Unit Title: **3D solid modelling**

OCR unit number	6
Level:	2
Credit value:	5
Guided learning hours:	42
Unit reference number	K/503/5859

Unit purpose and aim

This unit introduces the learners to 3D solid modelling. Learners will gain the opportunity to develop skills in the application of parametric modelling software in order to help realise their designs in three dimensions**.** Computer Aided Design (CAD) plays and increasingly important role within the field of design and engineering and is now and essential tool for bringing new products to market faster and more efficiently.

Learners will develop an understanding of the software system and the features within it and learn how to produce complex geometry. Learners should be encouraged to develop their skills with the system through the production of a wide range of 3D models.

Learning Outcomes	Assessment Criteria	Teaching Content

The Learner will:
 	
1   Know the key features of parametric modelling software
	The Learner can:
	
	1.1 Describe the features of a parametric modelling system
		• Features:
		
		    o Models are constructed of individual elements called features
		
		    o Features are either sketched or applied
		
		    o Features include:
		
		        - bosses
		
		        - cuts
		
		        - holes
		
		        - ribs
		
		        - fillets
		
		        - chamfers
		
		• Features of a parametric modelling system:
		
		    o dimensions and relations are captured within the model
		
		    o explanations of dimensions and relations

Learning Outcomes	Assessment Criteria	Teaching Content
		○ models are fully associative with drawings and assemblies. ○ constraints ○ design intent - Sketched features: ○ bosses ○ cut extrude ○ sweep - Applied features: ○ fillet ○ chamfer ○ shell - Primary elements of the software interface: ○ main toolbars ○ document window ○ modelling area ○ origin ○ feature tree ○ status bar
2 Be able to use software features to produce 2D drawings for use within solid models	2.1 Select appropriate software features to produce 2D drawings 2.2 Use appropriate software features to produce 2D drawings	- Default work planes: ○ top ○ front ○ right - Sketches using a range of tools including: ○ line ○ circle ○ rectangle ○ arc ○ polygon ○ slot - Sketch relations include: ○ equal ○ horizontal / vertical ○ tangent ○ parallel - Range of dimensions: ○ linear ○ angular ○ radial

Learning Outcomes	Assessment Criteria	Teaching Content
		- State of sketches: - under-defined - fully-defined - Symmetry sketches: - use mirror within sketches - Sketch modification tools: - fillet / chamfer - trim
3 Be able to use software features to produce 3D geometry	3.1 Select appropriate software tools to produce 3D geometry 3.2 Use appropriate software tools to produce 3D geometry	Software tools to create: - extruded features - revolved features - rib features - swept features - lofted features - cut features
4 Be able to use applied features in parametric modelling software	4.1 Select appropriate applied features in parametric modelling software 4.2 Use appropriate applied features in parametric modelling software	- Applied features within a range of models: - fillets and chamfers to the edges of a model - draft to the sides of a model - hole features - shell feature - mirror feature - circular and linear pattern features

Assessment

This unit is centre assessed and externally verified. In order to achieve the unit you must produce a portfolio of evidence which, on request, will need to be made available to the OCR external verifier. Portfolios of work must be produced independently and centres must confirm to OCR that the evidence is authentic.

Evidence requirements

Learners will produce a description of the features of parametric modelling systems which could be a written report, an instruction manual or information manual. They will produce a final complex, CAD model that incorporates a range of multiple features.

Learners will present their work as a series of screen grabs or graphical images of the CAD model, in a report, poster or display board format supported by written evidence.

Guidance on assessment and evidence requirements

Tutors should mix a range of taught sessions with practical opportunities to model a range of examples. Where possible, tutors should ensure that examples are a mix of simple learning examples and more advanced commercial components. These maybe supplied by industry partners. The final assignment maybe a development of the learners own design but more suitably will be a specific model(s) set out by an employer that may form part of a wider assembly. Tutors must ensure this final model(s) incorporates a broad range of features to allow learners the opportunity to apply the taught features.

National Occupational Standards (NOS) mapping/signposting

NOS can be viewed on the relevant Sector Skills Council's website or the Occupational standards directory at www.ukstandards.co.uk.

Occupational standards	Unit number	Title
Engineering Technical Support Suite 2 2007	TS2-02	Using and Interpreting Engineering Data and Documentation
Engineering Technical Support Suite 2 2007	TS2-04	Producing/Modifying Mechanical or Fabrication Engineering Drawings using a CAD System
Engineering Technical Support Suite 2 2007	TS2-05	Producing/Modifying Electrical or Electronic Engineering Drawings using a CAD System
Engineering Technical Support Suite 2 2007	TS2-07	Producing/Modifying Engineering CAD Models (Drawings) using a CAD System
Mechanical Manufacturing Engineering Suite 2 2008	O45NMME2-02	Using and Interpreting Engineering Data and Documentation
Mechanical Manufacturing Engineering Suite 2 2008	O45NETS3-02	Using and Interpreting Engineering Data and Documentation
Design	DES7	Contribute to the production of prototypes, models, mock-ups, artwork, samples or test pieces
Design	DES10	Create visual designs
Design	DES24	Create 3D Models using a Computer Aided Design System
Design and Draughting	O15NDD01ECRS2.04	Read and extract information from engineering drawings and specifications
Design and Draughting	O15NDD04ECRS2.01	Review technical information to produce detailed engineering drawings
Design and Draughting	O15NDD05ECRS2.02	Produce detailed drawings to support engineering activities

Functional skills signposting

This section indicates where learners may have an opportunity to develop their functional skills.

Functional Skills Standards					
English		**Mathematics**		**ICT**	
Speaking and Listening		Representing		Use ICT systems	✓
Reading		Analysing	✓	Find and select information	✓
Writing	✓	Interpreting	✓	Develop, present and communicate information	✓

Resources

Equipment

For effective delivery of this unit centres should have access to the following resources and equipment.

- Computer system with Internet access, word processing, spread sheet, business presentation and parametric modelling software

- 3D Parametric Modelling software e.g. Solidworks, Solid Edge, Inventor, Pro/Engineer

- A wide range of examples, drawings and tasks

Additional information

For further information regarding administration for this qualification, please refer to the OCR document '*Admin Guide: Vocational Qualifications' (A850)* on the OCR website www.ocr.org.uk .