoints ♦ demonstrate a final product to a prospective client ♦ plan a strategy for their meta-skills development ♦ implement and review plans for their meta-skills development ♦ assess their meta-skills development ♦ improve sustainability in a product or process

Knowledge	**Skills**
Learners should understand: ♦ approaches to developing meta-skills, in particular: — self-awareness: analysing preferences, strengths and weaknesses; meta-skills self-assessment — goal setting and action planning ♦ reflective practice: principles of reflective practice; tools and approaches for effective reflective practice ♦ the UN SDGs	

Meta-skills

Throughout the unit, learners develop meta-skills to enhance their employability in the computer science sector.

Self-management

This meta-skill includes:

- focusing: sorting and filtering information; showing attention to detail
- integrity: acting in an ethical manner; openness; displaying a strong sense of self
- adapting: critical reflection on the processes of the project; self-learning to develop wider skills, such as digital literacy; showing resilience as circumstances change
- initiative: displaying independent thinking; demonstrating the self-motivation, responsibility and decision making required by the project; risk-taking and showing enterprise

Social intelligence

This meta-skill includes:

- communicating: receiving and giving information; empathy with other learners' thoughts, intentions and ideas; storytelling
- collaborating: listening and conveying information; global and cross-cultural competence; taking part in meetings and report presentations; operating effectively in a group
- leading: influencing, inspiring and motivating others; being a change catalyst

Innovation

This meta-skill includes:

- curiosity: information sourcing; recognising problems and devising solutions
- creativity: maker mentality; imagination; visualising and generating ideas; contributing positively to create a solution to a problem and implement it
- sense-making: solving mathematical problems; holistic thinking; analysis and synthesis
- critical thinking: logical and computational thinking; decomposition; judgement

Delivery of unit

This is a mandatory unit within the HND Computer Science. It serves as the common core unit and serves two purposes:

1 it is a (mandatory) component unit within the qualification that learners must pass
2 it contributes to grading

The unit must be project-based and incorporate meta-skills and sustainability. It should be carried out towards the end of the learning programme, when learners have gained a wide range of vocational knowledge and skills.

The project must involve deriving a solution to a real-world problem. The focus of the unit is not the acquisition of new technical knowledge and skills, but the application of knowledge and skills to a large-scale computer science-related activity.

You should deliver the unit as an ongoing project management unit and provide learners with examples of real-world computer science problems, project management practices, and techniques for analysis and problem solving. Throughout the unit you should arrange progress meetings with learners in their team.

The time required varies depending on the previous experience of individual learners. Based on 160 hours delivery and assessment time, we suggest the following distribution:

Outcome 1 — Formulate a computer science problem from a given scenario
(10 hours)

Outcome 2 — Design a solution to the problem using an appropriate methodology
(25 hours)

Outcome 3 — Plan and implement the project in a team using project management methods
(30 hours)

Outcome 4 — Work in a team to create and implement a solution
(50 hours)

Outcome 5 — Prepare a project report that describes the problem, its solution and an evaluation of the project outcomes
(15 hours)

Outcome 6 — Present findings and documentation to an audience
(5 hours)

Outcome 7 — Reflect critically on their work in the project
(10 hours)

Outcome 8 — Develop their meta-skills in a vocational or academic context
(10 hours)

Outcome 9 — Develop sustainability knowledge and understanding, and skills, in a vocational context
(5 hours)

Additional guidance

The guidance in this section is not mandatory.

Content and context for this unit

This unit provides learners with experience in professional practice in a computer science context. Learners can present their evidence in the form of a final report, or they can use a more contemporary approach, such as an e-portfolio, to provide summative assessment evidence for the unit.

As team leader, you should work with learners throughout the life of the project to ensure that all members of each team are contributing to the project and that they are making progress.

You should work with the team to identify a real-life computer science problem and introduce approaches to project management. You should provide learners with a list of computer science projects that they may wish to tackle in their project and encourage each group to select something that is of interest to them.

Learners who solve a computer science problem can:

- work in a project team
- contribute to collaborative project planning and implementation using their preferred methodology
- analyse a real-world problem requiring the application of computer science
- implement a fully developed and tested solution by applying computer science principles and methods
- exhibit professional practice and behaviours
- demonstrate meta-skills in a vocational context
- evaluate their own work

Learners who carry out research into an aspect of computer science can:

- work in a project team
- contribute to collaborative project planning and implementation using their preferred methodology
- formulate and propose a research question on an aspect of computer science
- apply a research method to an identified research question
- demonstrate ethical considerations, including proper citation of sources and respect for intellectual property rights
- critically interpret and evaluate research findings
- reflect on the research process, identifying both the strengths and limitations of their approach
- demonstrate meta-skills in a vocational context

Guidance on grading

You should assess the product and performance evidence produced for the unit on a pass or fail basis, according to the standards set out in the assessment requirements. You can further consider the evidence as a component of grading in the HND Computer Science, and apply the guidance on grading to the available evidence.

For guidance on grading, you should refer to the grading pack for HND Computer Science.

Equality and inclusion

This unit is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

You should take into account the needs of individual learners when planning learning experiences, selecting assessment methods or considering alternative evidence.

Guidance on assessment arrangements for disabled learners and/or those with additional support needs is available on the assessment arrangements web page: www.sqa.org.uk/assessmentarrangements.

Information for learners

Professional Practice in Computer Science (SCQF level 8)

This information explains:

- what the unit is about
- what you should know or be able to do before you start
- what you need to do during the unit
- opportunities for further learning and employment

Unit information

This unit helps you to apply the knowledge and skills you have gained through study of computer science topics to the solution of a given computer science problem. Alternatively, you may research an aspect of computer science. You solve and document this problem or carry out research by working in a project team. You work collaboratively in one or more project roles and use a project management methodology and its tools to manage the scope and sequence of the project.

The unit is a mandatory unit in the HND Computer Science. Before starting the project unit, you should have studied a range of computer science topics at SCQF level 8, including programming. The unit requires you to collaborate with others as part of a team to investigate and develop a solution to a real-life computer science problem. This involves identifying a problem, devising a suitable methodology, and then implementing a solution. Your lecturer supports you in the role of team leader.

You are assessed on how you and your team plan and manage the project, the quality of the project report, and a team demonstration and presentation of the project outcomes. The unit also contributes to whole qualification grading for the HND Computer Science.

Throughout the unit, you develop meta-skills covering self-management, social intelligence and innovation. You also develop an understanding of sustainability as it applies to computer science.

On completion of the unit, you may progress to awards or degree programmes in computer science or related computing topics at SCQF level 9 or above.

Administrative information

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Superclass: CB

History of changes

Version	Description of change	Date
1.1	Minor update to reflect revised grading model.	January 2024

Note: please check SQA's website to ensure you are using the most up-to-date version of this document.