Awards in Computer Aided Design and Manufacturing (7579 -01)

Qualification handbook for centres

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City & Guilds is the UK's leading provider of vocational qualifications, offering over 500 awards across a wide range of industries, and progressing from entry level to the highest levels of professional achievement. With over 8500 centres in 100 countries, City & Guilds is recognised by employers worldwide for providing qualifications that offer proof of the skills they need to get the job done.

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Awards in Computer Aided Design and Manufacturing (7579 -01)

Qualification handbook for centres

Qualification title	Number	Ofqual ref.
Level 1 Award in Computer Aided Design Parametric Modelling	7579-01	500/7032/0
Level 2 Award in Computer Aided Design Parametric Modelling	7579-01	500/7033/2
Level 3 Award in Computer Aided Design Parametric Modelling	7579-01	500/6779/5

Version and date	Change detail	Section
1.3 February 2014	Removed last registration/ certification dates (centres to refer to Walled Garden)	**About this document**

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Contents

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1 About this document

This document contains the information that centres need to offer the following qualifications:

Qualification titles and levels	City & Guilds qualification numbers	Ofqual accreditation numbers	Last registration date	Last certification date
Level 1 Award in CAD Parametric Modelling	7579-01	500/7032/0	Please refer to the Walled Garden for last registration/certification dates	
Level 2 Award in CAD Parametric Modelling	7579-01	500/7033/2		
Level 3 Award in CAD Parametric Modelling	7579-01	500/6779/5		

This document includes details and guidance on:
• centre requirements
• candidate entry requirements
• course design and delivery
• qualification standards and specifications
• assessment requirements

2   About the qualifications

2.1   Accreditation details

Accreditation details

These qualifications are

- accredited by the Qualifications and Curriculum Authority at Level 1, 2 and 3 of the QCF

Qualifications and Credit Framework (QCF)

The QCF replaces the National Qualifications Framework (NQF) in England and Northern Ireland, and is intended to replace the regulated pillar within the Qualifications and Credit Framework for Wales (CQFW). It is also intended to align with the Scottish Credit and Qualifications Framework (SCQF). The QCF provides a way of recognising achievement through the award of credit for units and qualifications. Units within the framework are allocated a:

- level to indicate the level of difficulty
- credit value to indicate the size of the unit. 10 hours of **learning time** = 1 credit value.

Learning time is a notional measure of the amount of time a typical candidate might be expected to take to complete all the learning relevant to achievement of the learning outcomes. It differs from Guided Learning Hours (GLH) which represent only those hours a tutor/trainer or facilitator are present and contributing to the learning process because it takes into account all learning relevant to the learning outcomes regardless of where, when and how it has taken place.

The QCF recognises learning by awarding credit each time a candidate successfully completes a unit. Candidates can accumulate and transfer credit achievement over time.

A unit is the smallest part of learning for which credit is awarded. Candidates can also gain credit for full qualifications.

For further information about the QCF, CQFW and the SCQF, please refer to the websites for each country listed at Appendix 1.

2 About the qualifications

2.2 Aims of the qualifications

The use of computer aide design (CAD) systems in industry has become an essential part of the modern working environment. It is used at all stages of the design period, from conceptualisation and production of working drawings to the production of virtual reality images. These qualifications aim to further candidates understanding of the CAD Parametric Modelling environment, in terms of hardware, software and physical surroundings. They will explore the typical composition of a CAD Parametric Modelling system and Health and Safety matters that are associated with safe working practices

2   About the qualifications

2.3   Rules of combination

Rules of combination are used to define the structure of qualifications. The rules of combination specify the credits which must be achieved through a particular combination of units to gain a full qualification.

A single Award is available at each Level (1, 2 and 3). The following tables outline the qualification number, size of the qualification, the credit value and accreditation unit reference.

Individual Practical Assessment Handbook's have been produced for each of the Parametric Modelling awards. These can be found on the City & Guilds 7579 website.

2.4   **Level 1 Award in CAD Parametric Modelling**

To achieve the Level 1 Award in CAD Parametric Modelling learners must achieve **7** credits from the mandatory units listed in the table below:

Accreditation unit reference	City & Guilds unit number	Unit title	Mandatory/ optional for full qualification	Credit value
K/600/3262	Unit 101	Computer Aided Design Parametric Modelling	Mandatory	7
n/a	Unit 104	Parametric Modelling GOLA on-line test	Mandatory	n/a

2.5 **Level 2 Award in CAD Parametric Modelling**

To achieve the Level 2 Award in CAD Parametric Modelling learners must achieve **10** credits from the mandatory units listed in the table below:

Accreditation unit reference	City & Guilds unit number	Unit title	Mandatory/ optional for full qualification	Credit value
A/600/3265	Unit 102	Computer Aided Design Parametric Modelling	Mandatory	10
n/a	Unit 105	Parametric Modelling GOLA on-line test	Mandatory	n/a

2.6 **Level 3 Award in CAD Parametric Modelling**

To achieve the Level 3 Award in CAD Parametric Modelling learners must achieve **10** credits from the mandatory units listed in the table below:

Accreditation unit reference	City & Guilds unit number	Unit title	Mandatory/ optional for full qualification	Credit value
F/600/3266	Unit 103	Computer Aided Design Parametric Modelling	Mandatory	10
n/a	Unit 106	Parametric Modelling GOLA on-line test	Mandatory	n/a

2   About the qualifications

2.7 Relevant sources of information

Related publications

City & Guilds also provides the following documents specifically for these qualifications:

Publication	Available from
Practical Assessment Handbooks	website
Centre Guides	website
Learner Guides	website
FAQ	website
Fast track approval form/generic fast track approval form	website

Other essential City & Guilds documents

There are other City & Guilds documents which contain general information on City & Guilds qualifications:

- ***Providing City & Guilds qualifications – a guide to centre and qualification approval***
  contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification.

- ***Ensuring quality***
  contains updates on City & Guilds assessment and policy issues.

- ***Centre toolkit***
  contains additional information on *Providing City & Guilds qualifications*, in a CD-ROM, which links to the internet for access to the latest documents, reference materials and templates. The *Centre Toolkit* is sent to centres when they receive approved centre status. It is also available from to order at an additional cost.

- ***Online catalogue/shop***
  contains details of general regulations, registration and certification procedures and fees.

For the latest updates on our publications and details of how to obtain them and other City & Guilds resources, please refer to the City & Guilds website.

City & Guilds websites

Website	Address	Purpose and content
City & Guilds main website	**www.cityandguilds.com**	This is the main website for finding out about the City & Guilds group, accessing qualification information and publications.
Walled Garden	**www.walled-garden.com**	The Walled Garden is a qualification administration portal for approved centres, enabling them to register candidates and claim certification online.

Contacting City & Guilds by e-mail

The following e-mail addresses give direct access to our Customer Relations team.

e-mail	Query types
learnersupport@cityandguilds.com	all learner enquiries, including • requesting a replacement certificate • information about our qualification • finding a centre.
centresupport@cityandguilds.com	all centre enquiries
walledgarden@cityandguilds.com	all enquiries relating to the Walled Garden, including • setting up an account • resetting passwords.

3 Centre requirements

3.1 Obtaining centre and qualification approval

Only approved organisations can offer City & Guilds qualifications. Organisations approved by City & Guilds are referred to as **centres.**

Centres must meet a set of quality criteria including:
- provision of adequate resources, both physical and human
- clear management information systems
- effective assessment and quality assurance procedures including candidate support and reliable recording systems.

An organisation that has not previously offered City & Guilds qualifications must apply for approval to become a centre. This is known as the **centre approval process (CAP).** Centres also need approval to offer a specific qualification. This is known as the **qualification approval process (QAP)**. In order to offer these qualifications, organisations which are not already City & Guilds centres must apply for centre and qualification approval at the same time. Existing City & Guilds centres will only need to apply for qualification approval for these particular qualifications.

Full details of the procedures and forms for applying for centre and qualification approval are given

City and Guilds branch offices will support new centres through the approval process. They will appoint an External Verifier. They will also provide details of fees applicable for approvals. The local office will be the point of contact for all enquiries for these qualifications and will be responsible for monitoring the delivery and assessments through reports submitted by External Verifiers. They will be the first point of contact for any enquiries regarding the multiple choice examination.

Assessments must not be undertaken until qualification approval has been obtained and candidates have been registered.

City & Guilds reserves the right to withdraw qualification or centre approval for reasons of debt, malpractice or non-compliance with City & Guilds' policies, regulations, requirements, procedures and guidelines, or for any reason that may be detrimental to the maintenance of authentic, reliable and valid qualifications or that may prejudice the name of City & Guilds.

3 Centre requirements

3.2 Fast Track Approval

Centres approved to offer the Levels 1 to 3 Certificates in CAD Parametric Modelling (4353-21 to 23) may apply for approval for the new Levels 1-3 Awards in Computer Aided Design Parametric Modelling (7579-01) using the **fast track approval form**, available from the City & Guilds 7579 website.

Centres may apply to offer the new qualifications using the fast track form

- providing there have been no changes to the way the qualifications are delivered, and
- if they meet all of the approval criteria specified in the fast track form guidance notes.

Fast track approval is available for 12 months from the launch of the qualification. After this time, the qualification is subject to the **standard** Qualification Approval Process. It is the centre's responsibility to check that fast track approval is still current at the time of application.

3.3 Global online assessment (GOLA)

The assessment includes assignments and multiple-choice tests which covers the knowledge requirements for **each** Unit. The multiple choice test will be delivered on-line through the City & Guilds GOLA system with no paper-based alternative. Centres are required to register as a GOLA centre before any tests can be scheduled. The form for this is available from the website **www.city-and-guilds.co.uk/e-assessment**

A centre only needs to register once for GOLA

There is a GOLA helpline number - centre enquiries and technical enquiries about GOLA can be directed to this number **0845 241 0070**.

Centres can also e-mail: **gola@city-and-guilds.co.uk**

3 Centre requirements

3.4 Resource requirements

Physical resources

Centres must have an adequate learning environment. Resources should be accessible and reflect the nature of the qualification. They must also ensure that they have the staff and access to sufficient equipment so that candidates have the opportunity to cover all of the activities of the qualification.

Centre staff

Centre staff must satisfy the requirements for occupational expertise for these qualifications. Staff should be technically competent and experienced in the units for which they are delivering, teaching, training and assessing learning

3.5 Registration and Certification

Candidates must be registered at the beginning of their course. Centres should submit registrations using the Walled Garden, or Form S (Registration), under qualification and complex number -7579-01.

For each Award candidates must successfully complete two assignments and a multiple-choice test which covers the knowledge requirements. The multiple choice test will be delivered on-line through the City & Guilds GOLA system with no paper-based alternative (see also centre/scheme approval below).

When all assessment requirements have been successfully completed, internally and externally verified, candidate results should be submitted on the Walled Garden or Form S (Results). Centres should note that results will not be processed by City & Guilds where verification records are not complete.

Candidates will be graded with Pass or Fail for the GOLA test and the two practical assignments for each Award. Candidates achieving the required Rules of Combination will be issued with the full Level 1/2/3 Award in Computer Aided Design Parametric Modelling. For information on the registration and certification periods for the qualification, centre should refer to the City & Guilds Directory of qualifications.

Full details of City & Guilds' administrative procedures for this qualification are provided in the *Directory of qualifications,* provided online to City & Guilds registered centres. This information includes details on:
- registration procedures
- enrolment numbers
- fees
- claiming certification.

These details are also available on the **www.cityandguilds.com**

3 Centre requirements

3.6 Quality Assurance

Internal 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 standardising and monitoring quality. Centres are responsible for internal quality assurance, ensuring that there are appropriate opportunities for open communication between the course team, scheme co-ordinator and external verifier. City & Guilds is responsible for external quality assurance.

Full details and guidance on the internal and external quality assurance requirements and procedures, are provided in *Providing City & Guilds Qualifications* and in the centre toolkit. This document also explains the tasks, activities and responsibilities of quality assurance staff.

All candidates' evidence must be available for external verification, Centres are also required to retain copies of candidates' assessment and internal verification records for three years after certification.

National standards and rigorous quality assurance are maintained by use of:
- City & Guilds assignment, marked by the centres according to externally set marking criteria
- Portfolio evidence assessed against set criteria
- Internal (centre) quality assurance
- City & Guilds external verification.

To meet the quality assurance criteria for this qualification, the centre must ensure that the following internal roles are undertaken:
- quality assurance co-ordinator
- primary assessor
- independent assessor
- internal verifier.

External quality assurance

External verifiers are appointed by City & Guilds to approve centres, and to monitor the assessment and internal quality assurance carried out by centres. External verification is carried out to ensure that assessment is valid and reliable, and that there is good assessment practice in centres.

To carry out their quality assurance role, external verifiers must have appropriate occupational and verifying knowledge and expertise. City & Guilds external verifiers attend training and development designed to keep them up-to-date, to facilitate standardisation between verifiers and to share good practice.

Further details of the role of external verifiers are given in *Providing City & Guilds qualifications*.

4 Course design and delivery

Recommended delivery strategies

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

Provided that the requirements for the qualifications are met, centres may design course programmes of study in any way that they feel best meets the needs and capabilities of their candidates. Relationship tables are provided in Appendix 1 Relationships to other qualifications to assist centres with the design and delivery of the qualification.

Centres may wish to include topics as part of the course programme which will not be assessed through the qualifications for example to address local, organisational or government needs. Provided the aims, outcomes and knowledge requirements are met, centres have the flexibility to deliver the qualification in as many hours as they deem appropriate.

Data protection and confidentiality

Centres offering these qualifications may need to provide City & Guilds with personal data for staff and candidates. Centres will need to abide by the legal requirements of the country that they operate in. Centres and staff will be expected to maintain the confidentiality required by the laws and policies of national governments and the centres that offer the qualifications.

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 commence the programme.

Should a candidate fail to follow health and safety practice and procedures during an assessment, the assessment must be stopped. The candidate should be informed that they have not reached the standard required to successfully pass the assessment and told the reason why. Candidates may retake the assessment at a later date, at the discretion of the centre. In case of any doubt, guidance should be sought from the external verifier.

Initial assessment and induction

Centres will need to make an initial assessment of each candidate prior to the start of their programme. Candidates should have a reasonable level of English language and literacy skills.

The initial assessment should identify any specific training needs the candidate has, and the support and guidance they may require when working towards their qualification. The results of initial assessment will assist centres and tutors with the design and delivery of the courses to meet the particular needs of their candidates for both the class based and practical aspects of the course.

Centres should provide an induction programme to ensure the candidate fully understands the requirements of the qualifications they will work towards, their responsibilities as a candidate, and the responsibilities of the centre. It may be helpful to record the information as part of the learning contract/individual learning plan.

Equal opportunities

It is a requirement of centre approval that centres have an equal opportunities policy (see *Providing City & Guilds qualifications*).

The regulatory authorities require City & Guilds to monitor centres to ensure that equal opportunity policies are being followed.

The City & Guilds equal opportunities policy is set out on the City & Guilds website, in *Providing City & Guilds qualifications*, in the *Directory of qualifications*, and is also available from the City & Guilds Customer Relations department.

Access to assessment

City & Guilds' guidance and regulations on access to assessment are designed to facilitate access for assessments and qualifications for candidates who are eligible for adjustments to assessment arrangements. Access arrangements are designed to allow attainment to be demonstrated. For further information, please see Access to assessment and qualifications, available on the City & Guilds website.

Results and certification

All candidates for City & Guilds qualifications receive a Notification of Candidates Results giving details of their performance.
Centres will also receive a consolidated results list detailing the performance of all candidates they enter, whether they are successful or not.

Further information about the issue of results and certification for centres is available online at www.cityandguilds.com or by contacting the City & Guilds Operations Support Service enquiries team

Appeals

Centres must have their own, auditable, appeals procedure that must be explained to candidates during their induction. Appeals must be fully documented by the quality assurance co-ordinator and made available to the external verifier or City & Guilds.

Further information on appeals is given in *Providing City & Guilds qualifications.* There is also information on appeals for centres and learners on the City & Guilds website or available from the Customer Relations department.

5 Units

5.1 About the units

Structure of units

The units in these qualifications are written in a standard format and comprise the following:

- City & Guilds reference number
- title
- level
- credit value
- unit aim
- relationship to NOS/other qualifications
- endorsement by a sector or other appropriate body
- statement of guided learning hours
- assessment and grading
- learning outcomes which are comprised of a number of practical and/or knowledge based assessment criteria
- guidance notes.

Summary of units

City & Guilds unit number	Title	QCF unit number	Credits
101	Computer Aided Design Parametric Modelling	K/600/3262	7
102	Computer Aided Design Parametric Modelling	A/600/3265	10
103	Computer Aided Design Parametric Modelling	F/600/3266	10
104	Parametric Modelling GOLA on-line test	n/a	n/a
105	Parametric Modelling GOLA on-line test	n/a	n/a
106	Parametric Modelling GOLA on-line test	n/a	n/a

Unit 101   Computer Aided Design Parametric Modelling

Level: 1

Credit value: 7

Unit aim

To 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.

Learning outcomes

There are **eight** learning outcomes to this unit. The learner will be able to:

1. use associated IT, CAD hardware and operating systems
2. use basic file management techniques and maintain health and safety requirements
3. demonstrate an understanding of the parametric modelling process, the user interface and how to access help and tutorials
4. use a range of commands to create and constrain sketches
5. use the range of commands to produce extruded and revolved features
6. use placed features to modify parametric models
7. use methods to create assemblies
8. use the drawing layout environment to produce hard copies.

Guided learning hours

It is recommended that **60** hours should be allocated for this unit. This may be on a full-time or part-time basis.

Endorsement of the award by a sector or other appropriate body

This award is endorsed by SEMTA

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- communication
- information and Communication Technology
- improving Own Learning and Performance
- Problem Solving

Assessment and grading

This unit will be assessed by:

1. two assignments covering practical skills
2. one GOLA on-line test covering underpinning knowledge.

Unit 101　　Computer Aided Design Parametric Modelling

Outcome 1　　Use associated IT, CAD hardware and operating systems

Assessment Criteria
Practical Skills
The learner can:
1. select and use necessary hardware for a generic parametric modelling station
2. select appropriate printer/plotter paper
3. recognise and report problems relating to hardware components
   printer jams
   i)　　running out of paper
   ii)　　software problems due to hardware
   iii)　　VDU output quality
   iv)　　Keyboard or mouse not functioning properly
4. use different parts of the desktop to initiate software:
   i)　　icons
   ii)　　task bar
   iii)　　status bar
   iv)　　menu options
5. use the following functions of the desktop window
   i)　　maximise and minimise a window
   ii)　　restore a window from the task bar
   iii)　　manipulate the size of the active window
   iv)　　evoke a number of windows at the same time
   v)　　move windows on the desktop
   vi)　　switch between different programs
   vii)　　drag and drop information from one window to another

Underpinning Knowledge
The learner can:
1. identify and describe the purpose of the main components of a parametric modelling computer station:
   i)　　processor
   ii)　　memory
   iii)　　file storage
2. define the different types of common file storage available for a parametric modelling station and explain the need for these methods including:
   i)　　CD ROM
   ii)　　hard drive
   iii)　　USB
3. recognise the effects of hardware specifications on the efficiency of the parametric modelling system specifically relating to:
   i)　　processor type and speed
   ii)　　RAM
   iii)　　video processor card
4. describe briefly input and output devices used within a parametric modelling station
   i)　　printer/plotter
   ii)　　mouse
   iii)　　keyboard
   iv)　　VDU
   v)　　modem

5. identify necessary consumables and media that are used in conjunction with hardware:
   i)   printer/plotter paper
   ii)   ink/toner cartridges
6. identify the use of the internet in relation to the operation of a parametric modelling station
   i)   downloading CAD files from a web site
   ii)   sending/receiving parametric modelling files via e-mail
7. state the effect of different screen resolutions on the VDU output
   i)   quality of graphics
   ii)   operational size of window
   iii)   display size
8. identify the terminology related to the operation of the desktop environment
   i)   icons
   ii)   task bar
   iii)   status bar
   iv)   menu options

Unit 101   Computer Aided Design Parametric Modelling

Outcome 2   Use basic file management techniques and maintain health and safety requirements

Assessment Criteria
Practical Skills
The learner can:
1. use a range of basic file operations: new, open, save, save as, close.
2. create new named directories/folders and move/copy files between directories, including to and from other storage media.
3. delete and rename files and directories/folders that have been created
4. create back-up copies of files and directories/folders
5. find files that have been incorrectly located within a series of directories
6. display lists of files contained within a specific folder or directory, including details of file extensions

Underpinning Knowledge
The learner can:
1. describe briefly the directory/folder structure on a computer
2. identify ways of preventing the loss of data:
    i)   write protection
    ii)   virus checking
    iii)   back-up procedures
3. describe briefly what elements and practices create a good working environment
    i)   frequent breaks from the computer
    ii)   correct positioning of screens, chairs and keyboards
    iii)   lighting and ventilation requirements
4. state the health and safety precautions to adopt when using a computer
    i)   ensure power cables are safely secured
    ii)   ensure that power points are not overloaded
5. state common injuries associated with the use of computers
    i)   repetitive strain injury (RSI)
    ii)   eye strain
    iii)   bad posture
6. state current British or European legislation associated with the use of computers and health and safety
    i)   copyright
    ii)   data protection
    iii)   health & safety executive (HSE)

Unit 101 Computer Aided Design Parametric Modelling

Outcome 3 Demonstrate an understanding of the parametric modelling process, the user interface and how to access help and tutorials.

Assessment Criteria
Practical Skills

The learner can:

1. use toolbars and other menus to access commands
2. move toolbars within the parametric modelling environment to create usable work area
3. use viewing and zoom tools to manipulate geometry display on screen
4. change the background colour and graphics display in the work area
5. access the help menus and search for command explanations and online tutorial
6. Use standard templates

Underpinning knowledge

The learner can:

1. identify the use of the different menu bar tools and toolbar sets available within the parametric modelling system and the purpose of :
   i) scroll bars
   ii) display
   iii) viewing options
2. state the use of parts, assemblies and drawings within the context of parametric modelling
3. state the purpose of the design tree within a parametric modelling system
4. state briefly how the standard work planes relate to the origin point
5. state the use of standard templates

Unit 101   Computer Aided Design Parametric Modelling

Outcome 4   Use a range of commands to create and constrain sketches

Assessment Criteria

The learner can:

1. use the sketching environment to create geometry including lines, circles and arcs
2. use general geometric constraints when sketching including vertical, horizontal, parallel, tangent, perpendicular and coincident
3. display and add/remove additional geometric constraints to/from the sketch including equal, tangent, midpoint and concentric.
4. add linear, radial and angular dimensions to sketches as a means of a further constraining geometry
5. change the properties of sketch features to create construction and centre lines
6. create sketches onto the standard planes within the parametric modelling package

Underpinning knowledge

The learner can:

1. state the reason for using geometric constraints within a sketch and a model
2. state the difference between geometric and dimensional constraints
3. state the difference between a driving and driven dimension
4. state the reasons for beginning a model by sketching on to a default plane
5. state possible faults that might occur within a sketch
6. describe the use of sketching tools

Unit 101   Computer Aided Design Parametric Modelling

Outcome 5   Use the range of commands to produce extruded and revolved features.

Assessment Criteria

Practical Skills

The learner can:

1. create an extruded feature from a sketch
2. select a suitable face on a solid model to act as a sketching plane for the creation of a new feature
3. modify an existing solid model by using the extruded cut feature
4. create a revolved feature from a sketch
5. modify an existing solid model by using the revolved cut feature
6. create features that are constrained in different ways including mid plane, by distance or angle, to and to next
7. edit and modify existing features and sketches by changing their definitions
8. create simple ribs and webs from open and closed profiles.

Underpinning knowledge

The learner can:

1. state the reasons for choosing a face on an existing solid model as the basis of a new sketch as an alternative to using standard planes
2. describe briefly the concept of an extruded feature and how this relates to sketches and the finished model
3. describe briefly the concept of a revolved feature and how this relates to sketches and the finished model
4. state how the extrude and revolve feature commands can be used to modify existing geometry
5. state when centre and construction lines would be used in a sketch

Unit 101   Computer Aided Design Parametric Modelling

Outcome 6   Use placed features to modify parametric models

Assessment Criteria

Practical Skills

The learner can:

1. use the fillet feature to modify a solid model
2. use the chamfer feature to modify an existing solid model
3. use the hole definition feature as a means of defining drilled holes within a solid model
4. use the shell feature to remove material and faces from a solid model
5. use the pattern feature to create rectangular and circular patterns of existing features within a solid model
6. modify placed features (fillets, chamfers etc).

Underpinning knowledge

The learner can:

1. state the difference between sketch driven features and placed features
2. state the reasons for using the shell feature to create uniform wall thickness within a model
3. state the importance of considering the design intent
4. state the difference between rectangular and circular patterns and the geometric requirements of each type
5. state the advantages of using the hole definition feature
6. describe the use of placed feature tools

Unit 101   Computer Aided Design Parametric Modelling

Outcome 7   Use methods to create assemblies

Assessment Criteria
Practical Skills

The learner can:
1. start a new assembly and insert existing component parts
2. create new parts within an assembly environment
3. use simple assembly constraints and mates to assemble and align parts and correct over constraining
4. use view controls to move and rotate components and use view controls to assist in producing assembly.

Underpinning knowledge

The learner can:
1. state the reason for creating an assembly from existing parts only
2. state the reasons for creating parts within an assembly only
3. state that constraints are used to align components in an assembly
4. state the difference between a sub assembly and a full assembly

Unit 101   Computer Aided Design Parametric Modelling

Outcome 8   Use the drawing layout environment to produce hard copies

Assessment Criteria

Practical Skills

The learner can:
1. start a new drawing layout using an existing template
2. control the scale and display characteristics of views within a drawing
3. add annotations to views and title blocks
4. produce hard copy output to a print/plot device

Underpinning knowledge

The learner can:
1. state the reason for using the drawing layout environment to create hard copy output
2. state the need for using scaling when working with views and when sending output to a plot device
3. state the use of annotations

Unit 102 Computer Aided Design Parametric Modelling

Level: 2

Credit value: 10

Unit aim

The use of computer aide design (CAD) systems in industry has become an essential part of the modern working environment. It is used at all stages of the design period, from conceptualisation and production of working drawings to the production of virtual reality images. This unit aims to further candidates understanding of the CAD Parametric Modelling environment.

Learning outcomes

There are **six** learning outcomes to this unit. The learner will be able to:

1. use complex sketching and 2D constraints to create features
2. create and edit work features and use complex feature commands
3. create and modify simple table driven parts and assemblies
4. use motion and driven assembly constraints
5. add additional information to a drawing layout to aid the interpretation of design intent
6. create presentation quality displays of parts and assemblies

Guided learning hours

It is recommended that **90** hours should be allocated for this unit. This may be on a full-time or part-time basis.

This unit is linked to the Performing Engineering Operations Level 2, unit 61 Producing CAD models (drawings) using a CAD system.

This unit is endorsed by SEMTA.

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:

- Communication
- Information and Communication Technology
- Improving Own Learning and Performance
- Problem Solving

Assessment and grading

This unit will be assessed by:

1. two assignments covering practical skills
2. one GOLA on-line test covering underpinning knowledge.

Unit 102 Computer Aided Design Parametric Modelling

Outcome 1 Use complex sketching and 2D constraints to create features

Assessment Criteria
Practical Skills
The learner can:
1. share the sketch to re-use sketch geometry to create additional features
2. roll back through an object to aid in the creation of sketches on planes within the body of the solid
3. apply the use of the project command to create new sketches based on the geometry of other parts and features
4. apply the use of simple equations in sketch dimensions to drive part design intent and allow display of those equations on screen
5. apply the use of advanced sketching features such as mirror, offset, copy, move and pattern.

Underpinning Knowledge
The learner can:
1. explain the reasons for sharing sketches to create multiple features
2. explain how splitting an object aids in the creation of sketch geomtery
3. state how projecting geometry between parts aids creating linked parts
4. explain how using equations in sketch geometry helps drive part design intent
5. explain advantages of using the advanced sketching feature
6. identify sketching features such as mirror, effect, copy, move and pattern

Unit 102   Computer Aided Design Parametric Modelling

Outcome 2   Create and edit work features and use complex feature commands

Assessment Criteria
Practical Skills
The learner can:
1. create and edit work features such as planes, axes and points from existing part and assembly geometry.
2. create and edit work features from existing planes, points and axes.
3. create and edit face drafts
4. create and edit complex ribs, webs and struts up to existing geometry from open and closed profiles
5. create and edit a swept feature from a sketched shade following existing 2D geometry
6. create and edit a coiled feature from a sketched shape
7. create and edit a simple loft feature between two sketched shapes or between two sections of existing geometry
8. split parts, using existing geometry, planes or sketches to define the split position
9. apply the use of the mirror command to create additional features from existing geometry and features
10. create an embossed or indented shape from a sketch onto a part or assembly
11. apply the use of the advanced features for hole definition to allow for counter bores, countersinking, thread details and clearances
12. add cosmetic threads to shafts and bored holes
13. create suppressed features in parts and assemblies

Underpinning Knowledge
The learner can:
1. explain the purpose of work planes, axes and points
2. explain why the rib and web commands would be used in preference to the extrude command
3. explain the type of features the sweep, coil and loft commands would create
4. state where the split command would be used
5. explain reasons for the use of mirrored features
6. explain the advantages of the hole feature
7. explain the application of using an embossed or indented shape
8. explain the advantages of the thread feature
9. explain the reasons for suppressing features
10. explain the reasons for using face drafts

Unit 102 Computer Aided Design Parametric Modelling

Outcome 3   Create and modify simple table driven parts and assemblies

Assessment Criteria
Practical Skills
The learner can:
1. add meaningful names to sketch dimensions to allow relationships and design intent to be identified
2. apply the use of commands and actions within the parametric modelling software to allow parts to be created and modified through the use of simple tables
3. apply the use of commands and actions within the parametric modelling software to allow assemblies to be created and modified through the use of simple tables
4. apply the use of tables to control the display or suppression of features within a part
5. apply the use of tables to control the display or suppression of parts within an assembly
6. apply the use of commands to create new parts with features derived from the geometry of existing parts and features within an assembly

Underpinning knowledge
The learner can:
1. state reasons for naming dimensions
2. explain the uses for table driven features
3. explain how table driven parts are created and used
4. explain how table driven assemblies are created and used
5. explain how derived features can be used to create new parts based on the geometry of a previous part
6. explain what is meant by the term 'derived feature'
7. explain the reasons for using tables for suppressing features

Unit 102   Computer Aided Design Parametric Modelling

Outcome 4   Use motion and driven assembly constraints

Assessment Criteria

The learner can:

1. specify intended motion ratios between assembly components
2. drive the motion constraints with an assembly file
3. create exploded assemblies that show how the parts fit together
4. export in a suitable file format a driven assembly model to allow animated display outside of the parametric software

Underpinning knowledge

The learner can:

1. explain the reasons for constraining the relative motion of parts within an assembly
2. explain how the constraints can be driven to provide the relative movement of parts within an assembly
3. explain the reason for using exploded assemblies
4. identify suitable file formats for animated assembly files.

Unit 102   Computer Aided Design Parametric Modelling

Outcome 5   Add additional information to a drawing layout to aid the interpretation of design intent.

Assessment Criteria

Practical Skills

The learner can:
1. create and use standard templates including different projections and dimensions styles
2. create template files
3. create and use sketched symbols within the drawing environment
4. create and edit and display hole and thread notes
5. apply the use of enquiry commands to find and display dimensional or other information about a part or assembly
6. create projected and auxiliary views
7. add additional dimensions to view using existing drawing standards
8. create section and detail views of parts and assemblies
9. create and edit parts lists and balloon referencing within a drawing
10. create and edit revision tables and tags within a drawing
11. add standard symbols to drawings to aid identification of design intent in a manufacturing environment
12. produce hard copy output to a print/plot device using appropriate scales
13. create files for exporting to manufacturing devices

Underpinning knowledge

The learner can:
1. recognise the difference between first and third angle projections
2. recognise the difference between a projected and auxiliary view
3. explain when section and detail views would be needed
4. explain how sketched symbols are created
5. explain how hole and thread notes are created
6. explain how a parts list/bill of materials table is created and edited
7. explain the use for revision tables and tags
8. identify suitable file formats for exporting to manufacturing devices
9. explain the effect of modifying views
10. explain the reasons for using and creating template files

Unit 102   Computer Aided Design Parametric Modelling

Outcome 6   Create presentation quality displays of parts and assemblies

Assessment Criteria
Practical Skills

The learner can:
1. create a basic scene layout and apply standard rendering
2. define settings for rendering quality, lighting and background image
3. apply textures and material types to parts as appropriate
4. alter the image display to show parts or assemblies in perspective view
5. save rendered scene in a suitable file format for transferring into other graphics packages

Underpinning knowledge

The learner can:
1. explain the term 'photorealistic' in the context of a rendered scene of parts or assemblies
2. explain the need for presentation graphics in the design for manufacture environment
3. identify suitable file types for transferring of graphical bitmap images.

Unit 103 Computer Aided Design Parametric Modelling

Level: 3

Credit value: 10

Unit aim

The use of computer aide design (CAD) systems in industry has become an essential part of the modern working environment. It is used at all stages of the design period, from conceptualisation and production of working drawings to the production of virtual reality images. This unit aims to further candidates 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

Learning outcomes

There are **four** learning outcomes to this unit. The learner will be able to:
1. use advanced features and parts modelling
2. use advanced assembly modelling
3. link with external spreadsheets to create complex table driven parts and assemblies
4. use advanced presentation graphics.

Guided learning hours

It is recommended that **90** hours should be allocated for this unit. This may be on a full-time or part-time basis.

This unit is linked to the Engineering Woodworking, Pattern and Model Making Level 3, unit 21 Producing Drawings for Patterns and Models using 2D Computer Aided Techniques.

This unit is endorsed by SEMTA.

Key Skills

This unit may help candidates to gain confidence in, and possibly generate portfolio evidence for, the following Key Skills:
- Communication
- Information and Communication Technology
- Improving Own Learning and Performance
- Problem Solving

Assessment and grading

This unit will be assessed by:
1. two assignments covering practical skills
2. one GOLA on-line test covering underpinning knowledge.

Unit 103   Computer Aided Design Parametric Modelling

Outcome 1   Use advanced features and parts modelling

Assessment Criteria
Practical Skills
The learner can:
1. apply the use of imported parts and assemblies
2. apply the use of the design history table to re-order features appropriately
3. re-establish and repair lost or disjointed relations and dimensions
4. carry out significant design changes to a model through editing and modifying the parts and assemblies
5. utilise both formed and modelled parts to create complex components
6. create splines and complex three dimensional sketches that are defined by direct coordinate entry, dimensions and relations
7. create a complex swept feature that follows a 3D sketch
8. create and edit a complex loft feature between several sketch shapes following a 3D guide curve

Underpinning Knowledge
The learner can:
1. explain possible reasons for a failed derived feature
2. explain why some features might not be able to be re-ordered within the design history table and advise some possible resolutions to overcome this problem
3. identify the advantages and disadvantages of a 3D sketch over other, more conventional modelling methods
4. explain the reasons for using a 3D guide curve
5. explain direct coordinate entry and it's application

Unit 103 Computer Aided Design Parametric Modelling

Outcome 2 Use advanced assembly modelling

Assessment Criteria
Practical Skills
The learner can:
1. Apply the use of the top-down design to produce, edit and modify parts for assemblies
2. create and edit a new part within a complex assembly using the assembly as the context for adaptive relations and dimensions
3. break external references to a part that was created using the top-down design method
4. create and completely constrain an imported library feature into a part/assembly and, where necessary, correct or re-apply relevant controls to the feature
5. make use of intelligent mating features for the construction of complex assemblies
6. make use of intelligent fastening features for the construction of complex assemblies

Underpinning Knowledge
The learner can:
1. explain when top-down design might be an appropriate method of model creation
2. explain why it would be necessary to break the external references to parts created using top-down design
3. describe the advantages of using library features with parts/assemblies
4. describe the advantages of using intelligent features within parts/assemblies

Unit 103 Computer Aided Design Parametric Modelling

Outcome 3 Link with external spreadsheets to create complex table driven parts and assemblies

Assessment Criteria

Practical Skills

The learner can:

1. create and utilise externally linked spreadsheets to control parameters and configurations within parts and assemblies
2. apply the use of complex equations within a spreadsheet to control dimensions, parameters and define or suppress features within parts and assemblies

Underpinning knowledge

The learner can:

1. explain the advantages and disadvantages of using external spreadsheet control references/features
2. identify complex spreadsheet operations to control dimensions
3. identify complex spreadsheet operations to control parameters
4. identify complex spreadsheet operations to control feature suppression
5. identify complex spreadsheet functions for design calculations

Unit 103   Computer Aided Design Parametric Modelling
Outcome 4   Use advanced presentation graphics

Assessment Criteria

The learner can:

1. apply complex and advanced material types to a model
2. create specific bitmap textures and apply them to the model
3. define an animation within the scene which employs motion paths and key frames
4. export a file for use with the visual software package

Underpinning knowledge

The learner can:

1. explain the difference between different lighting methods and what effect these features have on the render production time
2. explain how textures can be used to reduce the need for detailed model geometry
3. explain how key-frames can define an animation cycle
4. explain suitable file types for viewing animated scenes
5. describe a number of different applications for animated and rendered presentation graphics within industry.

6 Assessment

6.1 Assignments

Full assignment details can be found in the Practical Assessment Handbooks which are located on the 7579 webpage. These are listed as:

- 7579-01-101 CAD Parametric Modelling Practical Assessment Handbook
- 7579-01-102 CAD Parametric Modelling Practical Assessment Handbook
- 7579-01-103 CAD Parametric Modelling Practical Assessment Handbook

6.2 Test specifications

The test specifications for the GOLA units are below:

7579-01-104 CAD Parametric Modelling GOLA Test
Duration: 40 minutes

Candidates will be graded with Pass or Fail for the GOLA test.

Unit number	Outcome	No. of questions	%
101	1 - Use associated IT, CAD hardware and operating systems	3	12
101	2 - Use basic file management techniques and maintain health and safety requirements	3	12
101	3 - Demonstrate an understanding of the parametric modelling process, the user interface and how to access help and tutorials	2	8
101	4 - Use a range of commands to create and constrain sketches	5	20
101	5 - Use the range of commands to produce extruded and revolved features	5	20
101	6 - Use placed features to modify parametric models	3	12
101	7 - Use methods to create assemblies	2	8
101	8 - Use the drawing layout environment to produce hard copies	2	8
	Total	**25**	**100**

7579-01-105 CAD Parametric Modelling GOLA Test
Duration: 40 minutes

Candidates will be graded with Pass or Fail for the GOLA test.

Unit number	Outcome	No. of questions	%
102	1 - Use complex sketching and 2D constraints to create features	4	16
102	2 - Create and edit work features and use complex feature commands	7	28
102	3 - Create and modify simple table driven parts and assemblies	3	12
102	4 - Use motion and driven assembly constraints	3	12
102	5 - Add additional information to a drawing layout to aid the interpretation of design intent	6	24
102	6 - Create presentation quality displays of parts and assemblies	2	8
	Total	**25**	**100**

7579-01-106 CAD Parametric Modelling Gola Test
Duration: 40 minutes

Candidates will be graded with Pass or Fail for the GOLA test.

Unit number	Outcome	No. of questions	%
103	1 - Apply advanced features and parts modelling	8	32
103	2 - Apply advanced assembly modelling	6	24
103	3 - Link with external spreadsheets to create complex table driven parts and assemblies	6	24
103	4 - Apply advanced presentation graphics	5	20
	Total	**25**	**100**

Appendix 1   Relationships to other qualifications

Links to other qualifications and frameworks

City & Guilds has identified the connections to previous qualifications. This mapping is provided as guidance and suggests areas of overlap and commonality between the qualifications. It does not imply that candidates completing units in one qualification are automatically covering all of the content of the qualifications listed in the mapping.

Centres are responsible for checking the different requirements of all qualifications they are delivering and ensuring that candidates meet requirements of all units/qualifications. For example, units within a QCF qualification may be similar in content to units in the NQF qualification which the candidate may have already undertaken and this may present opportunities for APL.

These qualifications have connections to the:

NQF units		QCF units	
Unit Number/Title		**Unit Number/Title**	
A/500/3014	Level 1 Certificate in Computer Aided Design	K/600/3262	Level 1 Award in CAD Parametric Modelling.
L/500/2952	Level 2 Certificate in Computer Aided Design	A/600/3265	Level 2 Award in CAD Parametric Modelling.
R/500/2953	Level 3 Certificate in Computer Aided Design	F/600/3266	Level 3 Award in CAD Parametric Modelling.

Key/Essential Skills (England, Wales and Northern Ireland)

Key Skills signposting

These qualifications include opportunities to develop and practise many of the underlying skills and techniques described in Part A of the standard for each Key Skills qualification. Where candidates are working towards any Key Skills alongside these qualifications they will need to be registered with City & Guilds for the Key Skills qualifications.

It should not be assumed that candidates will necessarily be competent in, or able to produce evidence for, Key Skills at the same level as these qualifications.

The 'signposts' below identify the **potential** for Key Skills portfolio evidence gathering that can be naturally incorporated into the completion of each unit. Any Key Skills evidence will need to be separately assessed and must meet the relevant standard defined in the QCA document '*Key skills qualifications standards and guidance*' (available from **www.cityandguilds.com/keyskills**).

Unit number	Communication	Application of Number	Information and Communication Technology
101	C2.2, C2.3		IT2.1
102	C2.2, C2.3		IT2.1
103	C2.2, C2.3		IT2.1

Unit number	Problem Solving	Improving Own Learning and Performance	Working With Others
101	PS2.1, PS2.2, PS2.3	LP2.1, LP2.2, LP2.3	
102	PS2.1, PS2.2, PS2.3	LP2.1, LP2.2, LP2.3	
103	PS2.1, PS2.2, PS2.3	LP2.1, LP2.2, LP2.3	

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 **Centres and Training Providers homepage** on **www.cityandguilds.com**.

Centre Guide – Delivering International Qualifications contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification. Specifically, the document includes sections on:
- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Providing City & Guilds qualifications – a guide to centre and qualification approval contains detailed information about the processes which must be followed and requirements which must be met for a centre to achieve 'approved centre' status, or to offer a particular qualification. Specifically, the document includes sections on:
- The centre and qualification approval process and forms
- Assessment, verification and examination roles at the centre
- Registration and certification of candidates
- Non-compliance
- Complaints and appeals
- Equal opportunities
- Data protection
- Frequently asked questions.

Ensuring quality contains updates and good practice exemplars for City & Guilds assessment and policy issues. Specifically, the document contains information on:
- Management systems
- Maintaining records
- Assessment
- Internal verification and quality assurance
- External verification.

Access to Assessment & Qualifications 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 homepage** section of the City & Guilds website also contains useful information such on such things as:
- ***Walled Garden***

Find out how to register and certificate candidates on line

- ***Qualifications and Credit Framework (QCF)***
  Contains general guidance about the QCF and how qualifications will change, as well as information on the IT systems needed and FAQs

- ***Events***
  Contains dates and information on the latest Centre events

- ***Online assessment***
  Contains information on how to register for GOLA assessments.

City & Guilds

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www.cityandguilds.com

Useful contacts

Type	Contact	Query
UK learners	T: +44 (0)20 7294 2800 E: learnersupport@cityandguilds.com	• General qualification information
International learners	T: +44 (0)20 7294 2885 F: +44 (0)20 7294 2413 E: intcg@cityandguilds.com	• General qualification information
Centres	T: +44 (0)20 7294 2787 F: +44 (0)20 7294 2413 E: centresupport@cityandguilds.com	• Exam entries • Registrations/enrolment • Certificates • Invoices • Missing or late exam materials • Nominal roll reports • Results
Single subject qualifications	T: +44 (0)20 7294 8080 F: +44 (0)20 7294 2413 F: +44 (0)20 7294 2404 (BB forms) E: singlesubjects@cityandguilds.com	• Exam entries • Results • Certification • Missing or late exam materials • Incorrect exam papers • Forms request (BB, results entry) • Exam date and time change
International awards	T: +44 (0)20 7294 2885 F: +44 (0)20 7294 2413 E: intops@cityandguilds.com	• Results • Entries • Enrolments • Invoices • Missing or late exam materials • Nominal roll reports
Walled Garden	T: +44 (0)20 7294 2840 F: +44 (0)20 7294 2405 E: walledgarden@cityandguilds.com	• Re-issue of password or username • Technical problems • Entries • Results • GOLA • Navigation • User/menu option problems
Employer	T: +44 (0)121 503 8993 E: business_unit@cityandguilds.com	• Employer solutions • Mapping • Accreditation • Development Skills • Consultancy
Publications	T: +44 (0)20 7294 2850 F: +44 (0)20 7294 3387	• Logbooks • Centre documents • Forms • Free literature

If you have a complaint, or any suggestions for improvement about any of the services that City & Guilds provides, email: **feedbackandcomplaints@cityandguilds.com**