

National Unit Specification: general information

UNIT Engineering Skills: Fabrication (Intermediate 1)

CODE F19F 10

COURSE Engineering Skills (Intermediate 1)

SUMMARY

This Unit is a mandatory Unit of the *Engineering Skills (Intermediate 1)* Course. The Unit is suitable for candidates with no previous engineering or employment experience. The candidate will learn to select the correct tools, materials and equipment required to manufacture an artefact using cutting, hot and cold forming, and mechanical and thermal joining techniques. These will include bolting, riveting, screwing, soldering, Metal Active Gas (MAG) welding and the use of adhesives.

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

The Unit forms part of the *Engineering Skills (Intermediate 1)* Course but can also be taken as a free-standing Unit.

The primary target group for this Unit is school candidates in S3 and above.

OUTCOMES

- 1 Identify, select and use materials, cutting and forming tools and equipment.
- 2 Identify, select and use joining tools and equipment.
- 3 Manufacture an artefact using fabrication techniques.
- 4 Review and evaluate own employability skills in practical engineering contexts.

RECOMMENDED ENTRY

Entry is at the discretion of the centre.

Administrative Information

Superclass: XH

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CREDIT VALUE

1 credit at Intermediate 1 (6 SCQF credit points at SCQF level 4*).

**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

There is no automatic certification of Core Skills in this Unit.

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 the Scottish Qualifications Authority.

OUTCOME 1

Identify, select and use materials, cutting and forming tools and equipment.

Performance Criteria

- (a) Identify common engineering materials and a reason for use.
- (b) Identify, select and safely use cutting tools and equipment correctly.
- (c) Identify, select and safely use a range of cold forming tools and equipment correctly.
- (d) Identify, select and safely use a range of hot forming tools and equipment correctly.
- (e) Safe working practices are correctly observed in all activities.

OUTCOME 2

Identify, select and use joining tools and equipment.

Performance Criteria

- (a) Identify, select and safely use a range of mechanical joining tools and equipment correctly.
- (b) Identify, select and safely use a range of thermal joining tools and equipment correctly.
- (c) Identify, select and safely use a range of engineering adhesives correctly.
- (d) Safe working practices are correctly observed in all activities.

OUTCOME 3

Manufacture an artefact using fabrication techniques.

Performance Criteria

- (a) Produce an artefact from given working drawings and material specifications correctly.
- (b) Functional dimensions are within specified tolerances.
- (c) The quality and finish of the completed artefact complies with the specification.
- (d) Safe working practices are correctly observed in all activities.
- (e) Complete a quality check on own finished artefact.

OUTCOME 4

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 (cont)

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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 practical activities in the preparation planning and manufacture of an artefact in a safe manner will cover:

- ◆ identification, selection and reason for use of common engineering materials
- ◆ interpretation of simple engineering drawings and specifications
- ◆ using non-thermal cutting techniques to shape and trim materials

- ◆ selection, function and use of any three of the following hot forming tools to form shapes and components:
 - heat source
 - anvil
 - vice
 - formers
 - hammers

- ◆ selection, function and use of any one of the following hot forming techniques to form shapes and components to:
 - bend
 - twist
 - draw down
 - flatten

- ◆ selection, function and use of any two of the following cold forming tools to form shapes and components:
 - mallets
 - stakes
 - rolls and folders

- ◆ using a minimum of any two of the following materials:
 - Low carbon steel
 - Tin plate
 - Aluminium
 - Non-metallic

National Unit Specification: statement of standards (cont)

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- ◆ complete each of the following joining techniques:
 - riveting (pop or solid)
 - bolting or screwing
 - thermal joining (MAG welding or soldering)
 - adhesives (any recognised engineering adhesive)
- ◆ the safe and correct use of adhesives should be included in the checklist

Dimensions must be within the stated tolerance as expressed in the National Assessment Bank (NAB) material.

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

Written/oral evidence

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

- ◆ maintaining good attendance
- ◆ maintaining a tidy workplace
- ◆ sourcing and use of tools in a correct and safe manner
- ◆ using tools solely for the purpose for which they are designed
- ◆ wearing appropriate personal protective equipment
- ◆ showing health and safety awareness
- ◆ positive attitude to learning
- ◆ preparing appropriately to carry out tasks

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

The National Assessment Bank item (NAB) 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

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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 fabrication 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 fabrication 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 manufacture of an artefact. During the process of practical work the candidate will become accustomed to engineering 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 time-keeping
- ◆ maintaining good attendance
- ◆ maintaining a tidy workplace
- ◆ following instructions
- ◆ seeking advice
- ◆ working co-operatively with others
- ◆ sourcing and use of tools in a correct and safe manner
- ◆ using tools solely for the purpose for which they are designed
- ◆ cleaning and storing tools correctly after use
- ◆ recognising common materials
- ◆ showing health and safety awareness
- ◆ wearing appropriate personal protective equipment
- ◆ preparing appropriately to carry out tasks
- ◆ following basic drawings and specifications
- ◆ checking own work
- ◆ identifying own strengths and weaknesses
- ◆ identifying learning points from practical experiences
- ◆ positive attitude to learning

In this Unit candidates will perform simple calculations and take measurements. These activities provide good opportunities to develop the Core Skill of Numeracy. Candidates will also share workspace, tools and equipment, and this will provide them with a good context in which to learn to work cooperatively with others.

National Unit Specification: support notes (cont)

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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 Control of Substances Hazardous to Health (COSHH) 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 setup and use of arc welding equipment should be stressed.

GUIDANCE ON LEARNING AND TEACHING APPROACHES FOR THIS UNIT

It is important that there is an induction to the Unit that 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 fabrication 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 tutors. 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 practise the skill emphasised by the demonstration. 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 by researching local engineering firms or from the Internet.

GUIDANCE ON APPROACHES TO ASSESSMENT FOR THIS UNIT

The Unit assessment will include forming, joining and employability skills, and it is recommended that the stated forming, joining and employability skills are assessed throughout the Unit.

The fabrication skills assessed in this Unit are:

- ◆ non-thermal cutting
- ◆ cold forming
- ◆ hot forming
- ◆ riveting
- ◆ bolting or screwing
- ◆ thermal joining
- ◆ adhesives
- ◆ preparation planning
- ◆ selecting materials

National Unit Specification: support notes (cont)

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- ♦ interpreting simple drawings
- ♦ selecting tools
- ♦ manufacturing to stated tolerances

The employability skills assessed in this Unit are:

- ♦ maintaining good attendance
- ♦ maintaining a tidy workplace
- ♦ sourcing and use of tools in a correct and safe manner
- ♦ using tools solely for the purpose for which they are designed
- ♦ wearing appropriate personal protective equipment
- ♦ showing health and safety awareness
- ♦ positive attitude to learning
- ♦ preparing appropriately to carry out tasks

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 fabrication skills will be evidenced by a practical assignment involving the manufacture of an artefact. Typical examples would be a tool tray/toolbox, a cup, a funnel, and these will be supported by assessor observation checklists.

It is anticipated that candidates will be given as much practice as possible in fabrication 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.

The National Assessment Bank item (NAB) 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.

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).