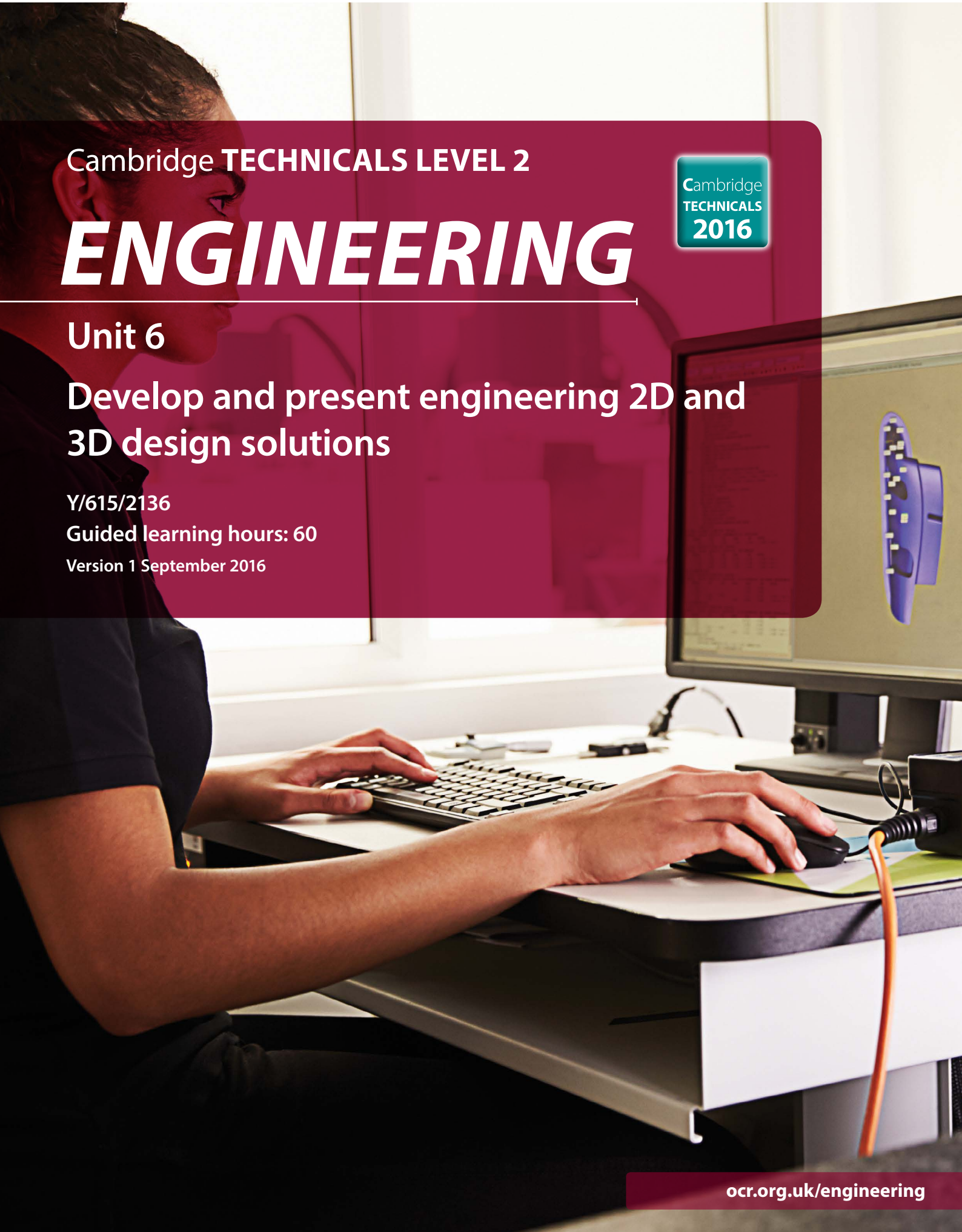
2016 Suite

OCR
Oxford Cambridge and RSA



Cambridge **TECHNICALS LEVEL 2**

Cambridge TECHNICALS 2016

ENGINEERING

Unit 6

Develop and present engineering 2D and 3D design solutions

Y/615/2136

Guided learning hours: 60

Version 1 September 2016

LEVEL 2

UNIT 6: DEVELOP AND PRESENT ENGINEERING 2D AND 3D DESIGN SOLUTIONS
Y/615/2136

Guided learning hours: 60

Essential resources required for this unit: manual drawing equipment, 3D parametric CAD software, extracts and illustrations from appropriate drawing standards and conventions, access to reference material which provides information about the physical and mechanical properties of materials, access to legislation and design standards, BS8888:2013 Technical product documentation and specification.

This unit is internally assessed and externally moderated by OCR.

Unit aim

This unit will enable learners to to develop the skills, knowledge and understanding to produce engineering drawings of different components, assemblies and circuits using a variety of drawing and computer-aided design techniques.

This unit enables learners to develop the knowledge and skills needed to set up and operate a 3D parametric computer-aided drawing (CAD) modelling system to produce fully detailed 3D models and 2D drawings for engineering activities.

The drawings produced will include detailed component drawings for manufacturing and assembly drawings.

TEACHING CONTENT

The unit content describes what has to be taught to ensure that learners are able to access the highest grade.

Anything which follows an i.e. details what must be taught as part of that area of content.

Anything which follows an e.g. is illustrative, it should be noted that where e.g. is used, learners must know and be able to apply relevant examples to their work though these do not need to be the same ones specified in the unit content.

Learning Outcome **The Learner will:**		**Teaching Content** **The Learner must be taught:**
1. Be able to create 2D and 3D drawings to present engineering components	1.1	to create 2D and 3D drawings using i.e. • 2D techniques i.e. o orthographic (e.g. single and linked views) o 3rd angle projection (e.g. scale, dimensions, materials, section views, annotations) • 3D techniques i.e. o oblique drawing (e.g. regular and hollow objects, cavalier and cabinet) o isometric (e.g.regular and hollow objects, cones, spheres, squares) • good proportion; • dimensions e.g. overall sizes, detail • use of 'thick and thin line' technique
2. Be able to save, store, organise and retrieve engineering drawings.	2.1	to save and store CAD work securely i.e. • as an electronic file • file location (e.g. Server, Hard disk, Flash drive, cloud) • file type and format conventions
	2.2	to retrieve and open CAD files securely i.e. • access stored files
	2.3	be able to produce paper copies i.e. • print to correct size
3. Be able to produce and modify 2D drawing(s) using 3D Computer Aided Design (CAD) software	3.1	to create 2D drawings for components within a 3D CAD environment using basic features i.e. • line • shape e.g. o rectangle o circle o fillet o chamfer o polygon o ellipse • project geometry e.g. o reference geometry o work planes o axes, points o co-ordinate systems

Learning Outcome The Learner will:		Teaching Content The Learner must be taught:
	3.2	to modify 2D drawings for components using i.e. • basic pattern features e.g. o solid bodies or part features (e.g. extrusion, fillet) o work features (e.g. work planes, work axis, work points) o surface features (e.g. sweep surface, stitch, boundary patch) o an entire solid (e.g. the solid body that is the result of all solid features) • basic modify drawing (e.g. trim, move, copy)
4. Be able to produce 3D solid model(s) using Computer Aided Design (CAD)	4.1	to use a 3D CAD software programme to produce and modify 3D solid models using i.e. • main features i.e. o lines, arcs, splines, polygons o extrude, revolve o sizing, dimensioning • applied features i.e. o hole, fillet, chamfer, shell • pattern features e.g. o solid bodies or part features (e.g. extrusion, fillet) o work features (e.g. work planes, work axis, work points) o surface features (e.g. sweep surface, stitch, boundary patch) o mirror o an entire solid (e.g. the solid body that is the result of all solid features)
5. Be able to produce 2D CAD engineering drawing from a 3D solid model	5.1	to use a 3D solid model to create 2D drawing i.e. • use formats and templates i.e. o border templates o formats o standards o critical information • use projection and units i.e. o first and third angle projection o section views o detailed views o isometric views o scale • apply dimensioning and annotations i.e. o dimensioning styles (e.g. linear, polar, baseline) o manufacturing information (e.g. surface finish, weld symbols, fit and tolerances)

GRADING CRITERIA

Learning Outcome	Pass	Merit	Distinction
The learner will:	The assessment criteria which are the pass requirements for this unit.	To achieve a merit the evidence must show that, in addition to the pass criteria, the candidate is able to:	To achieve a distinction the evidence must show that, in addition to the pass and merit criteria, the candidate is able to:
1. Be able to create 2D and 3D drawings to present engineering components	P1 Create 2D drawings using 2D techniques	M1 Create 2D and 3D drawings that are well proportioned and dimensioned	
	P2 Create 3D drawings using 3D techniques		
2. Be able to save, store, organise and retrieve engineering drawings	P3 Save, store, retrieve and print CAD drawings and 3D solid models		
3. Be able to produce and modify 2D drawing(s) using 3D Computer Aided Design (CAD) software	P4 Use 3D Computer Aided Design to produce and modify a 2D engineered drawing(s)		
4. Be able to produce 3D solid model(s) using Computer Aided Design (CAD)	P5 Use CAD to produce 3D solid model(s) for an engineered product using main features, applied features and pattern features	M2 Enhance 3D solid model(s) using a range of features	D1 Explain how the features you have used have enhanced the 3D solid model(s)
5. Be able to produce 2D CAD engineering drawing from a 3D solid model	P6 Produce a 2D CAD engineering drawing that includes appropriate annotations and dimensions for an engineering component from a 3D solid model		D2 Evaluate the benefits of using computer aided methods to produce an engineering drawing

ASSESSMENT GUIDANCE

Feedback to learners: you can discuss work-in-progress towards summative assessment with learners to make sure it's being done in a planned and timely manner. It also provides an opportunity for you to check the authenticity of the work. You must intervene if you feel there's a health and safety risk.

Learners should use their own words when producing evidence of their knowledge and understanding. When learners use their own words it reduces the possibility of learners' work being identified as plagiarised. If a learner does use someone else's words and ideas in their work, they must acknowledge it, and this is done through referencing. Just quoting and referencing someone else's work will not show that the learner knows or understands it. It has to be clear in the work how the learner is using the material they have referenced to inform their thoughts, ideas or conclusions.

For more information about internal assessment, including feedback, authentication and plagiarism, see the centre handbook. Information about how to reference is in the OCR Guide to Referencing available on our website: http://www.ocr.org.uk/i-want-to/skills-guides/.

P1
Learners must demonstrate 2D techniques (orthographic and 3rd angle projection). Evidence must consist of a portfolio of drawings.

P2
Learners must demonstrate 3D techniques (oblique and isometric). Evidence must consist of a portfolio of drawings.

M1
Learners must produce 2D and 3D drawings that are well proportioned and that include appropriate dimensions. Evidence should be in the form of dimensioned 2D and 3D drawings.

P3
Learners must present a file log that shows where they have retrieved and saved thier files. This could be in the form of screen shots. Learners must also present a final printed version of their CAD drawings and 3D solid models.

P4
Centres can decide on the 3D software used. Evidence could consist of a portfolio of screen shots, printed and annotated 2D engineered drawing(s) which clearly show the modifications that have been produced by the learner.

P5
Learners must produce 3D solid model(s) of component(s) that form all or part of an engineered product. Learners must produce model(s) that comprises of main features, applied features and pattern features. This could be achieved by producing separate models for more than one component or as a single model of a more complex component. All features must be demonstrated. Evidence for P5 would be in the form of a screen shot for each model.

M2
Learners should show a range of different features that develop the ability of the drawing to communicate the design ideas and purpose. Evidence should be in the form of printed and annotated 3D solid model(s).

D1
Learners should give an explanation of why the features they have used in M2 enhance the 3D solid model(s). Evidence should be in the form of a written report supported by printed and annoted 3D solid model(s).

P6
Learners must use a 3D solid model to produce a 2D CAD engineering drawing. The drawing must include annotations and dimensions that are appropriate. Evidence should be in the form of a printed copy of the 2D engineering drawing.

D2
Learners should produce a written evaluation of the benefits of using computer aided methods to produce engineering drawings, supported by printed engineering drawings that have been produced by the learner that relate to the written evidence.

SYNOPTIC ASSESSMENT AND LINKS BETWEEN UNITS

It will be possible for learners to make connections between other units over and above the unit containing the key tasks for synoptic assessment, please see section 6 of the centre handbook for more detail.

Synoptic assessment grid

This unit and specific LO	Related unit	Related LO
Unit 6 LO1 Be able to create 2D and 3D drawings to present engineering components	Unit 1	LO1 1.1, 1.3, 1.4, 1.5
	Unit 3	LO3 3.1, 3.2, 3.3, 3.4 LO4 4.1
	Unit 8	LO3 3.1
Unit 6 LO3 Be able to produce and modify 2D drawing(s) using 3D Computer Aided Design (CAD) software	Unit 1	LO1 1.1, 1.3, 1.4, 1.5
	Unit 3	LO3 3.1, 3.2, 3.3, 3.4 LO4 4.1
	Unit 8	LO3 3.1
Unit 6 LO4 Be able to produce 3D solid model(s) using Computer Aided Design (CAD)	Unit 1	LO1 1.1, 1.3, 1.4, 1.5
	Unit 3	LO3 3.1, 3.2, 3.3, 3.4 LO4 4.1
	Unit 8	LO3 3.1
Unit 6 LO5 Be able to produce 2D CAD engineering drawing from a 3D solid model	Unit 1	LO1 1.1, 1.3, 1.4, 1.5
	Unit 3	LO3 3.1, 3.2, 3.3, 3.4 LO4 4.1
	Unit 8	LO3 3.1

MEANINGFUL EMPLOYER INVOLVEMENT - A REQUIREMENT FOR TECHNICAL CERTIFICATE QUALIFICATIONS

These qualifications have been designed to be recognised as Technical certificates in performance tables in England. It is a requirement of these qualifications for centres to secure employer involvement through delivery and/or assessment of these qualifications for every learner.

The minimum amount of employer involvement must relate to at least one or more of the elements of the mandatory content. This unit is mandatory in the Design Engineering pathway.

Eligible activities and suggestions/ideas that may help you in securing meaningful employer involvement for this unit are given in the table below.

Please refer to the Qualification Handbook for further information including a list of activities that are not considered to meet this requirement.

Meaningful employer involvement – eligible activities	Suggestion/ideas for centres when delivering this unit
1. Students undertake structured work-experience or work-placements that develop skills and knowledge relevant to the qualification.	Students undertake work placements in engineering or manufacturing businesses where Computer Aided Design (CAD) tools are used. Students should have structured time to actively utilise the software in line with industrial practice, in a way which aligns with skills/techniques required in this unit.
2. Students undertake project(s), exercises(s) and/or assessments/examination(s) set with input from industry practitioner(s).	Project set on product design or redesign of components, using industry standard CAD equipment and design standards, to determine if the students' design of a product is capable of manufacture.
3. Students take one or more units delivered or co-delivered by an industry practitioner(s). This could take the form of master classes or guest lectures.	Lecture from practicing CAD engineers involved in product design, development and testing. Content to include examples of CAD software, design principles, CAD drawing standards and working documentation within professional commercial engineering practice. • Employers deliver sessions that showcase the link across skills and units. This may include the link between Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) units or Computer Aided Design (CAD) and Mechanical Simulation and Modelling.
4. Industry practitioners operating as 'expert witnesses' that contribute to the assessment of a student's work or practice, operating within a specified assessment framework. This may be a specific project(s), exercise(s) or examination(s), or all assessments for a qualification.	Review from practicing CAD engineers relating to the clarity of CAD engineering drawings and correct identification of design principles used during students' CAD project work and related documentation/software outputs.

You can find further information on employer involvement in the delivery of qualifications in the following documents:

- Employer involvement in the delivery and assessment of vocational qualifications
- DfE work experience guidance

To find out more
ocr.org.uk/engineering
or call our Customer Contact Centre on **02476 851509**

Alternatively, you can email us on **vocational.qualifications@ocr.org.uk**

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