

## Higher National Unit Specification

### General information for centres

**Unit title:** Computer Integrated Manufacture (CIM)

**Unit code:** DW8G 34

**Unit purpose:** This Unit has been designed to introduce candidates to some of the main components of Computer Integrated Manufacture (CIM). The unit will also allow candidates to enhance their practical skills in the fields of both Computer Aided Draughting (CAD)/Computer Aided Manufacture (CAM) systems and Computer Numerical Control (CNC) machining.

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

- 1 Describe the various components of Computer Integrated Manufacture (CIM).
- 2 Generate part programmes using a commercial CAD/CAM system.
- 3 Transfer part programmes to CNC machine and manufacture components.

**Credit points and level:** 1 HN Credit at SCQF level 7: (1 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:** Entry to the Unit is at the discretion of the centre. However, it would be beneficial if candidates possessed knowledge and skills in at least some of the following areas: Engineering Drawing, CAD, CNC and Engineering Measurement. This may be evidenced by possession of the following HN Units: (DT5P 34) CNC, (DR1X 34) Computer Aided Draughting in Engineering and (DT9R 34) Engineering Measurement.

**Core Skills:** There are opportunities to develop the Core Skills of Reading Communication, Written Communication, Using Information Technology and Critical Thinking at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

**Context for delivery:** If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

**Assessment:** The assessment strategy for this Unit is as follows:

Outcome 1 should be assessed by means of a short report covering the various components of Computer Integrated Manufacture (CIM).

In Outcome 2 candidates should be asked to produce component drawings and generate part programmes from these drawings.

## **General information for centres (cont)**

In Outcome 3 candidates should be asked to transfer the part programmes to a CNC machine, set tooling offsets and manufacture the components.

## Higher National Unit specification: statement of standards

**Unit title:** Computer Integrated Manufacture (CIM)

**Unit code:** DW8G 34

The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

### Outcome 1

Describe the various components of Computer Integrated Manufacture (CIM)

#### Knowledge and/or skills

- ◆ Computer Integrated Manufacture (CIM)
- ◆ Computer Aided Design / Manufacture (CAD/CAM)
- ◆ Computer Aided Quality Assurance (CAQ)
- ◆ Computer Aided Process Planning (CAPP)

#### Evidence Requirements

All knowledge and skill items in this outcome should be assessed.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that the candidate is able to:

- ◆ explain a Computer Integrated Manufacture (CIM) system
- ◆ explain the use of Computer Aided Design / Manufacture (CAD/CAM) within a CIM system
- ◆ explain the use of Computer Aided Quality Assurance (CAQ) within a CIM system
- ◆ explain the use of Computer Aided Process Planning (CAPP) within a CIM system

Candidate evidence should be presented in the form of a report of between 500 and 750 words plus diagrams, appendices etc. Candidates should be provided with the details of the required report format and should include, as a minimum, the items listed under the bullet points in the Evidence requirements. Reports should be completed in the candidates own time.

#### Assessment guidelines

Centres should make every reasonable effort to ensure the assignment is the candidate's own work. Where copying or plagiarism is suspected candidates may be interviewed to check their knowledge and understanding of the subject matter. A checklist should be used to record oral evidence of the candidate's knowledge and understanding.

Centres may wish to issue candidates with suitable guidance notes on the best way to structure their reports.

## Higher National Unit specification: statement of standards (cont)

**Unit title:** Computer Integrated Manufacture (CIM)

### Outcome 2

Generate part programmes using a commercial CAD/CAM system

#### Knowledge and/or skills

- ◆ 2D drawing creation
- ◆ Material selection
- ◆ Cutting Tool selection
- ◆ Post processing
- ◆ Simulation
- ◆ Program save

#### Evidence Requirements

This is a practically based outcome and **all** of the knowledge and/or skills items above should be assessed.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that for **two given components** the candidate is able to:

- ◆ create 2D drawings using appropriate CAD/CAM system
- ◆ select the relevant material within CAD/CAM system
- ◆ select the relevant tooling within CAD/CAM system
- ◆ generate machine operations
- ◆ post process operations to generate part programmes
- ◆ prove programmes by means of simulation
- ◆ save programmes in correct format to enable easy transfer

The complexity of the each component should include a minimum of six machining features requiring as minimum of three tools. Turning example: tapers, lengths, diameters, grooves, radii, chamfers, screw cutting. Milling example: contours, pockets, facing, angles, radii and holes.

Candidate Evidence should take the form of a copy of the drawing and part programme for each component. A checklist should be used to record evidence of the candidates' ability to generate and save the part programme.

#### Assessment guidelines

The assessment of this Outcome should take the form of a practical assignment and can be combined with the assessment of Outcome 3, details of which are given in Outcome 3.

## Higher National Unit specification: statement of standards (cont)

**Unit title:** Computer Integrated Manufacture (CIM)

### Outcome 3

Transfer part programmes to CNC machine and manufacture components

#### Knowledge and/or skills

- ◆ Transfer Programmes
- ◆ Program selection
- ◆ Work holding method
- ◆ Pre-set Tooling
- ◆ Tool offset
- ◆ Manual Data Input (MDI)
- ◆ Datum set
- ◆ Simulation
- ◆ Manufacture Component
- ◆ Check Dimensional Accuracy

#### Evidence Requirements

This is a practically based outcome and **all** of the knowledge and/or skills items above should be assessed.

A candidate's response can be judged to be satisfactory where evidence provided is sufficient to meet the requirements for each item by showing that for **two generated part programmes** the candidate is able to:

- ◆ transfer programmes from CAD/CAM system to CNC system
- ◆ select the appropriate program within CNC system
- ◆ select material and secure in appropriate work holding device
- ◆ pre-set tooling off line from machine
- ◆ input tooling offsets to CNC system
- ◆ use manual and MDI modes to set component datum
- ◆ verify component by means of simulation
- ◆ manufacture components using single block run mode
- ◆ check dimensional accuracy of components using appropriate measuring equipment

Candidate Evidence should take the form of a checklist to record evidence of the candidates' ability to transfer the part programmes and use the CNC system to manufacture the 2 components.

#### Assessment guidelines

The assessment of this Outcome should take the form of a practical assignment and can be combined with that of Outcome 2. The candidate will require to generate part programmes through the use of a CAD/CAM system, transfer these programmes to an appropriate CNC machines; set up work piece; set tooling offsets and manufacture the components on a CNC machine

It is essential that Centres ensure that evidence generated is the candidate's own work. Centres should therefore issue each candidate with a different specification for the components to be manufactured.

## Administrative Information

**Unit code:** DW8G 34

**Unit title:** Computer Integrated Manufacture (CIM)

**Superclass category:** VE

**Original date of publication:** August 2006

**Version:** 01

### History of Changes:

Version	Description of change	Date

**Source:** SQA

© Scottish Qualifications Authority 2006

This publication may be reproduced in whole or in part for educational purposes provided that no profit is derived from reproduction and that, if reproduced in part, the source is acknowledged.

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

## **Higher National Unit specification: support notes**

### **Unit title:** Computer Integrated Manufacture (CIM)

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 written in order to allow candidates to develop their knowledge, understanding and skills in the following areas:

- 1 Describe the various components of Computer Integrated Manufacture (CIM).
- 2 Generate part programmes using a commercial CAD/CAM system.
- 3 Transfer part programmes to CNC machine and manufacture components.

The Unit is designed to develop the candidates' knowledge and understanding of the fundamentals of Computer Integrated Manufacture (CIM). It will also strengthen the candidates' practical ability and knowledge of CAD/CAM software and CNC machine tools. This Unit has been developed to provide Advanced Certificate in Engineering Manufacture/HNC Engineering candidates with a fundamental knowledge, understanding and skills in the description and use of CAM systems. It is a 1-credit unit at SCQF Level 7 (8 SCQF credit points at SCQF Level 7). The Unit can also be offered on a free standing basis.

The recommended delivery and assessment time to be spent on each of the outcomes is shown in the brackets below:

- 1 Describe the various components of Computer Integrated Manufacture (CIM) — (10 hours).
- 2 Generate part programmes using a commercial CAD/CAM system and transfer to industrial CNC machine — (10 hours).
- 3 Transfer part programmes to CNC machine and manufacture components — (20 hours).

### **Guidance on the delivery and assessment of this Unit**

Due to the practical content of the Unit, the candidate will require access to both CAD/CAM software and the appropriate CNC machine tool.

The delivery of Outcome 1 is critical to the Unit as it equips the candidate with the fundamentals required to complete the remainder of the Unit. Therefore it should be taught at the start of the Unit to ensure that candidates have the correct level of knowledge. The assessment should be a short written report covering the various components of Computer Integrated Manufacture (CIM).

Delivery of Outcomes 2 and 3 should focus on the practical application of the knowledge and skills of the CAD/CAM element of Outcome 1. Therefore the candidate should be provided with the opportunity to gain as much "hands on" experience as possible. This will involve the use of CAD/CAM software and CNC machine tools. The assessment will involve the candidate generating two part programmes from the CAD/CAM software and manufacturing the components on the appropriate CNC machine tool. The Candidate will submit a copy of the part programmes and the manufactured artefacts at the end of the Unit.

## **Higher National Unit specification: support notes (cont.)**

### **Unit title:** Computer Integrated Manufacture (CIM)

Further information on Evidence requirements and Assessment guidelines is given after each Outcome in the Higher National Unit specification: statement of standards section. It is recommended that this section be read carefully before proceeding with assessment of candidates. It is recommended that other units that complement the CIM unit are referred to for possible integration of assessment.

The Unit may be taught as a freestanding Unit; however it is recommended that it is combined with CNC (DT5P 34) and CAD for Engineers (DR1X 34) Unit(s) to allow integration of related topics.

#### ***Opportunities for developing Core Skills***

There are opportunities to develop the Core Skills of Reading Communication, Written Communication, Using Information Technology and Critical Thinking at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

### **Open learning**

This Unit may be delivered by distance learning however, due to the practical nature of Outcome 2 and 3; a considerable degree of centre support may be required. With regard to assessment, planning would be required by the centre to ensure the sufficiency and authenticity of candidate evidence. Arrangements would be required to be put in place to ensure that the assessments were conducted under controlled, supervised conditions.

### **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. For information on these, please refer to the SQA document *Guidance on Alternative Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: [www.sqa.org.uk](http://www.sqa.org.uk).



## **General information for candidates**

### **Unit title:** Computer Integrated Manufacture (CIM)

Computer Integrated Manufacture (CIM) is essentially manufacturing supported by computers and involves the integration of various engineering software applications to assist the manufacturing process. This Unit is designed to introduce you to some of the components of Computer Integrated Manufacture (CIM). The Unit will specialise on the practical component of Computer Aided Design and Manufacture (CAD/CAM) and is designed to follow on from the CAD for Engineers and CNC Units to allow you to enhance your practical skills in producing a number of artefacts. You should also be provided with opportunities to gain 'hands on' experience of using CIM systems.

The Unit is likely to be delivered by a combination of lectures and group discussion on the various components of CIM and practical demonstrations using CAD/CAM software and CNC machine tools. The centre may also arrange one or more industrial visits so you have an opportunity to see CIM systems in operation, speak to engineers and explore various sources of information at various companies.

The formal assessment for Outcome 1 of this Unit will take the form of a short written report, based on the various components of CIM. The assessment for Outcomes 2 and 3 will consist of two practical assignments, which will involve generating two part programmes using CAD/CAM software, transferring the programmes to the appropriate CNC machine tool and manufacturing the components.