



Higher National Unit specification

General information for centres

Unit title: Woodmachining: CNC Part Programming (Routing)

Unit code: F8RA 34

Unit purpose: This Unit is designed to enable candidates to develop their knowledge, understanding and competency in compiling C.N.C. programs for routing applications including the safe utilisation of tools and fixtures and estimating machining times.

On completion of the Unit the candidate should be able to:

- 1 Re-dimension a drawing for C.N.C. machining and establish a tool path.
- 2 Specify appropriate tooling, fixture and working arrangements.
- 3 Write a part program and estimate the machining time.

Credit points and level: 1 HN credit at SCQF level 7: (8 SCQF credit points at SCQF level 7*)

**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.*

Recommended prior knowledge and skills: Access to this Unit will be at the discretion of the centre. It would be beneficial if candidates have successfully completed the Professional Development Award (PDA) in Woodmachining at SCQF level 6 (G9FH 46) or have the equivalent level of industrial experience and prior learning.

Core Skills: There are opportunities to develop the Core Skills of *Communication, Numeracy, Working with others, Information and Communication Technology* and *Problem Solving* all at SCQF level 5 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: This Unit forms part of the Professional Development Award in Woodmachining at SCQF level 7 and is aimed at candidates following a career in Machine Woodworking and receiving complementary industrial experience. It is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes

General information for centres (cont)

Unit title: Woodmachining: CNC Part Programming (Routing)

Assessment: This Unit is assessed on the candidates actual performance of producing a fully re dimensioned drawing, specification and sketches showing positions of location and devices, creating an outline program and producing a C.N.C. program that includes prompts for the operator and estimated machining times. Candidates will also have to provide oral or written evidence to show they can specify tooling, the composition and dimension of cutters, cutter profiles and design fixtures and holding devices.

Evidence will be gathered through observation of work processes and assessment of the completed work. Assessment should be carried out under controlled, supervised conditions. In order to achieve this Unit, candidates are required to present sufficient evidence that they have met all the Knowledge and/or Skills elements for each Outcome. Details of these requirements are given for each Outcome.

The assessment instruments used should follow the general guidance offered by the Scottish Qualifications Authority (SQA) assessment model and an integrative approach to assessment is encouraged. Centres may use the instruments of assessment which they consider to be most appropriate but are advised to use the Woodmachining Training and Assessment Programme (TAP) SCQF level 7 which has been developed centrally by SQA. Any other instruments of assessment used must be comparable to the TAP 7.

Accurate records should be made of the assessment instruments used showing how evidence is generated for each Outcome and given marking schemes, checklists and recorded candidate feedback. Records of candidates' achievements should be retained. These records will be made available for external verification.

Higher National Unit specification: statement of standards

Unit title: Woodmachining: CNC Part Programming (Routing)

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The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Outcome 1

Re-dimension a drawing for C.N.C. machining and establish a tool path

Knowledge and/or Skills

- ◆ Technical drawing
- ◆ Component specification
- ◆ Re-dimensioned drawing
- ◆ Sketches showing position of location and holding devices
- ◆ Datum point
- ◆ Clearance planes
- ◆ Sequence of operation

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ correctly dimension drawing from appropriate datum point
- ◆ specify holding and location devices, suitable position for component location and safely identify and accurately safety planes
- ◆ systematically detail appropriate sequence of operation

Evidence will be gathered under closed-book and supervised conditions.

Assessment Guidelines

The candidate could provide oral and/or written evidence using correct technical terminology to show knowledge and understanding by producing a fully re dimensioned drawing and specification showing the position of location and holding devises and a detailed sequence of operations.

Higher National Unit specification: statement of standards (cont)

Unit title: Woodmachining: CNC Part Programming (Routing)

Outcome 2

Specify appropriate tooling, fixture and working arrangements

Knowledge and/or Skills

- ◆ Sintered carbide
- ◆ High Speed Steel
- ◆ Diamond (P.C.D.)
- ◆ Replaceable tips (T.C.T.)
- ◆ Profile cutters
- ◆ Spiral up cut cutter and down cut cutter
- ◆ Ceramic
- ◆ Location devices mechanical and vacuum
- ◆ Location pins
- ◆ Timber, plastics, aluminium alloys and manufactured boards

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ correctly specify appropriate tooling for specific tasks
- ◆ design appropriate fixtures
- ◆ accurately specify work holding devices

Evidence will be gathered under closed-book and supervised conditions.

Assessment Guidelines

The candidate should provide oral and/or written evidence using correct technical terminology to show knowledge and understanding that they can specify correctly tooling, the composition and dimensions of cutters and cutter profiles. The candidate should also provide oral and/or written evidence to show knowledge and understanding of the design of fixtures, holding and location devices.

Higher National Unit specification: statement of standards (cont)

Unit title: Woodmachining: CNC Part Programming (Routing)

Outcome 3

Write a part program and estimate the machining time

Knowledge and/or Skills

- ◆ Absolute and incremental dimension
- ◆ Feed speeds and cutting speeds
- ◆ Cycles and sub programmes
- ◆ Automatic G and M codes
- ◆ Fixture offset
- ◆ Zero shift
- ◆ Waste removal
- ◆ Manual and automatic tool changes
- ◆ Operator prompts

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ◆ correctly develop an outline program
- ◆ accurately write a C.N.C. program
- ◆ estimate machining time within set range

Evidence can be gathered under closed-book and supervised conditions. Certain coding may be made available to Candidates such as sub program call up and machine codes during assessment.

Assessment Guidelines

The candidate should provide oral and/or written evidence using correct technical terminology to show knowledge and understanding that they can develop an outline program and produce a C.N.C. program to include operator prompts and also estimate the machining time within a set range.

Administrative Information

Unit code:	F8RA 34
Unit title:	Woodmachining: CNC Part Programming (Routing)
Superclass category:	WK
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Version	Description of change	Date

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Higher National Unit specification: support notes

Unit title: Woodmachining: CNC Part Programming (Routing)

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 as an optional Unit in the PDA in Woodmachining at SCQF level 7. The content and context of this Unit is aimed at candidates who are pursuing a career in the craft of Machine Woodworking.

This Unit has been designed to enable the candidate to develop their knowledge and understanding to enable them to be able to compile C.N.C. programs for routing application.

The successful completion of this Unit will help enable candidates to create C.N.C. programs, estimate component machining times, select appropriate tooling, holding devices and fixtures.

Health and Safety and Sustainability are integral and key to the construction industry therefore throughout the Unit emphasis will be placed where appropriate on the application of Health and Safety and Sustainability. Safe working practices should be looked at in accordance with current safety codes of practice and regulations. Sustainability should include reference to criteria affecting sustainability, impact of not implementing sustainability on the environment and the legislation promoting sustainability.

Where feasible, centres should also incorporate modern machining methods, tooling, equipment and materials used within the Machine Woodworking industry. Candidates should be made aware of current industry practice and emerging practice or technology which may become conventional in the future.

Guidance on the delivery and assessment of this Unit

As part of the Professional Development Award (PDA) in Woodmachining at SCQF level 7, this Unit may be delivered in a sequence suitable to individual candidates and centres. When completing this Unit as part of the PDA it is recommended that, where possible, opportunity is taken to integrate aspects of Constructional Technical Communication Skills (DW4D 34).

Centres may use the instruments of assessment which they consider to be most appropriate but are advised to use the Woodmachining Training and Assessment (TAP) at SCQF level 7 which has been developed centrally by SQA. Any other instruments of assessment used must be comparable to the TAP 7.

Where this Unit is incorporated into other Group Awards it is recommended that it be delivered in the context of the specific occupational area that the award is designed to cover. Details on approaches to assessment are given under Evidence Requirements and Assessment Guidelines under each Outcome in the Higher National Unit specification statement of standards section. It is essential that these sections be read carefully before proceeding with assessment of candidates.

Higher National Unit specification: support notes (cont)

Unit title: Woodmachining: CNC Part Programming (Routing)

The candidate should be introduced to all relevant information in relation to pre program planning, tooling, piece part programming, holding and location devices through electronic presentations, DVD's, e-learning, reference books, classroom exercises and group discussions. The function of each program code and machine function should be thoroughly explained. Safe working practice methods should be demonstrated by candidates showing good technique in the setting and safe operation of C.N.C. machinery. This teaching approach should help ensure the candidate is acquiring the underpinning knowledge required for the Unit.

Candidates should be given as much practise as possible writing and proving programs, and estimating machining times prior to being set the assessments. Evidence will be gathered through closed-book assessments and observation that the candidates have met the Evidence Requirement to successfully achieve the Unit. Certain coding may be made available to Candidates such as sub program call up and machine codes during assessment.

Where available, evidence from the workplace can be incorporated to enhance the Outcomes, provided that this evidence is appropriate and authenticated as the candidate's own work. It is the responsibility of the centre to satisfy themselves that the portfolio of evidence submitted for assessment is entirely original and solely the respective student's work.

Opportunities for developing Core Skills

The delivery and assessment of this Unit may contribute towards the Core Skill of *Communication* at SCQF 5 in all Outcomes; as candidates complete the practical tasks they will be expected to communicate with others using correct terminology, tone and style suited to the workplace.

There are opportunities to develop the Core Skill of *Numeracy* at SCQF Level 5 as the candidate will be required to interpret sizes and measurements, read and drawings and transfer information accordingly.

The Core Skill of *Working with Others* at SCQF 5 could also be developed in this Unit in the practical work where candidates may work in pairs. Working with Others involves the ability to work with others to plan, agree, and take responsibility for tasks; to support co-operative working in appropriate ways; and to review the effectiveness of one's own contribution.

The Core Skill of *Information and Communication Technology* at SCQF level 5 is evidenced as the written programs could be proved using CAD/CAM software via personal computers.

The Core Skill of *Problem Solving* at SCQF level 5 could be developed through the choice of tooling, appropriate materials, safety issues, safety equipment and sustainability.

Higher National Unit specification: support notes (cont)

Unit title: Woodmachining: CNC Part Programming (Routing)

Open learning

Although this Unit could be delivered in part by distance learning, it would require considerable planning by the centre to ensure the sufficiency and authenticity of candidate evidence. Arrangements would have to be made to ensure that:

- ◆ candidates have access to a suitable workshop with suitable equipment and tools
- ◆ health and safety considerations are fully taken into account
- ◆ the practical activities are supervised by a responsible person and clearly recorded (using an assessment checklist for the assessor)
- ◆ the assessor is, at some point, able to question the candidate on that performance
- ◆ assessment is carried out under the stated conditions

For information on open learning arrangements, please refer to the SQA guide *Assessment and Quality Assurance of Open and Distance Learning* (www.sqa.org.uk)

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

General information for candidates

Unit title: Woodmachining: CNC Part Programming (Routing)

This Unit has been designed to further your career in the timber industry by developing your competence and improving your knowledge of C.N.C. machines. It has been written as part of the Professional Development Award (PDA) in Woodmachining at SCQF level 7, and is for experienced crafts persons working in the timber industry as woodmachinists.

The Unit will help develop your underpinning knowledge and skills to complete C.N.C. programs for routing applications. It is designed to help you establish tool paths and specify appropriate tooling for machining. On completion of this Unit you will be able to compile C.N.C. programs for routing for a range of applications, correctly utilise tools and fixtures as well as being able to estimate machining times.

You will be assessed on your knowledge and understanding of dimensioned drawings, C.N.C. Part programming through closed-book assessment papers under supervised conditions. Some machine codes and sub programming codes will be made available to you during assessment.

You will also be assessed on estimating machine times, holding and location devices and tooling through supervised closed-book assessment papers.

There are opportunities to develop the Core Skills of *Communication*, *Numeracy*, *Working with others*, *Information and Communication Technology* and *Problem Solving* all at SCQF level 5 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

If you successfully complete this Unit and the full PDA at SCQF level 7, you will not only have advanced your craft skills, but will also automatically receive some credit for your achievement if you progress on to the HNC Construction.