National Unit Specification: general information

UNIT Engineering Skills: Maintenance (Intermediate 2)

CODE F39D 11

COURSE Engineering Skills (Intermediate 2)

SUMMARY

This Unit has been designed as a mandatory Unit of the *Engineering Skills (Intermediate 2)* Course but can also be taken as a free-standing Unit. It is suitable for candidates with no previous engineering or employment experience. Candidates will learn to select and use the correct tools, materials, and equipment required to test, disassemble, repair, and reassemble an engineering part.

Candidates will have the opportunity to review the employability skills they have developed across the range of practical experiences.

OUTCOMES

1 Identify, select, and use tools and equipment to assess the functionality of an engineering part.
2 Identify, select, and use tools and equipment to maintain an engineering part.
3 Review and evaluate own employability skills in practical engineering contexts.

RECOMMENDED ENTRY

Entry is at the discretion of the centre, but while no formal entry qualifications are required, it would be beneficial if candidates embarking on the Unit demonstrated:

- an interest in engineering
- an ability in numeracy and literacy at SCQF level 4
- some aptitude for graphical forms of communication

Administrative Information

Superclass: VG

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National Unit Specification: general information (cont)

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CREDIT VALUE

1 credit at Intermediate 2 (6 SCQF credit points at SCQF level 5*).

**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

Achievement of this Unit gives automatic certification of the following:

Complete Core Skill	None
Core Skill component	Critical Thinking SCQF level 4

Opportunities for developing aspects of Core Skills are highlighted in *Guidance on Learning and Teaching Approaches for this Unit*.

National Unit Specification: statement of standards

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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

Identify, select, and use tools and equipment to assess the functionality of an engineering part.

Performance Criteria

(a) Interpret and use manufacturers' drawings and specifications.
(b) Identify, select, and use tools and equipment to test an engineering part.
(c) Correctly determine whether the engineering part is functional.
(d) Correctly observe safe working practices in all practical activities.

OUTCOME 2

Identify, select, and use tools and equipment to maintain an engineering part.

Performance Criteria

(a) Interpret and use manufacturers' drawings and specifications correctly.
(b) Identify, select, and use tools and equipment to disassemble an engineering part correctly.
(c) Identify, select, and use tools and equipment to repair an engineering part correctly.
(d) Identify, select, and use tools and equipment to reassemble an engineering part correctly.
(e) Correctly observe safe working practices in all practical activities.

OUTCOME 3

Review and evaluate own employability skills in practical engineering contexts.

Performance Criteria

(a) Review and evaluate own employability skills.
(b) Seek and record feedback on own performance in employability skills.
(c) Make a judgement on own strengths, weaknesses, and learning points in relation to employability skills.
(d) Identify action points for improvement in relation to employability skills.

National Unit Specification: statement of standards

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EVIDENCE REQUIREMENTS FOR THIS UNIT

Performance and written/oral evidence is required to show that all Outcomes and Performance Criteria have been achieved.

Performance evidence will be supported by assessor checklists. This evidence will be generated from an integrated assignment consisting of practical activities carried out in supervised workshop conditions.

The evidence may be gathered at different points throughout the Unit.

The maintenance activities which include testing, disassembly, repair, and reassembly of an engineering part (an engineering part can be defined as a system, subsystem, item, or component) in a safe manner will cover:

- interpretation of manufacturers' drawing and specifications
- identification, selection, and use of tools and equipment to test an engineering part:
  - mechanical and/or electrical
- identification, selection, and use of any three of the following tools and equipment for disassembly:
  - screwdrivers, spanners, hammer, holding devices, extractors, pliers
- identification, selection, and use of any three of the following tools and equipment for repair:
  - files, scrapers, pliers, hammer, holding devices, drills, taps, dies, reamer
- identification, selection, and use of any three of the following tools and equipment for assembly:
  - screwdrivers, spanners, hammer, holding devices, insertion tool, extractors, pliers

Candidates will be required to carry out a quality check before submitting their work for final assessment.

The standard for the final assessment is expressed in the National Assessment Bank (NAB) material, in which the reassembled engineering part must conform to the manufacturer's original specification.

National Unit Specification: statement of standards (cont)

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Written/Oral Evidence

Candidates will complete a self evaluation review of their own performance against the following employability skills:

- showing health and safety awareness — to include wearing Personal Protective Equipment (PPE), safe working practices, and understanding a basic risk assessment
- interpreting engineering drawings and specifications
- working cooperatively with others — to include seeking advice, following instructions and working in a team
- planning and preparing for work — to include selection of correct tools and equipment
- awareness of environmental considerations — to include safe and correct disposal of waste/hazardous materials, waste minimisation, and fume and dust control
- quality checking own work
- self review and evaluation — to include identifying strengths and weaknesses, identifying learning points from practical experiences and having a positive attitude to learning

A signed record of the review must be retained by the assessor as assessment evidence.

The National Assessment Bank (NAB) item for this Unit provides an appropriate practical assignment, an appropriate candidate review sheet and assessor checklists. These exemplify the national standard. Centres wishing to develop their own assessments should refer to the NAB to ensure a comparable standard.

National Unit Specification: support notes

UNIT Engineering Skills: Maintenance (Intermediate 2)

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 covers practical maintenance activities at a basic level. The candidate will develop the ability to select and use tools correctly and safely in the different activities in the Unit. It is therefore important that the learning takes place in a supervised workshop environment. Basic safe working practices will be included in the content as it is important that candidates learn to adhere to these at all times.

Candidates will work on a range of practical maintenance tasks, which will enable them to become familiar with a variety of tools and materials in the workshop. Lecturers/teachers may include a wide range of short practical activities to equip candidates with the skills necessary to complete the disassembly, repair, and reassembly of an engineering part. An engineering part can be defined as a system, subsystem, item or component.

During the process of practical work the candidate will become accustomed to maintenance terminology and will be able to demonstrate a basic knowledge and understanding of the terminology in everyday practice. Candidates should learn good working practices at each stage and how to carry out quality checks on their own work.

This Unit provides opportunities to develop engineering employability skills such as:

- maintaining good timekeeping and attendance
- showing health and safety awareness
- selecting and using engineering tools and materials
- interpreting engineering drawings and specifications
- working cooperatively with others
- planning and preparing for work
- applying time management
- awareness of environmental considerations
- quality checking own work
- self review and evaluation

The context for learning should include the requirement to be clean, presentable and appropriately dressed for the workshop, wearing personal protective equipment (PPE) including protective clothing when required.

Relevant aspects of current health and safety legislation, current COSHH (Control of Substances Hazardous to Health) Regulations and any systems of work relevant to the candidates' workshop/workplace should be explained and adhered to as part of the work of this Unit.

In particular the Health and Safety requirements needed during the set up, test, disassembly, and assembly of engineering parts should be stressed.

National Unit Specification: support notes (cont)

UNIT Engineering Skills: Maintenance (Intermediate 2)

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is important there is an induction to the Unit which will include employability skills and health and safety awareness. This Unit involves experiential learning through the various practical experiences and activities. Candidates should experience workshop conditions and should be encouraged to perform tasks and conduct themselves in a manner appropriate to the workplace. General vocational skills, such as selecting and maintaining tools and equipment, are integrated with practical maintenance activities within the Unit. As well as carrying out practical tasks, candidates will also learn from brief lessons on health and safety and workshop protocol. Teaching and learning approaches will also include demonstrations of practical work by teachers/lecturers/tutors.

The functional test, disassembly, and reassembly of the following examples may be beneficial in the development of candidate ability:

♦ Washing Machine/Component(s)	♦ Kitchen Appliance
♦ Motor Vehicle Component(s)	♦ Bicycle
♦ Domestic Fan	♦ Electric Motor
♦ Industrial Valves or Pumps	♦ Motor Cycle
♦ Vacuum Cleaner	♦ Lawn Mower

The list is not designed to be exhaustive but merely an indication of the type of engineering part that would be suitable for maintenance.

Centres may wish to introduce some terminology relating to control circuits when referring to maintenance. Where this Unit is being taught as part of the Course this may be of benefit to candidates if an integrated approach is selected for the Unit: *Engineering Skills: Design and Manufacture (Intermediate 2).*

Short lessons on specific aspects of industrial practice and the correct use of tools will prove invaluable at intervals throughout the learning experience. These may be followed by brief practical sessions in which the candidates practice the skill emphasised by the demonstration.

Where centres authorise the use of power tools for candidates this should only be allowed after suitable training and the completion of a risk assessment, and in accordance with current legislation for that candidate age group. Particular attention should be made to specific legislative requirements where school age candidates are involved.

Where centres opt to use power tools it is essential that the safe and correct use of power tools is demonstrated before candidate use. In addition candidates must be made aware of the dangers of misuse or usage without proper training or associated PPE.

Some centres may be able to arrange demonstrations by local firms or power tool manufacturers to emphasise correct and safe usage of power tools.

Integrated into the Unit are the employability skills that employers value. It should be stressed that all the employability skills are developed in this Unit but only specified employability skills will be assessed. Employability skills are a focus of this Unit and should be promoted from Unit induction to Unit completion.

In order to raise the candidates' awareness of local industries, and the realities of the workplace visits to local engineering firms could be arranged if appropriate. Equally, visiting speakers from local engineering firms should be encouraged. Additional useful material and employment opportunities can be resourced from the research of local engineering firms or from the internet.

This Unit should be delivered by a combination of teaching and learning approaches which could include:

- Lecturing
- Demonstrations
- Practical activities
- Group discussions
- Tutorials
- Site visits
- Audio visual
- Guest speakers

OPPORTUNITIES FOR CORE SKILL DEVELOPMENT

In this Unit candidates will perform calculations and take measurements by the interpretation of diagrams and specifications. These activities provide good opportunities to develop the Core Skills of *Numeracy* and *Communication*. Candidates will also share workspace, tools, and equipment. This will provide them with a good context in which to learn to work cooperatively with others. In addition this Unit will provide each candidate with many different problems and this will enable development of the Core Skill of *Problem Solving*.

Achievement of this Unit gives automatic certification of the Core Skill component of *Critical Thinking* at SCQF level 4.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The Unit assessment will include a functionality test, disassembly, repair, and assembly of an engineering part and employability skills. It is recommended that the stated maintenance and employability skills are assessed throughout the Unit.

The maintenance skills assessed in this Unit are:

- test — mechanical
- test — electrical
- test — visual
- disassembly
- repair
- assembly
- preparation planning
- select materials
- interpret simple drawings
- select tools
- maintain to manufacturer's specification

National Unit Specification: support notes (cont)

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The employability skills assessed in this Unit are:

- showing health and safety awareness
- interpreting engineering drawings and specifications
- working cooperatively with others
- planning and preparing for work
- awareness of environmental considerations
- quality checking own work
- self review and evaluation

The assessment of employability skills will be evidenced by a candidate review sheet supported with assessor observation checklists of the practical activities. It is recommended that the candidate review sheet should be completed towards the end of the Unit when the candidate and assessor will have had a reasonable time to make a judgement.

The assessment of the maintenance skills will be evidenced by a practical assignment involving the functionality test, disassembly, repair, and assembly of an engineering part. Typical examples would be a calliper brake system, a hydraulic valve or cylinder, a pneumatic valve or cylinder and these will be supported by assessor observation checklists.

It is anticipated that candidates will be given as much practice as possible in maintenance techniques prior to assessment. The assessment activities should also make an important contribution to the learning process.

If candidates are working as a team on practical assignments, assessors must satisfy themselves that candidates are competent in each aspect of the given task.

Assessors are required to check the quality of candidates' work against prescribed standards and tolerances. Candidates themselves are required to carry out a quality check against these same standards. Candidates must carry out their own quality check prior to the assessor check.

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 communications 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) and SQA Guidelines on e-assessment for Schools (BD2625, June 2005).*

CANDIDATES WITH DISABILITIES AND/OR ADDITIONAL SUPPORT NEEDS

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.