City & Guilds Level 1-3 Award Certificate in Computer Aided Design (7689-01-03)

September 2024 Version 3.2

Qualification Handbook

Contents

1   Qualification at a glance

Subject area	CAD
City & Guilds number	7689
Age group approved Level 1 and 2 **Age group approved Level 3**	Pre 16, 16-18 and 19+ 16-18 and 19+
Entry requirements	None
Assessment	Assignment
Grading	Pass/Fail
Approvals	Automatic approval /Full approval
Support materials	• Centre Handbook • Assignments
Registration and certification	Consult the Walled Garden/Online Catalogue for last dates

Title and level	City & Guilds qualification number	Regulatory reference number	GLH	TQT
City & Guilds Level 1 Award in Parametric Modelling	7689-01	601/5120/1	60	70
City & Guilds Level 2 Award in Parametric Modelling	7689-02	601/5113/4	60	110
City & Guilds Level 3 Award in Parametric Modelling	7689-03	601/5114/6	90	120
City & Guilds Level 2 Award in 2D Computer Aided Design	7689-04	601/5115/8	60	70
City & Guilds Level 3 Award in 2D Computer Aided Design	7689-05	601/5116/X	90	120
City & Guilds Level 3 Award in 3D Computer Aided Design	7689-06	601/5117/1	90	100
City & Guilds Level 2 Certificate in Computer Aided Design	7689-07	601/5118/3	120	180
City & Guilds Level 3 Certificate in Computer Aided Design	7689-08	601/5119/5	180	220

Version and date	Change detail	Section
November 2015 V2.0	Corrected Unit Accreditation Number and credits for Unit 201	Structure Units
January 2017 V3.0	TQT added, pre 16 age group added where appropriate.	Centre requirements, Structure
September 2017 V3.1	Added TQT details	Qualification at a glance and Structure
	Deleted QCF	Throughout
September 2024 V3.2	Handbook updates	Throughout Assessment

2   Introduction

This document tells you what you need to do to deliver the qualifications.

Area	Description
Who are the qualifications for?	These provide learners with the essential skills in how to use Computer Aided Design software. You will learn how an object is designed in either 2D or 3D and how objects can be manufactured.
What do the qualifications cover?	They provide learners with the skills and knowledge to design object in either 2D or 3D. These qualifications allow candidates to learn, develop and practise the skills required for employment and / or career progression in the broad Engineering and Manufacturing sectors
What opportunities for progression are there?	They allow candidates to progress into employment or to the following City & Guilds qualifications: - Level 2 Certificate in Engineering - Level 3 Diploma in Engineering
Who did we develop the qualification with?	N/A
Is it part of an apprenticeship framework or initiative?	No

Structure

The tables below outline the structure and rules of combination for these qualifications.

To achieve the **City & Guilds 7689-01 Level 1 Award in Parametric Modelling** learners must achieve **7** credits from mandatory unit 101.

Level 1 Award in Parametric Modelling (7689-01)					
UAN	**City & Guilds unit number**	**Unit title**	**Group (if applicable)**	**Credit Value**	**GLH**
Mandatory					
Y/506/7819	101	Computer Aided Design Using Parametric Modelling Software	n/a	7	60

To achieve the **City & Guilds 7689-02 Level 2 Award in Parametric Modelling** learners must achieve **11** credits from mandatory unit 201

Level 2 Award in Parametric Modelling (7689-02)					
UAN	**City & Guilds unit number**	**Unit title**	**Group (if applicable)**	**Credit Value**	**GLH**
Mandatory					
T/506/8203	201	Computer Aided Design Using Parametric Modelling Software	n/a	11	60

To achieve the **City & Guilds 7689-03 Level 3 Award in Parametric Modelling** learners must achieve **12** credits from mandatory unit 301.

Level 3 Award in Parametric Modelling (7689-03)					
UAN	City & Guilds unit number	Unit title	Group (if applicable)	Credit Value	GLH
Mandatory					
D/506/7823	301	Computer Aided Design Using Parametric Modelling Software	n/a	12	90

To achieve the **City & Guilds 7689-04 Level 2 Award in 2D Computer Aided Design** learners must achieve **7** credits from mandatory unit 202.

Level 2 Award in 2D Computer Aided Design (7689-04)					
UAN	City & Guilds unit number	Unit title	Group (if applicable)	Credit Value	GLH
Mandatory					
L/506/7820	202	Using 2D Computer Aided Design Software	n/a	7	60

To achieve the **City & Guilds 7689-05 Level 3 Award in 2D Computer Aided Design** learners must achieve **12** credits from mandatory unit 302.

Level 3 Award in 2D Computer Aided Design (7689-05)					
UAN	**City & Guilds unit number**	**Unit title**	**Group (if applicable)**	**Credit Value**	**GLH**
Mandatory					
R/506/7821	302	Using 2D Computer Aided Design Software	n/a	12	90

To achieve the **City & Guilds 7689-06 Level 3 Award in 3D Computer Aided Design** learners must achieve **10** credits from mandatory unit 303.

Level 3 Award in 3D Computer Aided Design (7689-06)					
UAN	City & Guilds unit number	Unit title	Group (if applicable)	Credit Value	GLH
Mandatory					
H/506/7824	303	Using 3D Computer Aided Design Software	n/a	10	90

To achieve the **City & Guilds 7689-07 Level 2 Certificate in Computer Aided Design** learners must achieve **18** credits from **both** mandatory units 201 and 202.

Level 2 Certificate in Computer Aided Design (7689-07)					
UAN	City & Guilds unit number	Unit title	Group (if applicable)	Credit Value	GLH
Mandatory					
T/506/8203	201	Computer Aided Design Using Parametric Modelling Software	n/a	11	60
L/506/7820	202	Using 2D Computer Aided Design Software	n/a	7	60

To achieve the **City & Guilds 7689-08 Level 3 Certificate in Computer Aided Design** learners must achieve **22** credits from any **two** of the optional units 301, 302 and 303.

Level 3 Certificate in Computer Aided Design (7689-08)					
UAN	City & Guilds unit number	Unit title	Group (if applicable)	Credit Value	GLH
Optional					
D/506/7823	301	Computer Aided Design Using Parametric Modelling Software	n/a	12	90
R/506/7821	302	Using 2D Computer Aided Design Software	n/a	12	90
H/506/7824	303	Using 3D Computer Aided Design Software	n/a	10	90

Total qualification time (TQT)

Total Qualification Time (TQT) is the number of notional hours which represents an estimate of the total amount of time that could reasonably be expected for a learner to demonstrate the achievement of the level of attainment necessary for the award of a qualification.

TQT comprises of the following two elements:

1) the number of hours that an awarding organisation has assigned to a qualification for guided learning

2) an estimate of the number of hours a learner will reasonably be likely to spend in preparation, study or any other form of participation in education or training, including assessment, which takes place as directed by – but, unlike guided learning, not under the immediate guidance or supervision of – a lecturer, supervisor, tutor or other appropriate provider of education or training.

Title and level	GLH	TQT
City & Guilds Level 1 Award in Parametric Modelling	60	70
City & Guilds Level 2 Award in Parametric Modelling	60	110
City & Guilds Level 3 Award in Parametric Modelling	90	120
City & Guilds Level 2 Award in 2D Computer Aided Design	60	70
City & Guilds Level 3 Award in 2D Computer Aided Design	90	120
City & Guilds Level 3 Award in 3D Computer Aided Design	90	100
City & Guilds Level 2 Certificate in Computer Aided Design	120	180
City & Guilds Level 3 Certificate in Computer Aided Design	180	220

3   Centre requirements

Approval

Full approval

New centres will need to gain both centre and qualification approval. Please refer to the **Centre Approval Process: Quality Assurance Standards** for further information.

Centre staff should familiarise themselves with the structure, content, and assessment requirements of the qualification before designing a course programme.

Resource requirements

Centre staffing

Staff delivering these qualifications must be able to demonstrate they meet the following occupational expertise requirements. They should:

- be occupationally competent or technically knowledgeable in the area[s] for which they are delivering training and / or have experience of providing training (this knowledge must be to the same level as the training being delivered)
- have recent relevant experience in the specific area they will be assessing
- have credible experience of providing training.

Continuing professional development (CPD)
Centres are expected to support their staff in ensuring that their knowledge remains current of the occupational area and of best practice in delivery, mentoring, training, assessment and quality assurance, and that it takes account of any national or legislative developments.

Quality assurance

Approved centres must have effective quality assurance systems to ensure optimum delivery and assessment of qualifications. Quality assurance includes initial centre approval, qualification approval and the centre's own internal procedures for monitoring quality. Centres are responsible for internal quality assurance and City & Guilds is responsible for external quality assurance. All external quality assurance processes reflect the minimum requirements for verified and moderated assessments, as detailed in the Centre Assessment Standards Scrutiny (CASS), section H2 of Ofqual's General Conditions. For more information on both CASS and City and Guilds Quality Assurance processes visit: the **What is CASS?** and **Quality Assurance Standards** documents on the City & Guilds website.

Standards and rigorous quality assurance are maintained by the use of:

- Internal quality assurance
- City & Guilds external quality assurance.

To carry out the quality assurance role, Internal Quality Assurers must:

- have appropriate teaching and vocational knowledge and expertise

- have experience in quality management/internal quality assurance

- hold or be working towards an appropriate teaching/training/assessing qualification

- be familiar with the occupation and technical content covered within the qualification.

External quality assurance for the qualification will be provided by City & Guilds EQA process. EQAs are appointed by City & Guilds to approve centres, and to monitor the assessment and internal quality assurance carried out by centres. External quality assurance is carried out to ensure that assessment is valid and reliable, and that there is good assessment practice in centres.

The role of the EQA is to:

- provide advice and support to centre staff

- ensure the quality and consistency of assessments and marking/grading within and between centres by the use of systematic sampling

- provide feedback to centres and to City & Guilds.

Learner entry requirements

City & Guilds does not set entry requirements for these qualifications. However, centres must ensure that candidates have the potential and opportunity to gain the qualifications successfully.

Age restrictions

- For **Level 1 and 2** City & Guilds will accept registrations for candidates aged pre-16, 16-18 and 19+.

- For **Level 3** City & Guilds will accept registrations for candidates aged 16-18 and 19+.

Access arrangements and reasonable adjustments

City & Guilds has considered the design of these qualifications and the assessments to best support accessibility and inclusion for all learners. We understand however that individuals have diverse learning needs and may require reasonable adjustments to fully participate. Reasonable adjustments, such as additional time or alternative formats, may be provided to accommodate learners with disabilities and support fair access to assessment.

Access arrangements are adjustments that allow candidates with disabilities, special educational needs, and temporary injuries to access the assessment and demonstrate their skills and knowledge without changing the demands of the assessment. These arrangements must be made before assessment takes place.

Equities legislation requires City & Guilds to make reasonable adjustments where a disabled person would be at a substantial disadvantage in undertaking an assessment.

It is the responsibility of the centre to ensure at the start of a programme of learning that candidates will be able to access the requirements of the qualification.

Please refer to the Joint Council for Qualifications (JCQ) access arrangements and reasonable adjustments and access arrangements in the **Centre Document Library** on the City & Guilds website **www.cityandguilds.com** for when and how applications need to be made to City & Guilds.

4   Delivering the qualification

Initial assessment and induction

An initial assessment of each candidate should be made before the start of their programme to identify:

- if the candidate has any specific training needs
- support and guidance they may need when working towards their qualifications
- any units they have already completed, or credit they have accumulated which is relevant to the qualifications
- the appropriate type and level of qualification.

We recommend that centres provide an induction programme so the learner fully understands the requirements of the qualification, their responsibilities as a candidate, and the responsibilities of the centre. This information can be recorded on a learning contract.

Inclusion and diversity

City & Guilds is committed to improving inclusion and diversity within the way we work and how we deliver our purpose which is to help people and organisations develop the skills they need for growth.

More information and guidance to support centres in supporting inclusion and diversity through the delivery of City & Guilds qualifications can be found here:

Inclusion and diversity | City & Guilds (cityandguilds.com)

Sustainability

City & Guilds are committed to net zero. Our ambition is to reduce our carbon emissions by at least 50% before 2030 and develop environmentally responsible operations to achieve net zero by 2040 or sooner if we can. City & Guilds is committed to supporting qualifications that support our customers to consider sustainability and their environmental footprint.

More information and guidance to support centres in developing sustainable practices through the delivery of City & Guilds qualifications can be found here:

Our Pathway to Net Zero | City & Guilds (cityandguilds.com)

Centres should consider their own carbon footprint when delivering this qualification and consider reasonable and practical ways of delivering this qualification with sustainability in mind. This could include:

- reviewing purchasing and procurement processes (such as buying in bulk to reduce the amount of travel time and energy, considering and investing in the use of components that can be reused, instead of the use of disposable or single use consumables)
- reusing components wherever possible
- waste procedures (ensuring that waste is minimised, recycling of components is in place wherever possible)

- minimising water use and considering options for reuse/salvage as part of plumbing activities wherever possible.

Support materials

The following resources are available for these qualifications

Description	How to access
Approval form	**www.cityandguilds.com**

5 Assessment

Assessment of the qualifications

All units in these qualifications are assessed by assignments set by City & Guilds, internally marked by centres and externally verified. These assignments are graded Pass, Merit and Distinction.

Candidates must:

* successfully complete one assignment for each mandatory unit
* successfully complete one assignment for each chosen optional unit (if applicable).

Assessment strategy

City & Guilds has written the following assignments to use with these qualifications. Each assignment consists of practical tasks and short-answer questions.

These assessments have all been developed with input from experts in the industry.

Unit	Level	Title	Assessment method	Where to obtain assessment materials
101	1	Computer Aided Design Using Parametric Modelling Software	Assignment 7689-101 This assignment covers all the learning outcomes in this unit. Assignment set by City & Guilds, internally marked, externally verified.	www.cityandguilds.com
201	2	Computer Aided Design Using Parametric Modelling Software	Assignment 7689-201 This assignment covers all the learning outcomes in this unit. Assignment set by City & Guilds, internally marked, externally verified.	www.cityandguilds.com
202	2	Using 2D Computer Aided Design Software	Assignment 7689-202 This assignment covers all the learning outcomes in this unit. Assignment set by City & Guilds, internally marked, externally verified.	www.cityandguilds.com
301	3	Computer Aided Design Using Parametric	Assignment 7689-301	www.cityandguilds.com

Unit	Level	Title	Assessment method	Where to obtain assessment materials
		Modelling Software	This assignment covers all the learning outcomes in this unit. Assignment set by City & Guilds, internally marked, externally verified.	
302	3	Using 2D Computer Aided Design Software	Assignment 7689-302 This assignment covers all the learning outcomes in this unit. Assignment set by City & Guilds, internally marked, externally verified.	www.cityandguilds.com
303	3	Using 3D Computer Aided Design Software	Assignment 7689-303 This assignment covers all the learning outcomes in this unit. Assignment set by City & Guilds, internally marked, externally verified.	www.cityandguilds.com

Any electronic files or templates that are required to deliver the practical tasks within each assignment are provided on our website. The grading criteria and the mark sheet are provided in each assignment.

Contextualised tasks

Centres are allowed to contextualise the practical tasks within each assignment to suit the needs of different industry sectors. Design specifications within a task can be contextualised, however the grading criteria and the mark sheet provided in each assignment **must** be used and cannot be changed, to ensure validity and comparability of the grades achieved by candidates.

City & Guilds provides a Word version of each assignment on the City & Guilds website that centres can use to contextualise tasks. Further guidance about this is provided in the Assessor Guidance section within each assignment.

If a centre would like to contextualise a task within an assignment they should complete the equivalent Word document of the assignment found on City & Guilds 7689 webpage and forward this to their External Quality Assurer (EQA) for review and approval in advance of it

being used with candidates. Please refer to Section 2. Centre Requirements, Quality assurance.

Centres are **not** allowed to change or contextualise the short-answer questions within the assignments. There is a version A or B for this section and centres can select which version is provided to their candidates.

Time constraints

The following must be applied to the assessment of these qualifications:

- candidates must finish their assessment within six months
- assignments should take no longer than 8 hours. If they do, centres should consider why this is, and make sure that they are not trying to gather too much evidence.

Recognition of prior learning (RPL)

Recognition of prior learning means using a person's previous experience or qualifications which have already been achieved to contribute to a new qualification.

RPL is **not** allowed for these qualifications.

6 Units

Structure of units

These units each have the following:

- City & Guilds reference number
- unit accreditation number (UAN)
- title
- level
- credit value
- guided learning hours
- relationship to NOS, other qualifications and frameworks
- unit aim
- information on assessment
- learning outcomes which are comprised of a number of assessment criteria
- range statements.

Guidance for delivery of the units

These qualifications comprise a number of **units**. A unit describes what is expected of a competent person in particular aspects of their job.

Each **unit** is divided into **learning outcomes** which describe in further detail the skills and knowledge that a candidate should possess.

Each **learning outcome** has a set of **assessment criteria** (performance and knowledge and understanding) which specify the desired criteria that must be satisfied before an individual can be said to have performed to the agreed standard.

Range statements define the breadth or scope of a learning outcome and its assessment criteria by setting out the various circumstances in which they are to be applied.

Unit 101 Computer Aided Design Using Parametric Modelling Software

UAN:	Y/506/7819
Level:	Level 1
Credit value:	7
GLH:	60
Relationship to NOS:	Producing CAD Models (Drawings) using a CAD System
Aim:	This unit will equip candidates with an understanding of the CAD Parametric Modelling environment, in terms of hardware, software and physical surroundings. It will explore the typical composition of a CAD Parametric Modelling system and Health and Safety matters that are associated with safe working practices.
Assessment type	Assignment

Learning outcome:

The learner will:

1. Be able to use a parametric modelling workstation safely

Assessment criteria

The learner can:

1.1 identify **hardware** required for a parametric modelling system

1.2 identify **software** required for a parametric modelling system

1.3 manage files including file types

1.4 follow **legislation** associated with parametric modelling use

1.5 identify safe working practices

1.6 identify **common injuries** associated with extended computer use

Hardware

Processor type and speed, mother board, memory, RAM, ROM, file storage, external storage devices, graphics card, screen resolution, input devices – (mouse, keyboard, touch screen), output devices – (printer / plotter, speakers, monitor, consumables)

Software

Operating systems, device drivers, application programmes, antivirus software

Legislation

Health and Safety at Work, Data Protection Act, copyright

Safe working practices

Lighting, ventilation, good posture, frequent breaks, ergonomics

Common injuries

Eye strain, back / neck strain, RSI

Learning outcome

The learner will:

2. Be able to use key components used in parametric modelling software

Assessment criteria

The learner can:

2.1   identify the **features** of a parametric modelling interface

2.2   use **parametric modelling** to create parts accurately

2.3   identify viewing tools

2.4   use standard templates to create parts and assemblies

Range

Features

Start-up menu, ribbon / toolbar, tabs, browser, design tree, dialogue boxes, properties, drawing aids, visual settings, background colour, units

Parametric modelling

Sketch, origin, default work planes, constraints, line-types, Cartesian co-ordinate system

Viewing tools

Zoom, pan, navigation tools, function keys

The learner will:

3. Be able to use commands to create and constrain sketches

Assessment criteria

The learner can:

3.1   identify the standard work planes

3.2   create sketches on the **standard work planes**

3.3   create **geometry** within the sketch environment

3.4   use geometric constraints when sketching

3.5   display and remove geometric constraints

3.6   add **dimensions** to sketch to further constrain **geometry**

3.7   create construction and centre lines

Range

Standard work planes

Origin, XY, XZ, YZ

Geometry

Lines, arcs, circles, rectangles, slots, ellipses, polygons

Geometric constraints

Coincident, collinear, concentric, parallel, perpendicular, horizontal, vertical, tangent, symmetric, equal

Dimensions

Linear, radius, diameter, angular, aligned, driven

Learning outcome

The learner will:

4. Be able to use commands to produce features

Assessment criteria

The learner can:

4.1 create extruded features from sketched geometry

4.2 create revolved features from sketched geometry

4.3 select surfaces to act as sketch planes for the creation of new features

4.4 edit existing features and sketches by changing their definitions

4.5 create ribs and webs from open and closed profiles

Learning outcome

The learner will:

5. Be able to use placed features to modify parametric models

Assessment criteria

The learner can:

5.1 identify **sketch driven features** and placed features

5.2 state the importance of **design intent** when producing a single part

5.3 create **placed features** on models

5.4 modify **placed features** on models

Range

Sketch driven features

Fillet, chamfer, circle, rectangle

Design intent

The importance of order of design/ logical order of creating design

Placed features

Fillet, chamfer, holes and threads, shell, pattern (circular, rectangular), drafts

The learner will:

6. Be able to create an assembly

Assessment criteria

The learner can:

6.1   place component parts into an assembly

6.2   use assembly **constraints** to assemble and align parts

Range

Constraints

Mate, angle, tangent, insert, symmetry

Learning outcome

The learner will:

7. Be able to produce output using the drawing layout environment

Assessment criteria

The learner can:

7.1   create a new drawing layout using an existing metric template

7.2   control the **appearance of the views** within a layout

7.3   add text annotations to views and title block

7.4   create a drawing layout in a presentation **format** to suit the software in use

Range

Appearance of the views

Orthographic, isometric, hidden, shaded, scale

Format

Printed, PDF, DWF, JPG, BMP, STL

Unit 201   Computer Aided Design Using Parametric Modelling Software

UAN:	T/506/8203
Level:	Level 2
Credit value:	11
GLH:	60
Relationship to NOS:	Producing CAD Models (Drawings) using a CAD System
Aim:	This unit aims to deepen the learners' understanding of the CAD Parametric Modelling environment and its application. It will enable the learner to develop the knowledge and skills to create sketches, work features, table driven parts and assemblies, understand constraints and be able to create a drawing layout.
Assessment type	Assignment

Learning outcome:

The learner will:

1. be able to use a parametric modelling workstation safely

Assessment criteria

The learner can:

1.1   follow **legislation** associated with parametric modelling use

1.2   describe safe working practices

1.3   identify **common injuries** associated with extended computer use

Range

Legislation

Health and Safety at Work, Data Protection Act, copyright

Safe working practices

Lighting, ventilation, good posture, frequent breaks, ergonomics

Common injuries

Eye strain, back / neck strain, RSI

The learner will:

2. Be able to create sketches

The learner can:

2.1   identify default **constraints**

2.2   use **equations** in sketch geometry to drive part design intent

2.3   use advanced sketching **features**

Constraints

Standard 2D constraints (eg coincident, collinear)

Equations

Dimensional relationships, parameter names, visibility

Features

Mirror, offset, copy, move, rotate, pattern, shared sketch, roll back, projected geometry

The learner will:

3. Be able to create work features and use features

The learner can:

3.1   identify work features

3.2   create and edit **work features**

3.3   create and edit **features**

3.4   use advanced hole definition features

Work features

User defined work planes, axes, points

Features

Face draft, rib, web, sweep, coil, loft, split, mirror, emboss (or indent), suppress, unsuppress

Hole definition features

Placement, counterbores, countersinking, thread details, clearances

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Learning outcome:

The learner will:

4. Be able to create table driven parts and assemblies

Assessment criteria

The learner can:

4.1   identify the **controls** when linking table driven parts and assemblies

4.2   create sketch **relational dimensions** to allow design intent to be identified

4.3   create new parts with features **derived** from existing parts within an assembly

4.4   create parts and assemblies controlled by a **linked table**

4.5   create tables to **control** features or parts within a part or assembly

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Range

Controls

Parameters, prefixes, functions, algebraic operators

Derived

Copied geometry, projected geometry, referenced geometry

Relational dimensions

Dimension names, equations, user parameters

Linked table

Parameters table, equations

Control

Display or suppress

The learner will:

5. Understand motion and driven assembly constraints

The learner can:

5.1   describe the types of assembly constraints

5.2   use motion and driven **relationships** between assembly components

Types of assembly constraints

Rotation, rotation-translation, linear

Relationships

Motion constraints

The learner will:

6. Be able to create a drawing layout to aid the interpretation of design intent

The learner can:

6.1   create a **custom template** file

6.2   output a drawing presentation

6.3   use annotation functions

6.4   produce a saved drawing output in a suitable **format**

Custom template

ISO drawing sheet size, orientation, border, title block, first / third angle projection, projected views, auxiliary views, drafting standards, text styles, dimension styles, sketched symbol

Drawing presentation

Orthographic, exploded, isometric, section views, rendered, visual application, animated

Annotation functions

Hole and thread notes, centrelines, centre marks, notes, leaders, parts list, balloon referencing, revision tables and tags, service texture symbols, feature control frames, enquiry tools

Formats

Printed, BMP, GIF, IGES, JPEG, PDF, PNG, SAT, STEP, STL, TIFF, XML

Learning outcome

The learner will:

7. Be able to create presentation quality displays of parts and assemblies

Assessment criteria

The learner can:

7.1   create a presentation quality **scene layout**

7.2   identify suitable **file formats** for transferring to other graphics packages

7.3   export a presentation quality **rendered** graphics file in a suitable format

Range

Scene layout

Visual style, material / appearance, lighting, shadows, background, textures / material types, orthographic or perspective

File formats

BMP, JPEG, PNG

Rendered

Pixel resolution, camera, lighting style, scene style, render type

Unit 202   Using 2D Computer Aided Design Software

UAN:	L/506/7820
Level:	Level 2
Credit value:	7
GLH:	60
Relationship to NOS:	Producing CAD Models (Drawings) using a CAD System
Aim:	This unit will equip candidates with the basic understanding and principles of 2D drawing environment, in terms of hardware, software and physical surroundings. It will explore the typical composition of a CAD system and health and safety matters that are associated with safe working practices.
Assessment type	Assignment

Learning outcome:

The learner will:

1. Be able to use a CAD workstation safely

Assessment criteria

The learner can:

1.1   identify **hardware** required for a 2D CAD system

1.2   identify **software** required for a 2D CAD system

1.3   manage files including file types

1.4   follow **legislation** associated with computer use

1.5   describe safe working practices

1.6   describe how to prevent **common injuries** associated with extended computer use

Hardware

Processor type and speed, mother board, memory, RAM, ROM, file storage, external storage devices, graphics card, screen resolution, input devices – (mouse, keyboard, touch screen, scanner), output devices – (printer / plotter, speakers, monitor, consumables)

Software

Operating systems, device drivers, application programmes, antivirus software

Legislation

Health and Safety at Work, Data Protection Act, copyright

Safe working practices

Lighting, ventilation, good posture, frequent breaks, ergonomics

Common injuries

Eye strain, back / neck strain, RSI

Learning outcome

The learner will:

2. Be able to use key components in 2D CAD software

Assessment criteria

The learner can:

2.1   identify the features of a 2D CAD **interface**

2.2   modify **CAD settings** to create drawings to correct drawing standards

2.3   describe a range of **viewing tools**

Range

Interface

Start-up menu, toolbars, icons, menu bar, dialogue boxes, ribbon, command prompt, properties, drawing aids, visual settings, background colour, units, limits

CAD settings

Layers, colours, line-types, line weight, Cartesian co-ordinate system

Viewing tools

Zoom (extents, all, scale, object), pan, viewports, named views

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The learner will:

3. Be able to create lines and shapes relative to a co-ordinate system

Assessment criteria

The learner can:

3.1   describe the differences between **co-ordinate entry methods**

3.2   use drawing tools to create **lines** and **shapes** accurately

3.3   identify the properties between single line and a line with multiple vertices

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Range

Co-ordinate entry methods

Absolute, relative, polar

Lines

Centre lines, hidden, dashed, arcs

Shapes

Rectangle, polygon, circles, ellipse

Learning outcome

The learner will:

4. Be able to use text, hatch and simple dimensioning routines

Assessment criteria

The learner can:

4.1   create text styles

4.2   use text entry methods to annotate drawings accurately

4.3   justify text during input to specification

4.4   use hatch patterns to enhance drawings

4.5   perform basic **dimension commands** to specification

Range

Text styles

Name, font, font size

Dimension commands

Linear, aligned, angular, radius, diameter, leader

Learning outcome

The learner will:

5. Be able to modify existing drawings

Assessment criteria

The learner can:

5.1   identify **editing routines** used to modify existing drawings

5.2   use editing routines to modify existing drawings

Range

Editing routines

Erase, chamfer, fillet, scale, rotate, trim / extend, break, offset / parallel, lengthen / shorten, explode / join, move, copy, mirror, array, stretch, divide

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Learning outcome

The learner will:

6. Be able to output a 2D drawing layout

Assessment criteria

The learner can:

6.1   produce a border and title block

6.2   **output** a drawing in presentation format to suit the CAD software in use

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Range

Output

Printed, PDF, JPG, BMP

Unit 301   Computer Aided Design Using Parametric Modelling Software

UAN:	D/506/7823
Level:	Level 3
Credit value:	12
GLH:	90
Relationship to NOS:	Producing Mechanical Engineering Drawings using Computer Aided Techniques
Aim:	This unit will enable the learner to develop the knowledge and skills to generate and edit advanced models / assemblies using data driven parameters and to produce photorealistic rendered animations.
Assessment type	Assignment

Learning outcome:

The learner will:

1. Be able to use a parametric modelling workstation safely

Assessment criteria

The learner can:

1.1   follow **legislation** associated with computer use

1.2   explain how **legislation** affects computer use

1.3   describe how to prevent **common injuries** associated with extended computer use

Range

Legislation

Health and Safety at Work, Data Protection Act, copyright

Common injuries

Eye strain, back / neck strain, RSI

Learning outcome

The learner will:

2. Be able to use advanced features when modelling

Assessment criteria

The learner can:

2.1   manage **file types** to generate an advanced assembly

2.2   repair lost or **disjointed relationships** within a part or assembly

2.3   make a design change through editing a part or assembly

2.4   create formed and modelled parts

2.5   create a **shape**

Range

File types

SAT, STEP

Assembly modelling

Imported parts, design history browser

Disjointed relationships

Design error detection and correction, modelling constraints, file location error

Formed and modelled parts

Sheet metal, weldments

Shape

3D sketch, direct co-ordinate entry, spline, sweep, loft

The learner will:

3. Be able to create advanced assemblies

Assessment criteria

The learner can:

3.1   describe assembly modelling techniques

3.2   create an assembly using **modelling techniques**

3.3   create and edit **new parts** within an assembly

3.4   import and constrain a **library feature** into a part / assembly

3.5   use **mating and fastening features** when constructing complex parts / assemblies

Range

Modelling techniques

Top-down, bottom-up, middle-out, design tree, design history browser

New parts

Adaptive features and dimensions

Library feature

Constraint tools, parts library (eg fasteners, bearings, circlips)

Mating and fastening features

Intelligent mating tools, bolted and screw connections

The learner will:

4. Be able to create and modify table driven parts and assemblies

Assessment criteria

The learner can:

4.1   identify the **control parameters** when linking a spreadsheet to a part or assembly

4.2   use a spreadsheet to manipulate **control parameters** within parts and assemblies

4.3   create equations within a spreadsheet to control **features** within parts and assemblies

Range

Control parameters

Parameters, prefixes, functions, algebraic operators, named dimensions

Features

Spreadsheet: dimensions, parameters, equations, define or suppress

Learning outcome

The learner will:

5. Be able to create presentation graphics

Assessment criteria

The learner can:

5.1   use techniques to produce a photorealistic **presentation**

5.2   create a **rendered animation** of a model and export to view in the resident visual software package

5.3   record a **rendered animation** in a suitable **file format** for exporting as a video clip

Range

Presentation

Orthographic or perspective, material / appearance, bitmap texture, lighting styles (directional, point, spot), scene styles, camera, render

Rendered animation

Animation timeline, animation options, render animation

File formats

AVI, MOV, WMV

Unit 302   Using 2D Computer Aided Design Software

UAN:	R/506/7821
Level:	Level 3
Credit value:	12
GLH:	90
Relationship to NOS:	Producing Mechanical Engineering Drawings using Computer Aided Techniques
Aim:	This unit will enable the learner to have the knowledge and practical skills to create complex drawings including annotations and output using multiple view layouts. It will also enable them to manage CAD drawing data and libraries in line with industry standards.
Assessment type	Assignment

Learning outcome:

The learner will:

1. Be able to use a CAD workstation safely

Assessment criteria

The learner can:

1.1   follow **legislation** associated with computer use

1.2   explain how **legislation** affects computer use

1.3   describe how to prevent **common injuries** associated with extended computer use

Range

Legislation

Health and Safety at Work, Data Protection Act, copyright

Common injuries

Eye strain, back / neck strain, RSI

The learner will:

2. Be able to use layers, complex dimensions and text

Assessment criteria

The learner can:

2.1 describe the benefits of using **standards** in CAD drawings

2.2 create multiple **layers**

2.3 explain the purpose of layering systems

2.4 create and use multiple **text styles**

2.5 create and use dimension styles

2.6 explain why dimension styles are used

2.7 create template files

Range

Standards

Company standards, relevant British Standards (BS), International Organisation of Standards (ISO)

Layers

Centre, hidden, outline, border, text, line weight, line type, colour, visibility

Text styles

Font (italic, bold), height, colour

Dimension style

Sub styles (radial, diameter, aligned, angular, linear, leader)

Template files

Borders, layers, text style, dimension style, paper size, title block, output settings

Learning outcome

The learner will:

3. Be able to use library items and external references

Assessment criteria

The learner can:

3.1 explain the benefits of creating and using **library items**

3.2 explain the benefits of using **external references**

3.3 create, edit and save **library items** from existing separate entities

3.4 use **library items** and **external references** for the production of drawings

Range

Library items

Blocks / symbols (including attributes / attached text)

External references

Relevant CAD files, PDF, image files

Learning outcome

The learner will:

4. Be able to produce complex drawings

Assessment criteria

The learner can:

4.1 produce drawings using different **drawing methods**

4.2 describe the benefits of different **drawing methods**

4.3 explain why **drawing aids** and **keyboard shortcuts** are used to assist in drawing production

Range

Drawing methods

Orthographic, first angle, third angle, sectional, assembled, sectioned, isometric, oblique

Drawing aids / Keyboard shortcuts

Orthomode, grid and snap, snaps (eg endpoint, midpoint, centre), function keys, user co-ordinate system, default co-ordinate system

The learner will:

5. Be able to carry out advanced editing processes

Assessment criteria

The learner can:

5.1   identify **numeric information** from existing drawings

5.2   modify properties and geometry of drawn entities using a variety of **methods**

5.3   manipulate **continuous sequences** of line and arc geometry

Range

Numeric information

X, Y co-ordinate point, distance, angle, radius, area

Methods

Pre-command selection, stretch, move, rotate, scale, mirror, match properties, dialogue boxes, keyboard entry, command prompts

Continuous sequences

Polyline / smartline, spline

Learning outcome

The learner will:

6. Be able to use methods to cleanse a CAD drawing

Assessment criteria

The learner can:

6.1   explain why unused items in a CAD drawing require removal

6.2   apply **methods** to delete and rename items within a CAD document

Range

Methods

Purge, rename (symbols, layers, line types, text styles, dimension styles)

The learner will:

7. Be able to output drawings using multiple scale views

Assessment criteria

The learner can:

7.1   create multiple print space **layouts** in preparation for drawing presentation

7.2   apply standard and custom scales to present various views

7.3   modify layer visibility settings in individual views

7.4   explain the **benefits** of producing electronic files for design documentation

7.5   define output settings to create an electronic file / hard copy

Range

Layouts

Title block, border, viewports, scale

Benefits

Speed, efficiency, cost effective, communication, backups, space saving, increased accuracy, interaction between hardware

Output settings

Paper size, orientation, scale, drawing position

Electronic file / hard copy

Printed, PDF, JPG, BMP**,** emails, fax, scanning, CAD drawings

Unit 303   Using 3D Computer Aided Design Software

UAN:	H/506/7824
Level:	Level 3
Credit value:	10
GLH:	90
Relationship to NOS:	Producing Engineering Drawings / Models using 3D Computer Aided Techniques
Aim:	This unit will allow candidates to develop the ability to apply the drafting procedures required to create and modify existing 3D objects, either surfaces or solids, at any position within Three Dimensional Space.
Assessment type	Assignment

Learning outcome:

The learner will:

1. Be able to use a CAD workstation safely

Assessment criteria

The learner can:

1.1 follow **legislation** associated with computer use

1.2 follow safe working practices

1.3 explain how **legislation** affects computer use

1.4 describe how to prevent **common injuries** associated with extended computer use

Range

Legislation

Health and Safety at Work, Data Protection Act, copyright

Safe working practices

Lighting, ventilation, good posture, frequent breaks, ergonomics

Common injuries

Eye strain, back / neck strain, RSI

The learner will:

2. Be able to set the 3D modelling environment

Assessment criteria

The learner can:

2.1 create templates for 3D modelling using various **settings**

2.2 use and restore the default co-ordinate system

2.3 create and apply user co-ordinate systems

2.4 describe the **benefits** of setting up templates for 3D modelling

Range

Settings

Multi-view windows, drawing aids, system parameters, layers, user interface, icon style, limits, units

Benefits

Standardisation, customisation, ISO standards, company standards

Learning outcome:

The learner will:

3. Be able to construct and edit 3D surface models

Assessment criteria

The learner can:

3.1 use drawing tools to create open **2D shapes** using a variety of user co-ordinate systems

3.2 create 3D shapes using surface modelling techniques

3.3 describe 3D surface primitives

3.4 describe **surface editing** routines used to modify existing surface objects

Range

2D shapes

Lines, arcs, multi-segment line

Surface modelling techniques

Extrude, revolve, planer, network, loft, sweep, mesh tools (edgesurf, rulesurf, tabsurf, revsurf)

3D surface primitives

Box, cylinder, sphere, wedge, cone, pyramid, torus

Surface editing

Fillet, trim, extend, sculpt

Learning outcome:

The learner will:

4. Be able to construct and edit a 3D solid model

Assessment criteria

The learner can:

4.1   use drawing tools to create closed **2D shapes** using a variety of user co-ordinate systems

4.2   create 3D shapes using solid modelling techniques

4.3   describe 3D solid primitives

4.4   perform **Boolean operations** on 3D objects

4.5   modify solid objects using **solid editing routines**

Range

2D shapes

Rectangle, polygon, circle, region, multi-segment line (closed)

Solid modelling techniques

Extrude, revolve, sweep, loft

3D solid primitives

Box, cylinder, sphere, polysolid, wedge, cone, pyramid, torus

Boolean operations

Join, subtract, intersect

Solid editing routines

Fillet, chamfer, shell, slice, thicken, imprint, taper face, extrude face, copy face, copy edge

The learner will:

5. Be able to apply commands to manipulate a 3D model

Assessment criteria

The learner can:

5.1 use a 3D library item

5.2 perform **3D operations** on existing 3D models

5.3 obtain mass properties of a 3D solid model

Range

3D operations

3D pattern (rectangular and circular), 3D rotate, 3D mirror

Learning outcome:

The learner will:

6. Be able to apply commands to view 3D models in a variety of display formats

Assessment criteria

The learner can:

6.1 produce **various views** of 3D models

6.2 view 3D models in a variety of **display modes**

6.3 explain **reasons** for creating multiple views of an object

6.4 explain the **benefits** of saving named views

Range

Various views

Cut-away view, cross-sectional view, orthographic views, isometric views, named views

Display modes

Wireframe, conceptual, hidden, realistic, shaded

Reasons

Visualisation, standardisation, clarity, projection, scaling

Benefits

Retrieval, regeneration, efficiency

The learner will:

7. Be able to output a 3D model drawing layout

Assessment criteria

The learner can:

7.1   explain other **uses** for exported 3D CAD data

7.2   present a 3D model using a template

7.3   **output** a multiple view model in presentation format to suit the CAD software in use

Range

Uses

Rapid prototyping, CNC, associated software, 3D printer, laser cutting

Output

Printed, PDF, JPG, BMP, DXF, IGES, SAT, STL

Appendix 1   Relationships to other qualifications

Links to other qualifications

These qualifications have connections to the:

- 7682 Level 2 NVQ Diploma in Performing Engineering Operations
- 1786 Level 3 NVQ Extended Diploma in Engineering Technical Support
- 2850 Level 3 Diploma in Engineering

Appendix 2   Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the Centre document library on www.cityandguilds.com or click on the links below:

Centre Handbook: Quality Assurance Standards

This document is for all approved centres and provides guidance to support their delivery of our qualifications. It includes information on:
- centre quality assurance criteria and monitoring activities
- administration and assessment systems
- centre-facing support teams at City & Guilds/ILM
- centre quality assurance roles and responsibilities.

The Centre Handbook should be used to ensure compliance with the terms and conditions of the centre contract.

Centre Assessment: Quality Assurance Standards

This document sets out the minimum common quality assurance requirements for our regulated and non-regulated qualifications that feature centre-assessed components. Specific guidance will also be included in relevant qualification handbooks and/or assessment documentation.
It incorporates our expectations for centre internal quality assurance and the external quality assurance methods we use to ensure that assessment standards are met and upheld. It also details the range of sanctions that may be put in place when centres do not comply with our requirements or actions that will be taken to align centre marking/assessment to required standards. Additionally, it provides detailed guidance on the secure and valid administration of centre assessments.

Access arrangements: When and how applications need to be made to City & Guilds provides full details of the arrangements that may be made to facilitate access to assessments and qualifications for candidates who are eligible for adjustments in assessment.

The Centre document library also contains useful information on such things as:
- conducting examinations
- registering learners
- appeals and malpractice.

Useful contacts

Please visit the Contact us section of the City & Guilds website.

About City & Guilds

For over 140 years, we have worked with people, organisations and economies to help them identify and develop the skills they need to thrive. We understand the life-changing link between skills development, social mobility, prosperity and success. Everything we do is focused on developing and delivering high-quality training, qualifications, assessments, and credentials that lead to jobs and meet the changing needs of industry.

We partner with our customers to deliver work-based learning programmes that build competency to support better prospects for people, organisations and wider society.

We create flexible learning pathways that support lifelong employability because we believe that people deserve the opportunity to (re)train and (re)learn again and again – gaining new skills at every stage of life, regardless of where they start.

The City & Guilds community of brands includes Gen2, ILM, Intertrain, Kineo and The Oxford Group.