

# City & Guilds Level 3 Certificate in Engineering

Scheme handbook

**2800**

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# Contents

	<b>Page</b>
<b>Level 3 Certificate in Engineering</b>	<b>5</b>
<b>General information</b>	<b>7</b>
General structure	7
Assessment and quality assurance	7
Course design	8
Health and safety	8
Centre and scheme approval	8
Registration and certification	9
Verification of assignments	9
External verification	9
<b>Guidance notes on assessment</b>	<b>10</b>
What is provided by City & Guilds	10
On-line assessment requirements	11
Guidance for marking	13
What centres need to do	16
<b>The Award</b>	<b>19</b>
Test specifications	23
Relationship to SEMTA -OSCEng ECS standards	29
Key skills	35
Employment rights and responsibilities	37
Identification of moral, spiritual and ethical issues, European dimension, environmental, education and health and safety	38
<b>Further information</b>	<b>41</b>
<b>Level 3 Engineering Pathways   Appendix A</b>	<b>43</b>
<b>The units</b>	
001 Work effectively and safely in an engineering environment	
002 Engineering principles and practice	
003 Principles of welding	
004 Principles of fabrication	
005 Principles of fabrication and welding	
006 Principles of installation, commissioning and maintenance engineering	
007 Principles of materials processing	
008 Principles of materials forming	
009 Principles of mechanical manufacturing engineering	
010 Principles of electrical engineering	
011 Principles of electronics engineering	
012 Principles of integrated engineering	
013 Principles of shipbuilding	
014 <i>Kept free for new NVQ routes</i>	

- 015 Manual metal arc (MMA) welding
- 016 Metal inert gas (MIG) welding
- 017 Tungsten inert gas (TIG) welding
- 018 Mechanised welding
- 019 Thick plate work
- 020 Sheet metal work
- 021 Structural steelwork
- 022 Pipe and tube fabrication
- 023 Composite fabrication
- 024 Pattern development
- 025 Extrusion
- 026 Forging
- 027 Vacuum forming and moulding
- 028 Mould and core production and casting
- 029 Specialised casting processes
- 030 Pattern and model making
- 031 Manufacturing machinery and ancillary systems
- 032 Utility systems
- 033 Factory/plant services
- 034 Hydraulic systems and components
- 035 Pneumatic systems and components
- 036 Steam generation plant and ancillary systems
- 037 Power generation units and ancillary systems
- 038 Refrigeration plants and systems
- 039 Turning
- 040 Milling
- 041 Grinding
- 042 CNC Machining
- 043 Electro discharge machining (EDM)
- 044 Detailed fitting
- 045 Electrical equipment and systems
- 046 Computer integrated engineering (CIE)
- 047 Computer aided design (CAD)
- 048 Finishing surface coatings
- 049 Organising and managing engineering operations
- 050 Advanced mathematics and science
- 051 Industrial communications
- 052 Mechatronics systems
- 053 Robotics
- 054 Automation systems
- 055 Control systems
- 056 Control electronics
- 057 Analogue and digital electronics
- 058 Using wood for engineering applications

# Level 3 Certificate in Engineering (2800-03)

This award is aimed at candidates who

- are following Advanced Modern Apprenticeship programmes
- require evidence towards the underpinning knowledge of the N/SVQ
- or do not have access to an N/SVQ
- wish for career progression within the Engineering industry
- wish to develop the skills learnt from Applying Engineering Principles Level 2 and other qualifications

It is expected that candidates should have Applying Engineering Principles Level 2 or equivalent in order to be able to satisfactorily complete the course of study. Without evidence of formal qualifications, candidates must be able to demonstrate prior adequate knowledge and experience necessary to complete the course.

Advanced mathematics and science is an optional unit within the qualification- its purpose is to facilitate progression to a higher level qualification. Centres will need to carry out an initial assessment of candidates' literacy and numeracy skills in order to make a judgement about their ability to successfully achieve this unit.

This award is designed to contribute towards the knowledge and understanding for the N/SVQs in Engineering Level 3 (City & Guilds 1681-1689), while containing additional skills and knowledge which go beyond the scope of the National Occupational Standards. It provides a valuable alternative for those candidates who do not have access to the N/SVQ.

It replaces the engineering qualifications within the City & Guilds 2000 series and the 6984 Progression Awards (Level 3).

Candidates must follow ONE of eleven engineering pathways (details on page 43). Successful candidates will receive a certificate endorsed with their chosen pathway:

**Level 3 Certificate in engineering-Welding**

**Level 3 Certificate in engineering-Fabrication**

**Level 3 Certificate in engineering-Fabrication and welding**

**Level 3 Certificate in engineering-Installation, commissioning and maintenance engineering**

**Level 3 Certificate in engineering-Materials processing**

**Level 3 Certificate in engineering-Materials forming**

**Level 3 Certificate in engineering-Mechanical manufacturing engineering**

**Level 3 Certificate in engineering-Electrical engineering**

**Level 3 Certificate in engineering-Electronics engineering**

**Level 3 Certificate in engineering-Integrated engineering**

**Level 3 Certificate in engineering-Shipbuilding**

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# General information

This Award has been designed by City & Guilds to support government initiatives towards the National Qualifications Framework. It can contribute towards the knowledge and understanding required for the related N/SVQ while not requiring or proving evidence of occupational competence.

## General structure

The Award is made up of units expressed in a standard format. Each unit is preceded by details of the

- structure of the unit
- aims and general coverage of the unit
- relationship of the unit to the appropriate N/SVQ/ National Occupational Standards
- outcomes
- assessment methods.

## Assessment and quality assurance

National standards and rigorous quality assurance are maintained by the use of

- City & Guilds set and marked written tests
- City & Guilds question banks for centre set assessments
- Assignments marked by the centre according to externally set marking criteria, with quality assurance assured by the centre and monitored by City & Guilds' external verification system, to ensure that national standards are maintained.

Quality assurance includes initial centre approval, scheme approval, the centre's own procedures for monitoring quality and City & Guilds' ongoing monitoring by an External Verifier. Details of City & Guilds' criteria and procedures, including roles of centre staff and External Verifiers can be found in *Providing City & Guilds Qualifications – a guide to centre and scheme approval*.

Assessment components are graded (Pass, Credit, Distinction). A pass is the achievement level required for the knowledge and understanding in an NVQ and generally represents the ability to follow instructions and procedures. Credit and distinction represent increasing levels of ability to adapt to changing circumstances and to independently resolve problems.

For candidates with particular requirements, centres should refer to City & Guilds policy document *Access to assessment, candidates with particular requirements*.

External verifiers act on behalf of City & Guilds to ensure that national standards are maintained. Full details of their role can be found in *Providing City & Guilds' Qualifications - a guide to centre and scheme approval*.

## Course Design

Teacher/assessors should familiarise themselves with the structure and content of the award before designing an appropriate course; in particular they are advised to consider the knowledge and understanding requirements of the relevant N/SVQ.

City & Guilds does not itself provide courses of instruction or specify entry requirements.

As long as the requirements for the award are met, teachers/assessors may design courses of study in any way that they feel best meets the needs and capabilities of the candidates.

It is recommended that centres cover the following in the delivery of the course, where appropriate

- Key Skills (such as Communication, Application of Number, Information technology, Working with others, Improving own learning and performance, Problem solving)
- Health and safety considerations, in particular the need to impress to candidates that they must preserve the health and safety of others as well as themselves
- Spiritual, moral, social and cultural issues
- Environmental education
- European dimension.

It is recommended that 480 hours should be allocated for the SIX units required for certification.

## Health and safety

The requirement to follow safe working practices is an integral part of all City & Guilds qualifications and assessments, and it is the responsibility of centres to ensure that all relevant health and safety requirements are in place before candidates start practical assessments.

Should a candidate fail to follow health and safety practice and procedures during an assessment (eg practical assignment) the test must be stopped and the candidate advised of the reasons why. The candidate should be informed that they have failed the assessment. Candidates may retake the assessment at a later date, no less than seven days after the failure.

## Centre and scheme approval

Centres wishing to offer City & Guilds qualifications must gain approval.

New centres must apply for centre and scheme approval.

Existing City & Guilds centres will need to get specific scheme approval to run this Award.

Full details of the process for both centre and scheme approval are given in *Providing City & Guilds qualifications - a guide to centre and scheme approval* which is available from City & Guilds' regional offices.



## Registration and certification

- Candidates must be registered at the beginning of their course. Centres should submit registrations using Form S (Registration), under scheme 2800.
- When assignments have been successfully completed, candidate results should be submitted on Form S (Results submission). Centres should note that results must NOT be submitted to City & Guilds until the external verifier is satisfied that the required standard has been attained.

City & Guilds reserves the right to suspend an approved centre, or withdraw its approval from an approved centre to conduct a particular City & Guilds scheme or particular City & Guilds schemes, for reasons of debt, malpractice or for any reason that maybe detrimental to the maintenance of authentic, reliable and valid qualifications or that may prejudice the name of City & Guilds.

- Full details on all the above procedures, together with dates and times of written tests will be found in the *Directory of Vocational Awards* published annually by City & Guilds. This information also appears on City & Guilds Web site <http://www.city-and-guilds.co.uk>

## Verification of assignments

Although this Award does not imply occupational competence, it has a very close relationship with NVQ programmes. It is for this reason that, when assignments are assessed, it is important that reference is made to N/SVQ assessment methodology. Assessors/tutors will need to be familiar with the occupational standards for Engineering N/SVQs, because a similar system of internal verification is used. This means that the work of assessors involved in the qualification must be monitored by an Internal Verifier/scheme co-ordinator, to ensure that they are applying the standards consistently throughout assessment activities.

## External verification

An External Verifier will make an annual visit to the centre and their role includes the following:

- ensuring that internal verifiers are undertaking their duties satisfactorily
- monitoring internal quality assurance systems and sampling assessment activities, methods and records
- acting as a source of advice and support
- promoting best practice
- providing prompt, accurate and constructive feedback to all relevant parties on the operation of centres' assessment systems.

# Guidance notes on assessment

## Section 1- Introduction

The City & Guilds Level 3 Engineering Award is designed to provide opportunities for candidates to gain accreditation for their individual level of understanding of the underpinning knowledge relevant to the appropriate related NVQ.

The emphasis is on 'learning by doing', not on competence. For this reason candidates are required to complete a number of assignments to show their attainment of practical skills which in turn implies understanding of the theoretical knowledge required to complete a number of activities successfully.

For the endorsed certificate: eg Level 3 Certificate in Engineering (*Specialism*) candidates will be required to achieve

- TWO core units (Units 001 and 002)
- ONE endorsed ('principles of ') unit (from Units 003 to 014) and
- ONE related optional unit from the chosen specialism (TWO for Fabrication and welding)
- any TWO further optional units (from Units 015 to 058) (ONE for Fabrication and welding)

See Level 3 Engineering Pathways at Appendix A.

A grade of Pass, Credit or Distinction will be awarded to EACH unit on successful completion.

## Section 2 – Assessment

In order to gain the full certificate candidates MUST complete

ONE multiple-choice paper for EACH of the core units.

ONE knowledge assessment for the selected 'Principles of' unit assessed by centre set question paper using questions from a City & Guilds devised question bank.

ONE centre devised assignment based on an assignment template provided for EACH optional unit taken which will include ONE knowledge assessment comprising of short answer questions.

### 2.1 What is provided by City & Guilds

City & Guilds will provide on-line, on-demand testing using multiple choice questions, for the TWO core units.

For the Principles units, City & Guilds will provide a bank of short answer questions and a test specification from which centres should compile a question paper.

City & Guilds will also provide an assignment template for EACH optional unit.

## 2.2 Assessment of Core units

The TWO core units will be assessed by externally set multiple choice question papers. These tests will be available on line through the City & Guilds GOLLA system from December 2003.

Each test will comprise of multiple choice items in accordance with the test specifications provided.

### 2.2.1 On Line assessment requirements

City & Guilds Conduct of Examinations-General Regulations sets out the requirements in terms of seating, individual space and invigilator: candidate ratios. For the purposes of clarity these regulations state inter alia, that seating arrangements must be made that will prevent candidates from seeing each other's work intentionally or otherwise, that the minimum distance in all directions from centre to centre of candidate's chairs is 1.25 metres and that for written or computer tests there must be a minimum of one invigilator in each examination room per thirty candidates.

The entire test will be conducted via the candidate's VDU. All data relating to the assessment will be held by City & Guilds with results and performance feedback being delivered back to the approved centre.

City & Guilds will continue to apply its rigorous quality control procedures to the production, editing, marking, moderating and revision of all questions whilst at the same time applying a robust security system to prevent assessments being accessed or drawn down by unauthorised persons or for purposes beyond those authorised.

### 2.2.2 Staffing requirements

The following key roles must be filled:

#### **Management Contact** (Also referred to as the Promissor contact)

A key member of staff who will be responsible for the overall installation and running of the Global Online Assessments System. This person will be issued with the initial Promissor ID and password with which they will be able to gain access to the installation software and create other staff member IDs and passwords for their centre. This person will be receiving advance notification of all updates/service outages etc by email hence it is vital a correct and up to date email address is supplied.

#### **Technical Contact**

If different from the management contact, this person will be responsible for ensuring that the online testing system (including local network) is functioning properly prior to any scheduled tests taking place. This person will be receiving advance notification of all updates/service outages etc by email hence it is vital a correct and up to date email address is supplied.

#### **Administrator Contact**

If different from the management contact, this person will be responsible for the scheduling and administering of the tests on a day to day basis.

### 2.2.3 Technical Requirements

The GOLTA testing system consists of several elements:

- *File Server.*  
1 GB of disk space on a file server is needed to store downloaded tests and other materials. The file server can be the same computer as the reception machine, or it can be a different machine. A number of reception machines can share a single shared directory on the file server.
- *The Reception Workstation.*  
This computer is used by the person administering the tests. The *CAT SiteManager* software is installed on this PC. A centre can have more than one Reception machine.
- *The Testing Workstations.*  
These are the computers used by students to take the tests. The *CAT Administrator* software is installed on these PCs.

#### **LAN File Server**

PC with Intel Pentium processor

1Gb space free on a single volume for the testing system

Windows NT 4 or 2000 Server\* or Novell NetWare (version 3.12 or above)

RAM – at least the minimum recommended for the operating system.

(\*Win 2000 Prof may be used with limited concurrent connections)

#### **Invigilator/Reception Workstation**

PC with Intel Pentium processor

10/100 Mbps network interface adapter

Windows 95, 98, 2000 or Windows NT 4 Workstation (with Service pack 4 or higher)

RAM – at least the minimum recommended for the operating system.

10Mb or more disk space available for the testing system.

Internet Explorer version 5.0 or above.

Microsoft or compatible mouse

Access to the LAN server location where the testing files are stored.

Direct access to a laser-quality printer, local or networked.

Internet connection – 56Kbps modem minimum, 128 Kbps or faster connection recommended.

Ability to send traffic of type TCP to the public internet on either port 21 (ftp) or 80 (http).

#### **Testing Workstation**

PC with Intel Pentium processor

10/100 Mbps network interface adapter with connections to the LAN file server used for test files.

Windows 95, 98, 2000 or Windows NT 4 Workstation (with Service pack 4 or higher)

RAM – at least the minimum recommended for the operating system.

10Mb or more disk space available for the testing system.

Internet Explorer version 5.0 or above.

Microsoft or compatible mouse

Video adapter capable of displaying at least 16 million colours (24-bit colour) and 1024 x 768 pixels.

15" or larger monitor capable of displaying 16 million colours (24-bit colour) and 1024 x 768 pixels.

## 2.2.4 Further information

Any queries on the technical requirements for running City & Guilds' GOLLA assessment should be directed to the GOLLA helpline: **0207 294 2843**

## 2.3 Assessment of Principles units for endorsed certification

The Principles units are assessed by a centre set question paper using questions from a City & Guilds devised question bank to the published specification.

## 2.4 Assessment of optional units

In each optional unit there are a number of learning outcomes and each of these learning outcomes specifies a number of practical activities. EACH optional unit should be assessed by the use of an assignment.

The assignment should be produced by the centre in accordance with the template provided by City & Guilds. It will be made up of a number of practical tasks and one underpinning knowledge task. The resultant level of candidate achievement will be graded. *Candidates MUST pass all tasks within an assignment.*

Assignments will provide opportunities for candidates to be assessed for a **sample** range of the practical activities required for the unit. Assignments will usually consist of several tasks. The range of assignments developed by the centre for each unit should ensure that all the practical activities for all the outcomes are assessed as the centre uses a range of assignments over a period of time.

City & Guilds will provide assignment templates from which centres should produce the assignments for the units contained in this award. Centres are required to use the templates provided by City & Guilds. City & Guilds centre devised team must approve all assignments prior to use by the centre. (see **2.5.5** page 17)

### 2.4.1 Assignment templates

Detailed assignment templates for EACH optional unit are provided as a separate document on the accompanying 2800 Assessment CD-ROM.

### 2.4.2 Guidance for Marking

Grading of assignments is Pass, Credit and Distinction; grades of Credit and Distinction are intended to distinguish those candidates who show greater degrees of autonomy in the way they organize themselves, or apply reflective thinking and originality in the completion of tasks.

Detailed marking and grading criteria are provided for each assignment in the Marking Criteria section of the assignment. *The candidate must display satisfactory performance throughout the tasks. Failure to do so will result in the candidates requiring further training.*

### 2.4.3 Marking assignments

Centres will be taking into account the following THREE aspects of candidate's performance:

- planning, preparation and recording
- practical activity
- underpinning knowledge.

Each aspect must be marked and awarded a Pass, Credit or Distinction. Specific guidance for marking is provided in the assignment template. Candidates MUST achieve a MINIMUM of a Pass in EACH aspect of performance.

The marks that should be awarded for **planning, preparation and recording** and **underpinning knowledge** are as follows

	Marks	<b>(Note: half marks are NOT available)</b>
<b>Pass</b>	<b>1</b>	
<b>Credit</b>	<b>2</b>	
<b>Distinction</b>	<b>3</b>	

The marks that should be awarded for the **practical activities** are as follows

	Marks	<b>(Note: these marks are NOT divisible ie, Pass candidates must be awarded 2 marks, Credit candidates 4 marks and so on)</b>
<b>Pass</b>	<b>2</b>	
<b>Credit</b>	<b>4</b>	
<b>Distinction</b>	<b>6</b>	

The marks that should be awarded for the **underpinning knowledge** are as follows

<b>Grading criteria Pass=1 mark Credit = 2 marks Distinction = 3 marks</b>	
<b>Pass</b>	50-64%
<b>Credit</b>	65-79%
<b>Distinction</b>	80 – 100%

To award an overall grade the number of marks given for each task are totalled and then a grade is applied as follows

Marks	Grade
<b>4-6</b>	<b>Pass</b>
<b>7-9</b>	<b>Credit</b>
<b>10-12</b>	<b>Distinction</b>

#### 2.4.4 Recording marks and grades

To record candidate marks and overall grades for each completed assignment, assessors should enter details onto the appropriate Assignment marksheet.

For example, below is a completed Assignment marksheet as it would appear in the candidates' Assignment Guide. It shows how the overall grade was produced.

	Pass	Credit	Distinction
Planning, preparation and recording	1		
Practical activity		4	
Underpinning knowledge			3
		<b>Total</b>	8
		<b>Grade</b>	<b>CREDIT</b>

#### 2.4.5 Underpinning knowledge questions for optional units

Assignments for option units **MUST** also include underpinning knowledge questions and are designed to sample the underpinning knowledge of the unit. The questions included in the assignments do **NOT** need to be taken in formal examination conditions, however, they should be taken under supervision as assessors need to ensure the answers to the questions are the candidate's own work.

To preserve the integrity and useful life of the questions, candidates should **NOT** be given their answer sheets. A candidate's success in a written assessment should be recorded by a statement from the centre, quoting the relevant unit number or areas of knowledge assessed, which can then be used by candidates as evidence.

Original completed answer sheets should be kept for auditing purposes by the assessor in their own assessment records of candidates' performance. Please refer to City & Guilds General Regulations for confirmation of the period of time in which records should be maintained to meet regulatory requirements.

#### 2.4.6 Feedback

The assignments are intended as a formal assessment of candidates' practical skills. They are not designed as teaching aids and candidates should not be entered until they are ready. Should a candidate fail any of these tasks other than on health & safety grounds, as stated above, appropriate feedback should be given by the assessor both to the candidate and the tutor concerned.

Assessors must ensure that candidates understand why a particular grade has been given for the award.

If a candidate's work is selected for verification, samples of work must be available to the appointed external verifier.

## **2.5 What centres need to do**

### **2.5.1 Machinery, tools and equipment**

Centres must have access to sufficient equipment in the college, training centre or workplace to ensure candidates have the opportunity to cover all of the practical activities.

It is acceptable for centres to use specially designated areas within a centre for some of the units: eg to train and assess the installation of compressed air systems, ventilation ducting, alignment and setting up of electric motors and driven devices (pumps, compressors generators etc.)

The equipment, systems or machinery must be of an industrial standard and be capable of being used under normal working conditions: eg hydraulic rigs must have a method of applying reasonable loads and not merely be connected up to show movement.

### **2.5.2 Producing assignments to assess optional units**

The centre devised assignments must be made up of THREE sections:

#### **1 Assessor's Guidance Notes**

This section is intended for use by the assessor only. It should contain

- a health and safety statement
- the location of where the assignment should be taken
- the requirements for tools, equipment, materials and data
- notes on the content of the assignment to include any preparatory work required by the assessor/centre
- details of evidence and recording requirements
- time consideration.

Any new assignments set must have the same time allocated to the completion of the assignment as set in the guidance note in the assignment template.

#### **2 Candidate's Instructions**

The candidate's instructions should contain:

- general advice to candidates about the need to understand the assignment before starting work and the need to seek guidance if clarification is required
- guidance on the time limits
- the importance of health and safety
- an assignment brief which sets the scene or a scenario to contextualise the task(s)
- clearly defined tasks covering a range of practical activities – an outline of each task should be provided rather than a series of marking checklists
- recording/report sheets for recording the progress of the activity
- notes which refer to how the evidence they produce should be stored and labelled.

#### **3 Mark scheme (see Guidance for marking section on page 14)**



## **2.5.4 Fault diagnosis**

Centres may find it difficult to arrange a 'live' fault diagnosis assignment opportunity. Centres may arrange for a realistic 'fault scenario' to be used with permission from their external verifier.

### **NOTE:**

Where the use of drawings/specifications is essential for the activity, relevant pages can be photocopied from workshop manuals, etc – copyright and industrial confidentiality permitting. It is not usually necessary for such items to be copied out by the candidates, however, the use of sketches to show specific, important aspects of the work undertaken: eg points of wear, location of components within a system, alignment methods, etc should be encouraged.

CAD and word processing packages can be used but time spent on the presentation should not be excessive. The final grade awarded will not necessarily depend upon presentation provided the candidates' work is clear, neat and technically correct. Candidates generating evidence for IT Key Skills may wish to spend more time on this aspect of their work.

## **2.5.5 Approval of assignments**

All assignments **MUST** be approved for use by City & Guilds. Each assignment should be submitted with a copy of the Centre-devised assignment submission report.\*

Centres **MUST** submit all centre devised assignments to their external verifier.

**SIX** weeks before candidates intend to use the assignment to be submitted to the external verifier.

**EIGHT** weeks before they intend to use the assignment if a paper based submission is made (**THREE** copies must be provided).

\*A copy of the Centre-devised assignment submission report is contained as a separate document on this CD-ROM and should be submitted with the assignment to the external verifier.

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## Level 3 Certificate in Engineering (2800-03)

### The Award

For the award of a certificate, candidates must successfully complete the assessments for Units 1 and 2 plus those for ONE 'Principles' unit (units 3-14) and THREE optional units (units 15-58). See Level 3 Engineering pathways at Appendix A.

Core units		Assessment components required	
Unit 1	Work effectively and safely in an engineering environment	2800-03-01	Written-multiple choice
Unit 2	Engineering principles and practice	2800-03-02	Written-multiple choice
<b>Principles units</b>			
Unit 3	Principles of welding	2800-03-03	Written-centre set
Unit 4	Principles of fabrication	2800-03-04	Written-centre set
Unit 5	Principles of fabrication and welding	2800-03-05	Written-centre set
Unit 6	Principles of installation, commissioning and maintenance engineering	2800-03-06	Written-centre set
Unit 7	Principles of materials processing	2800-03-07	Written-centre set
Unit 8	Principles of materials forming	2800-03-08	Written-centre set
Unit 9	Principles of mechanical manufacturing engineering	2800-03-09	Written-centre set
Unit 10	Principles of electrical engineering	2800-03-10	Written-centre set
Unit 11	Principles of electronics engineering	2800-03-11	Written-centre set
Unit 12	Principles of integrated engineering	2800-03-12	Written-centre set
Unit 13	Principles of shipbuilding	2800-03-13	Written-centre set
Unit 14	<i>Kept free for new NVQ route</i>	2800-03-14	Written-centre set

<b>Optional Units</b>			
Unit 15	Manual metal arc (MMA) welding	2800-03-15	Assignment
Unit 16	Metal inert gas (MIG) welding	2800-03-16	Assignment
Unit 17	Tungsten inert gas (TIG) welding	2800-03-17	Assignment
Unit 18	Mechanised welding	2800-03-18	Assignment
Unit 19	Thick platework	2800-03-19	Assignment
Unit 20	Sheet metalwork fabrication	2800-03-20	Assignment
Unit 21	Structural steelwork	2800-03-21	Assignment
Unit 22	Pipe and tube fabrication	2800-03-22	Assignment
Unit 23	Composites fabrication	2800-03-23	Assignment
Unit 24	Pattern development	2800-03-24	Assignment
Unit 25	Extrusion	2800-03-25	Assignment
Unit 26	Forging	2800-03-26	Assignment
Unit 27	Vacuum forming and moulding	2800-03-27	Assignment
Unit 28	Mould and core production and casting	2800-03-28	Assignment
Unit 29	Specialised casting processes	2800-03-29	Assignment
Unit 30	Pattern and model making	2800-03-30	Assignment

Unit 31	Manufacturing machinery and ancillary systems	2800-03-31	Assignment
Unit 32	Utility systems	2800-01-32	Assignment
Unit 33	Factory/plant services	2800-01-33	Assignment
Unit 34	Hydraulic systems and components	2800-01-34	Assignment
Unit 35	Pneumatic systems and components	2800-03-35	Assignment
Unit 36	Steam generation plant and ancillary systems	2800-03-36	Assignment
Unit 37	Power generation units and ancillary systems	2800-03-37	Assignment
Unit 38	Refrigeration plant and systems	2800-03-38	Assignment
Unit 39	Turning	2800-03-39	Assignment
Unit 40	Milling	2800-03-40	Assignment
Unit 41	Grinding	2800-03-41	Assignment
Unit 42	CNC machining	2800-03-42	Assignment
Unit 43	Electro discharge machining (EDM)	2800-03-43	Assignment
Unit 44	Detailed fitting	2800-03-44	Assignment
Unit 45	Electrical equipment and systems	2800-03-45	Assignment
Unit 46	Computer integrated engineering (CIE)	2800-03-46	Assignment
Unit 47	Computer aided design (CAD)	2800-03-47	Assignment
Unit 48	Finishing surface coatings	2800-03-48	Assignment

Unit 49	Organising and managing engineering operations	2800-03-49	Assignment
Unit 50	Advanced mathematics and science	2800-03-50	Assignment
Unit 51	Industrial communications	2800-03-51	Assignment
Unit 52	Mechatronics systems	2800-03-52	Assignment
Unit 53	Robotics	2800-03-53	Assignment
Unit 54	Automation systems	2800-03-54	Assignment
Unit 55	Control systems	2800-03-55	Assignment
Unit 56	Control electronics	2800-03-56	Assignment
Unit 57	Analogue and digital electronics	2800-03-57	Assignment
Unit 58	Using wood for engineering applications	2800-01-58	Assignment

# Test Specifications: Core Units

The knowledge requirements will be assessed by a multiple choice test.

**Subject** Engineering Level 3

**Paper No.** 2800-03-01

**Paper title** Work effectively and safely in an engineering environment

**Duration** 60 minutes      **No of items** 40

Section/Heading (outcome)	Group/topic/objective	No of items	%
01	Comply with statutory regulations and organisational requirements.	12	30
02	Follow accident and emergency procedures.	8	20
03	Apply safe working practices and procedures	10	25
04	Work effectively and develop competences.	10	25
Totals		40	100

**Subject** Engineering Level 3

**Paper No.** 2800-03-02

**Paper title** Engineering principles and practice

**Duration** 75 minutes      **No of items** 50

Section/Heading (outcome)	Group/topic/objective	No of items	%
01	Select and interpret engineering information.	6	12
02	Identify and select common engineering materials.	14	28
03	Carry out workshop calculations.	4	8
04	Mark out components to the required specification.	6	12
05	Carry out fitting, assembly and joining operations.	10	20
06	Apply quality control in engineering.	10	20
Totals		50	100

# Test Specifications: 'Principles of' Units

The knowledge requirements will be assessed by a short answer question paper using question from the City & Guilds question bank.

**Subject** Engineering Level 3

**Paper No.** 2800-03-03

**Paper title** Principles of welding

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	Identify the fundamentals of welding	2	20
02	Identify the geometry of effective joint design	2	20
03	Identify the affects of distortion and residual stress due to welding	2	20
04	Identify the metallurgical effects of welding	2	20
05	Determine the integrity of welded joints	2	20
Totals		10	100

**Subject** Engineering Level 3

**Paper No.** 2800-03-04

**Paper title** Principles of fabrication

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	Identify and select common materials used in fabrication engineering	2	20
02	Determine the bending and rolling allowances for fabricated forms and describe the principles of shearing	3	30
03	Identify non-thermal methods of joining	3	30
04	Identify methods used for finishing fabricated components	2	20
Totals		10	100



**Subject Engineering Level 3**

**Paper No.** 2800-03-05

**Paper title** Principles of fabrication and welding

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	Identify and select common materials used in fabrication engineering	2	20
02	Identify the geometry of effective joint design	2	20
03	Identify non-thermal methods of joining	2	20
04	Identify the affects of distortion and residual stresses due to welding	2	20
05	Determine the integrity of welded joints	2	20
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-06

**Paper title** Principles of installation, commissioning and maintenance engineering

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	Use safe, effective and efficient working practices for maintenance, installation and commissioning.	2	20
02	Select appropriate working methods and use tools, equipment and instruments.	2	20
03	Select and apply approved lubrication, insulation and protection techniques.	2	20
04	Select and use appropriate methods of supporting, locating and fastening engineering components and deal with associated problems.	4	40
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-07

**Paper title** Principles of materials processing

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	Identify and select materials used in pattern/model-making and casting operations.	2	20
02	Interpret and apply design principles to material(s) processing operations.	3	30
03	Identify suitable finishing techniques for material(s) processing operations.	3	30
04	Monitor and control material(s) processing operations.	2	30
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-08

**Paper title** Principles of materials forming

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	Identify and select materials used in forming and moulding operations.	2	20
02	Interpret and apply design principles to material(s) forming and moulding process operations.	3	30
03	Identify suitable finishing techniques for material(s) forming and moulding process operations.	3	30
04	Monitor and control material(s) forming and moulding operations.	2	30
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-09

**Paper title** Principles of mechanical manufacturing engineering

**Duration** 60 minutes **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	Evaluate technical resource requirements and plant for machining operations.	3	30
02	Apply analyses and cost control methods and techniques.	4	40
03	Identify and test materials.	3	30
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-10

**Paper title** Principles of electrical engineering

**Duration** 60 minutes **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	understand the functions of electrical components	5	50
02	understand electrical supply systems, protection and earthing	3	30
03	understand the functions of electrical machines and motors	2	20
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-11

**Paper title** Principles of electronics

**Duration** 60 minutes **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	understand the function of electronic components	5	50
02	carry out electronic measurement and test	5	50
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-12

**Paper title** Principles of integrated engineering

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	understand digital fundamentals applicable to industrial control systems	1	10
02	explain the characteristics and features of various types of control system transducers	4	40
03	identify and select common engineering solutions	2	20
04	apply recognised cell design techniques	2	20
05	carry out basic flow programming operations	1	10
Totals		10	100

**Subject Engineering Level 3**

**Paper No.** 2800-03-13

**Paper title** Principles of shipbuilding

**Duration** 60 minutes      **No of questions** 10

Section/Heading (outcome)	Group/topic/objective	No of questions	%
01	describe shipbuilding technical drawings and Computer Aided Engineering	4	40
02	identify ships types, design features and major components	2	20
03	identify the principal structural components of a ship	2	20
04	describe the assembly and erection of ship parts	2	20
Totals		10	100

## **Level 3 Certificate in Engineering (2800-03)**

### **Relationship to SEMTA OSC*Eng* ECS**

<b>ECS No.</b>	<b>ECS Title</b>
1.01	Determine engineering requirements for products and processes
1.02	Identify solutions to meet technical requirements
1.03	Establish engineering objectives
1.04	Recommend methods to achieve engineering objectives
1.05	Identify factors that impact on engineering design briefs
1.06	Produce an analysis of identified factors in engineering design briefs
1.07	Generate engineering design options
1.08	Evaluate and recommend engineering design options for implementation
1.09	Complete designs for engineering products
1.10	Review technical information to produce detailed engineering drawings
1.11	Produce detailed drawings to support engineering activities
1.12	Interpret detailed information from technical sources
1.13	Read and extract information from engineering drawings and specifications
1.14	Provide technical information in required formats
1.15	Review an engineering activity to determine its technical requirements
1.16	Specify technical requirements for engineering activities
1.17	Determine technical requirements to achieve objectives
1.18	Determine resource requirements to achieve objectives
1.19	Plan engineering activities
1.20	Determine procedures for engineering activities
1.21	Determine requirements for safe access to work locations
1.22	Implement safe access systems
1.23	Identify and suggest improvements to working practices and procedures
1.24	Identify potential developments to engineering products and assets
1.25	Evaluate and recommend development options
1.26	Control allocated resources to achieve requirements
1.27	Provide technical information on engineering products and assets
1.28	Provide technical information on the use of engineering products and assets
2.01	Prepare machine tools to achieve material removal requirements
2.02	Mounting and setting work holding devices and workpieces
2.03	Setting and adjusting machine tools
2.04	Marking out to required specification
2.05	Prepare equipment for modifying or processing of materials
2.06	Prepare machines to achieve pressure shaping requirements
2.07	Prepare machines to produce cast products
2.08	Prepare equipment to carry out surface treatment operations
2.09	Prepare thermal joining machines to produce joined products
2.10	Prepare work areas and materials for engineering activities

- 2.11** Prepare work areas for engineering activities
- 2.12** Prepare materials for engineering activities
- 2.13** Prepare equipment for engineering activities
- 2.14** Prepare loads for moving
- 2.15** Reinstate the work area after engineering activities
- 2.16** Store resources for further use
- 2.17** Prepare a programmable controlled system for operation
- 2.18** Check a computer controlled system for operation
- 3.01** Operate computer controlled engineering processes
- 3.02** Operate programmable controlled engineering processes
- 3.03** Shape engineering products by material removal using hand tools
- 3.04** Shape engineering products by material removal using machine tools
- 3.05** Produce engineering products by moulding or laying-up
- 3.06** Produce engineering products by machine controlled pressure shaping operations
- 3.07** Produce cast engineering products through manual operations
- 3.08** Make cast products by machine based operations
- 3.09** Join materials by manually-controlled thermal processes
- 3.10** Join materials by machine-controlled thermal processes
- 3.11** Join materials by bonding
- 3.12** Assemble components to meet specifications
- 3.13** Produce one-off components
- 3.14** Finish engineering products by applying surface treatments
- 3.15** Process materials to alter their properties
- 3.16** Shaping of engineering materials by manually-applied pressure
- 4.01** Configure engineering products or assets
- 4.02** Install engineering products or assets
- 4.03** Set up and secure access structures
- 4.04** Dismantle and remove access structures
- 4.05** Position engineering construction elements
- 4.06** Dismantle engineering construction elements
- 4.07** Dismantle engineering assets
- 4.08** Move loads
- 5.01** Carry out planned maintenance procedures
- 5.02** Adjust engineering assets to meet operating requirements
- 5.03** Remove components from assemblies or sub-assemblies
- 5.04** Replace assembly or sub-assembly components
- 5.05** Determine the feasibility of a component repair
- 5.06** Restore components to operational condition by repair
- 5.07** Deal with variations and defects in engineering products or assets
- 6.01** Establish compliance with specifications
- 6.02** Conduct specified testing of engineering products or assets
- 6.03** Analyse and interpret the results of engineering tests

- 6.04 Monitor the performance and condition of engineering assets
- 6.05 Assess the performance and condition of engineering assets
- 6.06 Inspect engineering products and equipment
- 6.07 Monitor the use of allocated resources
- 6.08 Diagnose faults in engineering products or assets
- 7.01 Hand over configured products or assets
- 7.02 Accept and confirm responsibility for the control of engineering products or assets
- 7.03 Hand over engineering products and assets to the control of others
- 7.04 Identify and deal with hazards in the work environment
- 7.05 Minimise risks to life, property and the environment
- 7.06 Deal with risks arising from contingencies
- 7.07 Contribute to technical leadership on engineering activities
- 7.08 Contribute to the organisation of work activities
- 7.09 Provide operational support to users of engineering products and assets
- 8.01 Develop yourself in the work role
- 8.02 Contribute to effective working relationships

Unit Number/Title	Related ECS Unit(s)
<b>Core units</b>	
001 Work effectively and safely in an engineering environment	1.20-1.26 inc, 7.01-7.09 inc 8.01, 8.02
002 Engineering principles and practice	1.01-1.28 inc
<b>Principles units</b>	
003 Principles of welding	3.09
004 Principles of fabrication	3.04, 3.06
005 Principles of fabrication and welding	3.09, 3.04, 3.06
006 Principles of installation, commissioning and maintenance engineering	1.01, 1.03 1.12, 1.13 1.15 – 1.1.23 2.10 – 2.16
007 Principles of materials processing	1.12 1.15 1.16 1.17 2.05 3.15
008 Principles of materials forming	1.12 1.15 1.16 1.17 2.06 3.16
009 Principles of mechanical manufacturing engineering	1.13 2.02 2.03 6.02 6.03 6.06
010 Principles of electrical engineering	
011 Principles of electronics engineering	
012 Principles of integrated engineering	1.17, 1.18, 2.17 2.18
013 Principles of shipbuilding	1.12, 1.13, 4.02
014 <i>Kept free for new NVQ routes</i>	

<b>Optional units</b>		
015	Manual metal arc (MMA) welding	3.09
016	Metal inert gas (MIG) welding	3.09
017	Tungsten inert gas (TIG) welding	3.09
018	Mechanised welding	3.10
019	Thick platework	1.12, 1.13, 1.17, 1.18, 1.20, 2.01, 2.02-2.04, 2.06, 2.09, 2.10, 2.14, 2.15 - 2.17, 3.03, 3.04, 3.09, 3.12, 3.13, 3.16, 4.08, 6.01, 6.02, 6.06, 7.04, 8.01, 8.02
020	Sheet metalwork fabrication	3.03, 3.04, 3.06, 3.12
021	Structural steelwork	2.04, 2.06, 2.09, 2.10, 2.14, 2.15, 2.16, 2.17, 3.03, 3.04, 3.09, 3.12, 3.13, 3.16, 4.08, 6.01, 6.02, 6.06, 7.04, 8.01, 8.02
022	Pipe and tube fabrication	1.12, 1.13, 1.17, 1.18, 1.20, 2.01- 2.04, 2.06, 2.09, 2.10, 2.14, 2.15, 2.16, 2.17, 3.03, 3.04, 3.09, 3.12, 3.13, 3.16, 4.08, 6.01, 6.02, 6.06, 7.04, 8.01, 8.02
023	Composites fabrication	1.12, 1.13, 1.17, 1.18, 1.19, 1.20, 2.01, 2.04, 2.10, 2.12, 2.13, 2.15, 2.16, 3.02, 3.05, 3.11, 3.13, 5.07, 6.01-6.03, 6.06, 7.04, 8.01, 8.02
024	Pattern development	1.02, 1.14
025	Extrusion	1.18, 1.19, 1.20, 2.05, 2.06, 2.10, 2.11, 2.12, 2.13, 2.17, 3.02, 3.06, 3.13, 3.14, 3.15, 3.16, 6.01, 6.02, 6.03, 6.05, 6.06, 6.08
026	Forging	1.18, 1.19, 1.20, 2.05, 2.06, 2.10, 2.11, 2.12, 2.13, 2.17, 3.02, 3.06, 3.13, 3.14, 3.15, 3.16, 6.01, 6.02, 6.03, 6.05, 6.06, 6.08
027	Vacuum forming and moulding	1.18, 1.19, 1.20, 2.05, 2.06, 2.10, 2.11, 2.12, 2.13, 2.17, 3.02, 3.06, 3.13, 3.14, 3.15, 3.16, 6.01, 6.02, 6.03, 6.05, 6.06, 6.08
028	Mould and core production and casting	1.18, 1.19, 1.20, 2.05, 2.06, 2.10, 2.11, 2.12, 2.13, 2.17, 3.02, 3.06, 3.13, 3.14, 3.15, 3.16, 6.01, 6.02, 6.03, 6.05, 6.06, 6.08



029	Specialised casting processes	1.18,1.19,1.20, 2.05,2.06,2.10,2.11,2.12,2.13 2.17,3.02,3.06,3.13,3.14,3.15, 3.16, 6.01,6.02,6.03,6.05,6.06,6.08
030	Pattern and model making	1.18,1.19,1.20, 2.05,2.06,2.10,2.11,2.12,2.13 2.17,3.02,3.06,3.13,3.14,3.15, 3.16, 6.01,6.02,6.03,6.05,6.06,6.08
031	Manufacturing machinery and ancillary systems	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03
032	Utility systems	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03
033	Factory/plant services	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03
034	Hydraulic systems and components	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03
035	Pneumatic systems and components	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03
036	Steam generation plant and ancillary systems	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03
037	Power generation units and ancillary systems	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03
038	Refrigeration plant and systems	2.10 - 2.16 4.01 - 4.05, 4.07, 4.08 5.01 - 5.07 6.01 - 6.08 7.01 - 7.03

039	Turning	2.01, 2.02, 2.03, 2.12, 2.15, 3.04, 3.13
040	Milling	2.01, 2.02, 2.03, 2.15, 3.04, 3.13
041	Grinding	2.01, 2.02, 2.03
042	CNC machining	2.01, 2.02, 2.03, 2.05, 2.13, 2.15, 2.16, 2.17, 2.18, 3.02, 3.04
043	Electro discharge machining (EDM)	2.01, 2.02, 2.03, 2.05, 2.15, 3.04, 3.13
044	Detailed fitting	2.04, 2.11, 2.15, 2.16, 5.05
045	Electrical equipment and systems	1.12, 6.02 6.08
046	Computer integrated engineering	1.18 1.19 1.20 3.01 3.02
047	Computer aided design (CAD)	1.11 1.14
048	Finishing surface coatings	1.01, 1.02, 1.12, 1.13, 1.21, 2.08, 3.14, 7.04, 7.05, 7.06, 8.01, 8.02
049	Organising and managing engineering operations	1.17 - 1.28 7.04 - 7.09, 8.01, 8.02
050	Advanced mathematics and science	Not applicable
051	Industrial communications	1.12, 1.15, 1.17, 2.17, 2.18, 3.02
052	Mechatronics systems	1.12, 1.15, 1.17, 2.17, 2.18, 3.02
053	Robotics	1.12, 1.15, 1.17, 2.17, 2.18, 3.02
054	Automation systems	1.12, 1.15, 1.17, 2.17, 2.18, 3.02
055	Control systems	1.12, 1.15, 1.17, 2.17, 2.18, 3.02
056	Control electronics	1.12, 1.15, 1.17, 2.17, 2.18, 3.02
057	Analogue and digital electronics	1.12, 1.15, 1.17, 2.17, 2.18, 3.02
058	Using wood for engineering applications	1.12, 1.13, 2.04, 3.03

# Level 3 Certificate in Engineering (2800-03)

Identification of Key Skills summary relationship table

Unit No	Communication	Application of Number	Information Technology	Improving own learning and performance	Problem solving
1.	C3.3			LP3.1	
2.	C3.1b C3.2 C3.3	N2.2 Level 3			
3.					
4.		N2.2			
5.					
6.					
7.					
8.					
9.	C3.2 C3.3	N3.2			
10.					
11.					
12.			IT3.1 IT3.2 IT3.3		PS3.1 PS3.2 PS3.3
13.					
14.					
15.	C3.1b C3.2 C3.3				
16.	C3.1b C3.2 C3.3				
17.	C3.1b C3.2 C3.3				
18.	C3.1b C3.2 C3.3				
19.	C3.1b C3.2 C3.3	N2.2			
20.	C3.1b C3.2 C3.3				
21.					
22.	C3.1b C3.2 C3.3	N2.2			
23.	C3.1b C3.2 C3.3	N2.2			
24.		N2.2			
25.					
26.					
27.					

28.					
29.					
30.					
31.	C3.2 C3.3				
32.	C3.3				
33.	C3.3				
34.	C3.3				
35.	C3.3				
36.	C3.3				
37.	C3.3				
38.	C3.3				
39.	C3.3				
40.					
41.					
42.	C3.3	N 3.1 N 3.2 N 3.3			
43.					
44.	C3.3	N 3.1 N 3.2 N 3.3			
45.					
46.			IT 3.1 IT 3.2 IT 3.3		
47.			IT 3.1 IT 3.2 IT 3.3		
48.					
49.	C3.2 C3.3		IT 3.1 IT 3.2 IT 3.3		
50.			IT 3.1 IT 3.2 IT 3.3		
51.					
52.	C3.3				PS3.1 PS3.2 PS3.3 PS2.1 PS2.2 PS2.3
53.			IT 3.1 IT 3.2 IT 3.3		
54.			IT 3.1 IT 3.2 IT 3.3		
55.			IT 3.1 IT 3.2 IT 3.3		
56.					PS2.1 PS2.2 PS2.3

57.					PS2.1 PS2.2 PS2.3
58.	C3.1a C3.1b C3.2 C3.3				

## Level 3 Certificate in Engineering (2800-03)

### Employment Rights and Responsibilities matrix

ERR	Scheme handbook reference
<b>Employment law</b>	
Statutory rights	Unit 1
Procedures and documentation	Units 1 and 49
Sources of information and advice	Units 1 and 49
<b>Organisation and representation</b>	
Organisation of the industry and how the job fits in	Units1 and 49
Jobs, roles and careers	Units1 and 49
Representation in the industry	Unit 1
Sources of information and advice	Units 1 and 49
<b>Industry issues</b>	
Principles and codes of practice	Units 1 and 49
Issues of public concern	Unit 1

## Level 3 Certificate in Engineering (2800-03)

Identification of opportunities for evidence generation of moral, ethical, spiritual, European dimension, Environmental education and Health and safety

Unit No and Title	Moral, Ethical and Spiritual	European dimension	Environmental education	Health and safety
001 Work effectively and safely in an engineering environment	§	§	§	§
002 Engineering principles and practice	§	§	§	§
003 Principles of welding			§	§
004 Principles of fabrication			§	§
005 Principles of fabrication and welding			§	§
006 Principles of installation, commissioning and maintenance engineering			§	§
007 Principles of materials processing			§	§
008 Principles of materials forming			§	§
009 Principles of mechanical manufacturing engineering			§	§
010 Principles of electrical engineering			§	§
011 Principles of electronics			§	§
012 Principles of integrated engineering			§	§
013 Principles of shipbuilding			§	§
014 <i>Kept free for new NVQ routes</i>				
015 Manual metal arc (MMA)			§	§
016 Metal inert gas (MIG)			§	§
017 Tungsten inert gas (TIG)			§	§
018 Mechanised welding			§	§
019 Thick platework			§	§
020 Sheet metal work fabrication			§	§
021 Structural steelwork			§	§
022 Pipe and tube fabrication			§	§
023 Composites fabrication			§	§
024 Pattern development			§	§
025 Extrusion			§	§
026 Forging			§	§
027 Vacuum forming and moulding			§	§
028 Mould and core production and casting			§	§
029 Specialised casting processes			§	§
030 Pattern and model making			§	§
031 Manufacturing machinery and ancillary items			§	§
032 Utility systems			§	§
033 Factory/plant services			§	§

034	Hydraulic systems and components			§	§
035	Pneumatic systems and components			§	§
036	Steam generation plant and ancillary items			§	§
037	Power generation units and ancillary items			§	§
038	Refrigeration plant and systems			§	§
039	Turning			§	§
040	Milling			§	§
041	Grinding			§	§
042	CNC Machining			§	§
043	Electro discharge machining (EDM)			§	§
044	Detailed fitting			§	§
045	electrical equipment and systems			§	§
046	Computer integrated engineering			§	§
047	CAD			§	§
048	Finishing surface coatings			§	§
049	Organising and managing engineering operations	§	§	§	§
050	Advanced mathematics and science			§	§
051	Industrial communications			§	§
052	Mechatronics systems			§	§
053	Robotics			§	§
054	Automation systems			§	§
055	Control systems			§	§
056	Control electronics			§	§
057	Analogue and digital electronics			§	§
058	Using wood for engineering applications			§	§

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## Level 3 Certificate in Engineering (2800-03)

### Further information

Further information regarding centre/scheme approval or any aspect of assessment of the award should be referred to the relevant City & Guilds regional/national office:

Region	Telephone	Facsimile
City & Guilds London and South East	020 7294 8139	020 7294 2419
City & Guilds Southern	020 7294 2677	020 7294 2412
City & Guilds South West	01823 722200	01823 444231
City & Guilds East Anglia	01480 308300	01480 308325
City & Guilds East Midlands	01773 842900	01773 833030
City & Guilds West Midlands	0121 503 8900	0121 359 7734
City & Guilds North East	0191 402 5100	0191 402 5101
City & Guilds North West	01925 897900	01925 897925
City & Guilds Yorkshire	0113 380 8500	0113 380 8525
City & Guilds Northern Ireland	028 9032 5689	028 9031 2917
City & Guilds Scotland	0131 226 1556	0131 226 1558
City & Guilds Wales	02920 748600	02920 748625

City & Guilds Head Office – Customer Service Enquiry Unit	020 7294 2800	020 7294 2400
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# Level 3 Certificate in Engineering (2800-03)

Appendix A structure

**Common core - Candidates take TWO units:**

Work effectively and safely in an engineering environment

Engineering principles and practice

**Plus ONE 'Principles of' dependent on pathway chosen:**

Level 3 Certificate in engineering- Welding	Level 3 Certificate in engineering- Fabrication	Level 3 Certificate in engineering- Fabrication and welding	Level 3 Certificate in engineering- Installation, commissioning and maintenance engineering
<p><b>Principles of welding</b></p> <p>plus any ONE from</p> <p>Manual metal arc (MMA) welding Metal inert gas (MIG) welding Tungsten inert gas (TIG) welding Mechanised welding</p>	<p><b>Principles of fabrication</b></p> <p>plus any ONE from</p> <p>Thick platework Sheet metalwork fabrication Structural steelwork Pipe and tube fabrication Composite fabrication Pattern development</p>	<p><b>Principles of fabrication &amp; welding</b></p> <p>plus any ONE from</p> <p>Manual metal arc (MMA) welding Metal inert gas (MIG) welding Tungsten inert gas (TIG) welding Mechanised welding</p> <p>and ONE from</p> <p>Thick platework Sheet metalwork fabrication Structural steelwork Pipe and tube fabrication Composite fabrication Pattern development</p>	<p><b>Principles of installation, commissioning and maintenance</b></p> <p>plus any ONE from</p> <p>Manufacturing machinery and ancillary systems Utility systems Factory/plant services Hydraulic systems and components Pneumatic systems and components Steam generation plant and ancillary systems Power generation units and ancillary systems Refrigeration plant and systems Electrical equipment and systems</p>

Level 3 Certificate in engineering- Mechanical manufacturing engineering	Level 3 Certificate in engineering- Materials forming	Level 3 Certificate in engineering- Materials processing	Level 3 Certificate in engineering- Electrical engineering
<p><b>Principles of mechanical manufacturing</b> plus any ONE from</p> <p>Turning Milling Grinding CNC machining Electro Discharge Machining Detailed fitting Computer integrated engineering</p>	<p><b>Principles of materials forming</b> plus any ONE from</p> <p>Extrusion Forging Vacuum forming and moulding</p>	<p><b>Principles of materials processing</b> plus any ONE from</p> <p>Mould and core production and casting Specialised casting processes Pattern and model making Finishing surface coatings</p>	<p><b>Principles of electrical engineering</b> plus any ONE from</p> <p>Utility systems Factory/plant services Hydraulic systems and components Pneumatic systems and components Steam generation plant and ancillary systems Power generation units and ancillary systems Refrigeration plants and systems Electrical equipment and systems Industrial communications Mechatronics systems Robotics Automation systems Control systems Control electronics Analogue and digital electronics</p>

Level 3 Certificate in engineering- Electronics engineering	Level 3 Certificate in engineering- Integrated engineering	Level 3 Certificate in engineering- Shipbuilding	
<p><b>Principles of electronics engineering</b> plus any ONE from Electrical equipment and systems Utility systems Factory/plant services Hydraulic systems and components Pneumatic systems and components Steam generation plant and ancillary systems Power generation units and ancillary systems Refrigeration plants and systems Industrial communications Mechatronics Robotics Automation systems Control systems Control electronics Analogue and digital technology</p>	<p><b>Principles of integrated engineering</b> plus any ONE from Hydraulic systems and components Pneumatic systems and components Industrial communications Mechatronics Robotics Automation systems Control systems Control electronics Analogue and digital technology</p>	<p><b>Principles of shipbuilding</b> plus any ONE from Manual metal arc (MMA) welding Metal inert gas (MIG) welding Tungsten inert gas (TIG) welding Mechanised welding Thick plate work Sheet metal work Structural steelwork Pipe and tube fabrication Composite fabrication Pattern development Manufacturing machinery and ancillary systems Utility systems Hydraulic systems and components Pneumatic systems and components Refrigeration plants and systems Grinding</p>	<p><b>shipbuilding (cont)</b> CNC Machining Electro discharge machining (EDM) Detailed fitting Electrical equipment and systems Computer integrated engineering (CIE) Computer aided design (CAD) Finishing surface coatings Organising and managing engineering operations Advanced mathematics and science Industrial communications Mechatronics Robotics Automation systems Control systems Control electronics Analogue and digital technology Using Wood for Engineering Applications</p>

Plus TWO **different** units from (Only ONE different unit required for Fabrication and Welding candidates)

- |     |   |     |  |
|-----|---|-----|--|
| 015 | Manual metal arc (MMA) welding                | 039 | Turning  |
| 016 | Metal inert gas (MIG) welding                 | 040 | Milling  |
| 017 | Tungsten inert gas (TIG) welding              | 041 | Grinding                                       |
| 018 | Mechanised welding                            | 042 | CNC machining                                  |
| 019 | Thick platework                               | 043 | Electro Discharge Machining                    |
| 020 | Sheet metalwork fabrication                   | 044 | Detailed fitting                               |
| 021 | Structural steelwork                          | 045 | Electrical equipment and systems               |
| 022 | Pipe and tube fabrication                     | 046 | Computer integrated engineering                |
| 023 | Composite fabrication                         | 047 | Computer aided design                          |
| 024 | Pattern development                           | 048 | Finishing surface coatings                     |
| 025 | Extrusion                                     | 049 | Organising and managing engineering operations |
| 026 | Forging                                       | 050 | Advanced mathematics and science               |
| 027 | Vacuum forming and moulding                   | 051 | Industrial communications                      |
| 028 | Mould and core production and casting         | 052 | Mechatronics                                   |
| 029 | Specialised casting processes                 | 053 | Robotics                                       |
| 030 | Pattern and model making                      | 054 | Automation systems                             |
| 031 | Manufacturing machinery and ancillary systems | 055 | Control systems                                |
| 032 | Utility systems                               | 056 | Control electronics                            |
| 033 | Factory/plant services                        | 057 | Analogue and digital technology                |
| 034 | Hydraulic systems and components              | 058 | Using wood for engineering applications        |
| 035 | Pneumatic systems and components              |     |  |
| 036 | Steam generation plant and ancillary systems  |     |  |
| 037 | Power generation units and ancillary systems  |     |  |
| 038 | Refrigeration plant and systems               |     |  |

# **Level 3 Certificate in Engineering (2800-03)**

## **The Units**

The Units comprising this award are contained as a separate document on this CD-ROM

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