Next Generation Higher National Unit Specification

Professional Practice in Engineering (SCQF level 8)

Unit code: J7BR 48

SCQF level: 8 (24 SCQF credit points)

Valid from: session 2023–24

Prototype unit specification for use in pilot delivery only (version 1.0) October 2023

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: October 2023 (version 1.0)

Unit purpose

This unit helps learners to develop their knowledge and skills in engineering. They then apply these, along with professional engineering judgement, to a realistic engineering problem in a project setting. An important aim of the unit is to improve learners' professional practice and behaviours through the development of meta-skills such as self-management, social intelligence and innovation. The unit lays down the [Engineering Council's competences](#) to be registered to become an engineering technician.

This mandatory unit develops learners' ability to define, plan and implement an engineering project, while enhancing their meta-skills in associated engineering ethical codes of practice. This unit is supported by the other Higher National Diploma (HND) Engineering mandatory unit, Engineering Project Management, which develops learners' skills in the management process of an engineering project.

Entry to the unit is at your centre's discretion. However, we recommend that learners have one or more of the following:

♦ a broad knowledge and understanding of engineering processes and theorems at SCQF level 7, for example units related to professional practice in engineering
♦ an appreciation of manufacturing principles and project and risk management at SCQF level 7, for example in subjects related to manufacturing principles, and project and risk management
♦ relevant SCQF level 7 qualifications, for example Higher National Certificate (HNC) in Engineering Systems
♦ relevant, equivalent workplace experience

The unit provides learners with suitable knowledge and skills to progress to further study or employment in a wide range of engineering industries.

Unit outcomes

Learners who complete this unit can:

1   define an engineering project
2   plan an engineering project
3   implement an engineering project
4   develop meta-skills in a vocational or academic context
5   work to engineering codes of practice

Evidence requirements

You should assess the unit holistically, using a portfolio of evidence generated by learners.

Learners must produce evidence in an appropriate written or oral format. They must generate this under unsupervised, open-book conditions. It can be stored as an e-portfolio or a hard-copy folder.

You should arrange regular progress meetings to discuss teams' and individual learners' progress.

You deliver the outcomes in sequence. Outcome 1 involves understanding the given engineering project, including cost, quality, safety, security and environmental impact considerations. Outcome 2 is planning all project tasks and activities for an engineering project, clearly defining the role and responsibilities of all project team members. Outcome 3 is reporting the learner's contribution to the project, and planning and taking action accordingly. Outcome 4 is about working with others and advancing meta-skills. Outcome 5 is about working to appropriate codes of professional conduct.

To successfully achieve the unit, learners must provide evidence for the following outcomes.

Outcome 1
♦   Evaluate potential methods of carrying out an engineering project and select the most appropriate solution, considering cost, quality, safety, security and environmental impact.
♦   Recognise all potential difficulties and identify an approach to resolve any anticipated difficulties.
♦   Identify all test procedures necessary to progress the project, giving proof of concept.
♦   Analyse performance or test data, or compare performance information with published material.

Outcome 2
♦   Produce a project plan of all tasks and responsibilities in accordance with given cost, quality, safety, security and environmental impact.
♦   Consider how waste can be minimised, recycled or disposed of safely if recycling is not possible.
♦   Identify precautions as a result of evaluating risks and other factors.
♦   Identify standards and codes of practice relevant to the project tasks.

Outcome 3

♦ Complete all project tasks to agreed standards and timelines.

♦ Fully understand drawings, permits to work, instructions or other similar documents after appropriate checking, and identify issues.

♦ Check the status of equipment, the work environment and facilities, and take appropriate actions before starting work.

♦ Ensure the scope of a task is clear before accepting it or allocating it to others.

♦ Query any aspect of a task that is not clear, or provide an explanation if others raise a query.

♦ Learn from experience and provide constructive feedback when supervising or working with others.

Outcome 4

♦ Self-assess their meta-skills baseline.

♦ Create a plan for their own meta-skills development.

♦ Carry out activities to develop and demonstrate their meta-skills.

♦ Use reflective practice to monitor and assess the meta-skills they have improved and developed.

Outcome 5

♦ Demonstrate compliance with a relevant code of professional conduct.

♦ Provide evidence of applying current safety requirements, such as risk assessment, and other examples of good practice.

♦ Recognise how they can apply sustainability principles in their day-to-day work.

♦ Identify actions they can take or have taken to improve sustainability.

♦ Review their own development needs.

♦ Demonstrate an understanding of any ethical issues surrounding the project.

Knowledge and skills

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

Knowledge	Skills

Outcome 1
Learners should understand:
 	
♦ the engineering principles and technology they need to define a given engineering project, considering:
  — cost
  — quality
  — safety
  — security
  — environmental impact
	Outcome 1
	Learners can:
	
	♦ evaluate potential methods of carrying out an engineering project and select the most appropriate solution, considering:
	  — cost
	  — quality
	  — safety
	  — security
	  — environmental impact
	♦ recognise all potential difficulties and identify an approach to resolve any anticipated difficulties
	♦ identify all test procedures necessary to progress the project, giving proof of concept
	♦ analyse performance or test data, or compare performance information with published material

Outcome 2 Learners should understand: ♦ engineering project planning ♦ how to create project plans by applying engineering principles and technology-specific standards for a given project ♦ how to identify project tasks and milestones ♦ how to apply appropriate methods to potential causes of problems ♦ how to achieve satisfactory solutions	**Outcome 2** Learners can: ♦ produce a project plan of all tasks and responsibilities in accordance with given cost, quality, safety, security and environmental impact ♦ consider how waste can be minimised, recycled or disposed of safely if recycling is not possible ♦ identify precautions as a result of evaluating risks and other factors ♦ identify standards and codes of practice relevant to the project tasks

Knowledge	Skills
Outcome 3 Learners should understand: ♦ their responsibility to work reliably and effectively without close supervision for a given project ♦ the appropriate codes of practice ♦ how to accept responsibility for the work of themselves and others ♦ how to accept, allocate and supervise technical and other tasks	**Outcome 3** Learners can: ♦ complete all project tasks to agreed standards and timelines ♦ fully understand drawings, permits to work, instructions or other similar documents after appropriate checking, and identify issues ♦ check the status of equipment, the work environment and facilities, and take appropriate actions before starting work ♦ ensure the scope of a task is clear before accepting it or allocating it to others ♦ query any aspect of a task that is not clear, or provide an explanation if others raise a query ♦ learn from experience and provide constructive feedback when supervising or working with others

Knowledge	Skills

Outcome 4
Learners should understand:
 	
♦ 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 their vocational context
♦ 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
	Outcome 4
	Learners can:
	
	♦ plan a strategy for meta-skills development
	♦ implement and review plans for their meta-skills development
	♦ assess their meta-skills development

Outcome 5 Learners should understand: ♦ the need to demonstrate compliance with a relevant code of professional conduct and how to do this ♦ obligations to society, the profession and the environment ♦ the safety implications of their role and how to apply safe systems of work ♦ sustainability principles and how they can apply them in their day-to-day work ♦ ethical issues that may arise in their role and how to carry out their responsibilities in an ethical way	**Outcome 5** Learners can: ♦ demonstrate compliance with a relevant code of professional conduct ♦ provide evidence of applying current safety requirements, such as risk assessment, and other examples of good practice ♦ identify actions they can take or have taken to improve sustainability ♦ review their own development needs ♦ demonstrate an understanding of any ethical issues surrounding the project

Meta-skills

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

Outcome 4 gives learners the opportunity to measure their meta-skills development throughout the life cycle of the project. You can find more details in the 'Knowledge and skills' section.

Typical examples in an engineering environment may be to demonstrate the ability to work with others constructively and to explain ideas and proposals clearly for a given project. This includes the ability to communicate effectively with others, at all levels, to work effectively with colleagues, clients, suppliers or the public, and demonstrate personal and social skills and awareness of diversity and inclusion issues.

Learners can demonstrate meta-skills by:

♦ contributing to meetings and discussions
♦ preparing communications, documents and reports on technical matters
♦ exchanging information and providing advice to technical and non-technical colleagues
♦ contributing constructively as part of a team
♦ successfully resolving issues in discussions with team members, suppliers, clients or others
♦ identifying, agreeing and working towards collective goals
♦ being aware of and managing their own emotions, strengths and weaknesses
♦ being confident and flexible in dealing with new and changing interpersonal situations
♦ creating, maintaining and enhancing productive working relationships, and resolving conflicts
♦ being supportive of the needs and concerns of others, especially where this relates to diversity and inclusion

Self-management

Learners are assessed on the meta-skill of integrity through their reflective reports.

Social intelligence

Learners are assessed on their ability to collaborate throughout a group project.

Innovation

Learners are assessed on the meta-skill of sense-making when they consider project choices and options.

Literacies

Numeracy

Learners develop numeracy skills by performing engineering calculations.

Communication

Learners develop their written and oral communication skills by studying the course material, engaging with lecturers and other learners, and writing academic reports and reflective essays.

Digital

Learners develop digital skills and computer literacy by accessing course materials through a virtual learning environment (VLE), collaborating online and keeping an e-portfolio.

Delivery of unit

This unit is a mandatory unit in HND Engineering. The framework includes mandatory and optional units, and you can tailor the selected combination of units to specific engineering pathway needs.

You can deliver this unit through taught content to develop theoretical knowledge and skills, which learners then put into practice in group and/or individual projects.

You should design projects to allow learners to develop and apply the skills that they have learned in other units relevant to their course of study.

While the exact time allocated to the unit is at your centre's discretion, the notional design length is 120 hours.

The amount of time you allocate to each outcome is also at your discretion (particularly as we recommend a holistic approach). We suggest the following distribution of time, including assessment:

Outcome 1 — Define an engineering project
(15 hours)
Outcome 2 — Plan an engineering project
(15 hours)
Outcome 3 — Implement an engineering project
(60 hours)
Outcome 4 — Develop meta-skills in a vocational or academic context
(15 hours)
Outcome 5 — Work to engineering codes of practice
(15 hours)

Additional guidance

The guidance in this section is not mandatory.

Content and context for this unit

This unit allows learners to demonstrate the technical knowledge and skills they have developed in other units by applying them to, and successfully completing, a project.

It also gives them the opportunity to further develop their own non-technical and meta-skills by successfully completing and evaluating an engineering project of a level of complexity appropriate to HND, and in an area relevant to their core topic of study.

Define an engineering project (outcome 1)

Learners apply engineering knowledge to a given project by reviewing and selecting appropriate engineering techniques and procedures to carry it out. This requires the ability to identify, organise and use resources effectively to complete tasks, with consideration for cost, quality, safety, security and environmental impact.

Plan an engineering project (outcome 2)

Learners create a project plan by applying engineering principles and technology-specific standards to a given project. They identify project tasks and milestones, and apply appropriate methods to identify causes of potential problems and achieve satisfactory solutions.

Implement an engineering project (outcome 3)

Learners should accept responsibility to work reliably and effectively without close supervision for a given project. This requires being able to:

♦ work reliably and effectively without close supervision, to the appropriate codes of practice
♦ accept responsibility for the work of themselves and others
♦ accept, allocate and supervise technical and other tasks

Develop meta-skills in a vocational or academic context (outcome 4)

Learners demonstrate the ability to work with others constructively, and explain ideas and proposals clearly for a given project. This requires being able to:

♦ communicate effectively with others
♦ work effectively with colleagues, clients, suppliers and the public
♦ demonstrate personal and social skills, and awareness of diversity and inclusion issues

Work to engineering codes of practice (outcome 5)

Learners demonstrate commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment.
This includes understanding:

♦ relevant codes of conduct and complying with them

♦ the safety implications of their role and how to apply safe systems of work

♦ the principles of sustainable development and how to apply them in their work

♦ the ethical issues that may arise in their role, and carrying out their responsibilities in an ethical manner

Approaches to delivery

We recommend you deliver the elements of outcomes 1 to 5 that are necessary to begin a project first and holistically. You could then deliver the rest of outcomes 1 to 5 as learners work on their project. For example, planning elements from all outcomes should be delivered first, then the elements related to implementation, then finally the elements related to project completion.

We recommend that learners work cohesively as part of a small project team to design, implement and evaluate an engineering solution to a real-world problem. Where learners are unable to work as part of a team, they should work on their own and evidence their work.

Approaches to assessment

You should integrate assessment of this unit with technology-specific units and in conjunction with the Engineering Project Management unit.

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 Engineering (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 provides you with fundamental knowledge and skills you need to study the Higher National Diploma (HND) in Engineering.

Before you start the unit, we recommend you have one or more of the following:

♦ a broad knowledge and understanding of engineering processes and theorems at SCQF level 7, for example units related to professional practice in engineering
♦ an appreciation of manufacturing principles and project and risk management at SCQF level 7, for example in subjects related to manufacturing principles, and project and risk management
♦ relevant SCQF level 7 qualifications, for example Higher National Certificate (HNC) in Engineering Systems
♦ relevant, equivalent workplace experience

You study some of the key project principles found in all project environments, particularly those within engineering disciplines. Specifically, the unit provides you with a record of work contributing towards the Engineering Council's competences for engineering technicians:

♦ A — Knowledge and understanding
♦ B — Design, development and solving engineering problems
♦ C — Responsibility, management and leadership
♦ D — Communication and interpersonal skills
♦ E — Professional commitment

Unit outcomes

On completion of the unit, you can:

1 define an engineering project
2 plan an engineering project
3 implement an engineering project
4 develop meta-skills in a vocational or academic context
5 work to engineering codes of practice

In outcome 1, you apply engineering knowledge effectively to a given project. You review and select appropriate engineering techniques and procedures to complete an engineering project. You develop the abilities to identify, organise and use resources effectively to complete tasks, with consideration for cost, quality, safety, security and environmental impact.

In outcome 2, you create a project plan, applying engineering principles and technology-specific standards for a given project. You identify project tasks and milestones, and apply appropriate methods to identify causes of potential problems and achieve satisfactory solutions.

In outcome 3, you carry out an engineering project. You accept responsibility to work reliably and effectively without close supervision. This includes working to the appropriate codes of practice, and accepting responsibility for your own work and the work of others. You also accept, allocate and supervise technical and other tasks.

In outcome 4, you demonstrate your ability to work with others constructively, and explain ideas and proposals clearly. This includes:

♦ communicating effectively with others
♦ working effectively with colleagues, clients, suppliers or the public
♦ demonstrating personal and social skills
♦ demonstrating awareness of diversity and inclusion issues

In outcome 5, you demonstrate commitment to an appropriate code of professional conduct, recognising obligations to society, the profession and the environment. This includes understanding:

♦ relevant codes of conduct and complying with them
♦ the safety implications of your role and how to apply safe systems of work
♦ the principles of sustainable development and how to apply them in your work
♦ the ethical issues that may arise in your role and how to carry out your responsibilities in an ethical way

The unit provides you with suitable knowledge and skills to progress to further study or employment in a wide range of engineering industries.

Meta-skills

Throughout the unit, you develop meta-skills to enhance your employability in the engineering sector.

Outcome 4 gives you the opportunity to measure your meta-skills development throughout the life cycle of the project.

Self-management

You are assessed on the meta-skill of integrity through your reflective reports.

Social intelligence

You are assessed on your ability to collaborate throughout a group project.

Innovation

You are assessed on the meta-skill of sense-making when you consider project choices and options.

Administrative information

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Superclass: AG

History of changes

Version	Description of change	Date

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