National Unit Specification: general information

UNIT Engineering Project (SCQF level 6)

CODE F5D5 12

SUMMARY

This Unit may form part of a National Qualification Group Award but may also be offered on a free-standing basis.

This Unit has been designed to develop candidates' knowledge, understanding and skills of the processes involved in implementing an engineering project. As such candidates will undertake a practical project from a given defined project brief. Candidates will learn how to create a project plan in which they will state project aims and objectives and develop an appropriate project time-activity chart. They will also implement the project by manufacturing a product and developing and carrying out functional test procedures on the product. Candidates will also prepare a written technical report which will include an evaluation of project activities in terms of the agreed project objectives and enhancements in their own personal development as a result of undertaking the project.

This Unit is suitable for candidates training to be electrical, electronic, fabrication and welding, manufacturing, mechanical or multi-disciplinary engineering technicians.

OUTCOMES

1 Create and monitor a project plan.
2 Implement the project in accordance with the project plan.
3 Report and evaluate the project.

Administrative Information

Superclass: XA

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National Unit Specification: general information (cont)

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RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained any of the following, or equivalent:

- Relevant Units from the appropriate National Certificate award in Engineering at SCQF level 6
- Relevant industrial experience of engineering process operations and/or the manufacture of engineering components/products

CREDIT VALUE

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

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

CORE SKILLS

This Unit gives automatic certification of the following:

Complete Core Skills None

Core Skills Component Planning and Organising at SCQF level 6

The Unit also provides opportunities for candidates to develop aspects of the following Core Skills:

Communication (SCQF level 6)

Numeracy (SCQF level 6)

Information Technology (SCQF level 6)

Problem Solving (SCQF level 6)

Working with Others (SCQF level 5)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit Specification: statement of standards

UNIT Engineering Project (SCQF level 6)

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

OUTCOME 1

Create and monitor a project plan.

Performance Criteria

(a) State project aims and objectives correctly.
(b) Source resources required for project activities in accordance with budgetary limits.
(c) Plan a sequence of project activities correctly and clearly set these out in a time-activity chart.
(d) Record logbook entries during the project planning stage clearly and accurately.

OUTCOME 2

Implement the project in accordance with the project plan.

Performance Criteria

(a) Obtain relevant technical data and information for the project and apply relevant theoretical knowledge correctly to the project.
(b) Organise efficiently and effectively resources required to carry out planned manufacturing and testing activities.
(c) Perform planned manufacturing activities correctly and safely to completion.
(d) Develop and carry out functional test procedures and record results correctly.
(e) Submit progress reports regularly to the project supervisor and agree corrective actions with the supervisor where applicable.
(f) Monitor and record progress in manufacturing and testing the product correctly in the project log book.

OUTCOME 3

Report and evaluate the project.

Performance Criteria

(a) Produce correctly and concisely a technical report about the project.
(b) Draw valid conclusions from the test results.
(c) Evaluate correctly the completed product in terms of achieving project objectives.
(d) Evaluate correctly enhancements in personal development as a result of undertaking the project.
(e) Submit completed project product, report and project log book to set deadline.

National Unit Specification: statement of standards (cont)

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EVIDENCE REQUIREMENTS FOR THIS UNIT

Evidence is required to demonstrate that the candidates have achieved all of the Outcomes and Performance Criteria.

Written and/or recorded oral evidence, product and performance evidence supplemented by an assessor observation checklist (s) is required to demonstrate that the candidate has achieved the Outcomes and Performance Criteria. Assessment must be conducted under supervised conditions. An integrated approach to the generation of assessment evidence is required with evidence being gathered at appropriate points throughout the delivery of the Unit.

In order to pass the Unit each candidate must produce sufficient evidence on his/her own to satisfy the Outcomes and Performance Criteria in the Unit Specification.

With regard to Outcome 1

- Candidates must state a minimum of 2 project aims and 3 project objectives
- Candidates must organise the project aims and objectives into a logical sequence
- Candidates must be given a budgetary limit for purchasing materials for the project
- Time activity charts may take any appropriate form (eg Gantt Chart)
- Candidates must record a minimum of 2 logbook entries as part of the planning stage

With regard to Outcome 2

- Candidates must demonstrate how they have applied any underpinning theoretical knowledge to the project
- Candidates must submit a minimum of 2 progress reports during the implementation stage of the project
- Candidates must record a minimum of 3 logbook entries as part of the implementation stage
- Logbook entries must be:
  - dated
  - contain only relevant information
  - contain neat sketches where appropriate
  - contain evaluative commentary

With regard to Outcome 3

- Technical reports must be between 750 and 1000 words in length plus diagrams and appendices
- Candidates must explain any variations between theoretical and practical results
- Candidates must identify a minimum of 3 personal development enhancements as a result of undertaking the project

Candidates may undertake a group based project. However, where group work takes place centres should check that candidates are generating sufficient evidence on their own to meet the Outcomes and Performance Criteria.

National Unit Specification: statement of standards (cont)

UNIT Engineering Project (SCQF level 6)

The Assessment Support Pack for this Unit provides sample assessment material. Centres wishing to develop their own assessments should refer to the Assessment Support Pack to ensure a comparable standard.

National Unit Specification: support notes

UNIT Engineering Project (SCQF level 6)

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

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

GUIDANCE ON THE CONTENT AND CONTEXT FOR THIS UNIT

This Unit has been developed for the National Qualification Group Awards (NQGA) in Electrical Engineering, Electronic Engineering, Fabrication and Welding Engineering, Manufacturing Engineering and Mechanical Engineering at SCQF level 6, but may also be offered on a free-standing basis.

The use of project management terminology has been kept to a minimum in this Unit Specification. Such terms can be found in Project Management Standards.

The aim of this Unit is to develop candidates' knowledge, understanding and skills of the processes involved in implementing an engineering project. On successful completion of the project candidates will have learnt how to create a project plan in which they would have stated project aims and objectives and have developed an appropriate project time-activity chart. They will also be able to implement a project by manufacturing a product and develop and carry out functional tests procedures on the product. Candidates will also have prepared a written technical report which included an evaluation of project activities in terms of the agreed project objectives and enhancements in their own personal development as a result of undertaking the project.

The Unit Outcomes have been designed to reflect the main phases of a project life cycle: that is

- Project brief
- Plan the project
- Implement the planned activities
- Complete the deliverables
- Evaluate and close out the project

The Unit Specification requires that candidates undertake a practical engineering project based on a given project brief in which a product is produced and tested. The project should seek, as far as possible, to allow candidates to integrate, consolidate and transfer knowledge, understanding and skills from other NQ Units in the National Certificate in Engineering award they are studying.

As noted above, the Engineering Project at SCQF Level 6 Unit is included in a number of National Certificate in Engineering SCQF level 6 awards and, as such, it is not possible to specify precisely the level of complexity of project work expected of candidates studying at SCQF level 6. The Assessment Support Pack for this Unit exemplifies the standard of work expected of candidates at SCQF level 6. Advice can be sought from SQA external verifiers in the various engineering discipline areas as to the standard of project work candidates are expected to produce to satisfy the requirements of this Unit Specification.

National Unit Specification: support notes (cont)

UNIT Engineering Project (SCQF level 6)

When selecting suitable project topics for candidates the project supervisor should take account of the following: the engineering subject discipline area the candidates are studying, prior knowledge, any practical engineering experience the candidates may have and the interests of the candidates.

Candidates may be allowed, where appropriate, to undertake some engineering design as part of Unit delivery although such design work should not be formally assessed.

Both project supervisors and candidates must comply with centre policies in respect of Health and Safety legislation, risk assessment and provision and use of Personal Protective Equipment (PPE).

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is recommended that the Unit is delivered in the same sequence the Outcomes are presented in the National Unit Specification: statement of standards section of the Unit. The Unit may be delivered by a combination of lectures, group discussions and practical activities. Candidates must have access to appropriate workshop and/or laboratory facilities while undertaking practical project work.

It is recommended that the lecturer explains at the start of Unit delivery the phases in the project life cycle and their logical sequence so that candidates can grasp the totality of project work. This totality can be exemplified by using examples within candidates' experience, eg, planning and arranging a holiday, buying a consumer product, buying and building a flat pack furniture product, or, by using case studies from appropriate engineering disciplines.

To assist candidates in developing the knowledge and skills to produce time-activity charts such charts may be constructed for everyday activities so that candidates can practise setting out the logical flow of activities and estimating the duration of individual activities and the overall time to complete a task. Use may be made of Information Technology (IT) products in creating such charts and other related project documentation. It is recommended that project supervisors allocate a defined time for the completion of the deliverables leading to closure of the project and ensure that this is included correctly in the time-activity chart prepared by candidates.

Candidates should have obtained the knowledge and skills to manufacture the project components/product earlier (eg when studying other NQ engineering Units) and 'new learning' in this context should not be required. Candidates should be closely observed while they undertake practical activities to ensure valid assessment and compliance with relevant Health and Safety procedures and practices.

Lecturers should regularly monitor and review the progress of each candidate so that problems can be discussed and corrective actions agreed between the project supervisor and candidate for resolving problems.

Candidates should be encouraged to develop the 'good habit' of completing their logbooks at relevant intervals. Logbook entries do not have to be long but should be dated, contain relevant information and neat, annotated sketches (where appropriate). The inclusion of learning points/evaluative commentary in log book entries will provide candidates with some, if not all, the materials they require to write the evaluate section of their project.

National Unit Specification: support notes (cont)

UNIT Engineering Project (SCQF level 6)

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

Candidates have to evaluate, apply and convey a range of complex technical information. Support materials and self assessment checklists could emphasise the requirement for technical accuracy, formal structure and expression in both Oral and Written Communication.

Numeracy and *IT* skills will be naturally enhanced as the Unit is achieved. Measurements and calculations will be essential and accurately recorded; data will be interpreted, applied and communicated using graphics and number. Access to technology will support the presentation of documents and diagrams, with use of CAD, or specialist application software to model, simulate or evaluate possible solutions.

All elements of the Core Skill of *Problem Solving*, that is, Critical Thinking, Planning, Organising, Reviewing and Evaluating, will be naturally developed as candidates learn how to plan and complete an engineering project. A range of factors relevant to defined objectives has to be identified, investigated and documented as candidates plan a strategy for project management. Appropriate resources are identified and sourced before deliverables are completed in accordance with safety requirements. Test procedures are designed to verify theory or principles and the effectiveness of process and product is monitored and evaluated.

Project activities may provide opportunities to enhance skills in co-operative working. Candidates could be encouraged to analyse a task and its component elements. They could discuss the nature and scope of team roles and responsibilities involved, including safety issues. Feedback from the assessor can encourage self-evaluation of contributions to team working in a laboratory/workshop environment.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003), SQA Guidelines on e-assessment for Schools (BD2625, June 2005).*

Common to all Outcomes

An Assessment Support Package (ASP) is available for the guidance of project supervisors, assessors and verifiers. The ASP gives an exemplar of a suitable project topic which exemplifies the national standards. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. The ASP also gives guidance on the content of candidate written technical reports together with checklists which may be used to monitor and record the achievement of Outcomes and Performance Criteria.

National Unit Specification: support notes (cont)

UNIT Engineering Project (SCQF level 6)

The role of the project supervisor includes that of advisor, mentor, facilitator and assessor. While candidates will need some guidance during the project all candidates should be encouraged to think through activities for themselves.

Candidate evidence will be generated during each of the sequential ongoing activities throughout the duration of the project.

Assessment of Outcome 1

Candidates should be issued with the project brief which sets out the scope and requirements of the project. Candidates should write appropriate aims and objectives for the project. These aims and objectives should be organised into a logical sequence. Candidates should source materials for the project whose cost is within a budgetary limit. Candidates should plan project activities and produce an appropriate time-activity chart for the project.

Centres may wish to provide candidates with appropriate forms to record their responses to the tasks shown above or, alternatively, leave it to candidates to record information in the way they feel fit.

While candidates should be allowed to work at their own pace while completing the tasks shown above it is advisable that the supervisor places a limit on the time candidates have to complete the tasks so that the planning process becomes manageable in normal classroom time. Such a time limit may be 4 hours.

Candidates should be reminded that they must record at least 2 logbook entries for this stage of the project.

Assessment of Outcome 2

The core assessment for this Outcome involves practical exercises in which candidates manufacture and test a product. Centres should develop an appropriate checklist (s) to record evidence of whether a candidate has satisfied the Outcome and Performance Criteria or not. The project supervisor must ensure that the candidates have the necessary knowledge and skills required to safely manufacture and test products and ensure that safe systems of work are in place before candidates commence any practical work. The project supervisor and the candidate must comply with the centre’s policy in respect of the Health and Safety legislation, risk assessment and, provision and use of PPE.

Candidates should be reminded that they must submit at least two progress reports and record at least 3 logbook entries for the implementation stage of the project.

National Unit Specification: support notes (cont)

UNIT Engineering Project (SCQF level 6)

Assessment of Outcome 3

Candidates should produce a written report to meet the Outcome and Performance Criteria. It is left to centres to decide the precise format their candidates should use to write up their technical reports. A possible format is as follows:

- Introduction
- Underpinning theory (brief overview only)
- Description of how the project was conducted
- Test Results
- Conclusions
- Evaluation of Project
- Appendices (if applicable)

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**