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# CAMBRIDGE NATIONALS IN ENGINEERING

R107 - DEVELOPING AND PRESENTING  
ENGINEERING DESIGNS

**DELIVERY GUIDE**

VERSION 1

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# INTRODUCTION

This Delivery Guide has been developed to provide practitioners with a variety of creative and practical ideas to support the delivery of this qualification. The Guide is a collection of lesson ideas with associated activities, which you may find helpful as you plan your lessons.

OCR has collaborated with current practitioners to ensure that the ideas put forward in this Delivery Guide are practical, realistic and dynamic. The Guide is structured by learning objective so you can see how each activity helps you cover the specification.

We appreciate that practitioners are knowledgeable in relation to what works for them and their learners. Therefore, the resources we have produced should not restrict or impact on practitioners' creativity to deliver excellent learning opportunities.

Whether you are an experienced practitioner or new to the sector, we hope you find something in this guide which will help you to deliver excellent learning opportunities.

If you have any feedback on this Delivery Guide or suggestions for other resources you would like OCR to develop, please email [resourcesfeedback@ocr.org.uk](mailto:resourcesfeedback@ocr.org.uk).

## PLEASE NOTE

The activities suggested in this Delivery Guide **MUST NOT** be used for assessment purposes. (This includes the Consolidation suggested activities).

The timings for the suggested activities in this Delivery Guide **DO NOT** relate to the Guided Learning Hours (GLHs) for each unit.

Assessment guidance can be found within the Unit document available from [www.ocr.org.uk](http://www.ocr.org.uk).

The latest version of this Delivery Guide can be downloaded from the OCR website.

## OPPORTUNITIES FOR ENGLISH AND MATHS SKILLS DEVELOPMENT

We believe that being able to make good progress in English and maths is essential to learners in both of these contexts and on a range of learning programmes. To help you enable your learners to progress in these subjects, we have signposted opportunities for English and maths skills practice within this resource. These suggestions are for guidance only. They are not designed to replace your own subject knowledge and expertise in deciding what is most appropriate for your learners.

### KEY



English



Maths



# UNIT R107 - DEVELOPING AND PRESENTING ENGINEERING DESIGNS

Guided learning hours : 30

## PURPOSE OF THE UNIT

This unit develops techniques in generation, concept development and the communication of design ideas using hand rendering and computer-based presentation techniques including computer aided design software.

Learners will generate design ideas using a mixture of detailed hand rendering and computer-based presentation techniques including computer aided design in 2 and 3 dimensions. Learners' will gain skills in annotation and labelling techniques, such as showing key features, functions, dimensions, materials, construction/manufacture methods.

On completion of this unit, learners will have developed knowledge and understanding of how to communicate design ideas through hand rendering and computer-based techniques.

### Learning Outcome — The learner will:

LO1: Be able to generate design proposals using a range of techniques





LO2: Know how to develop designs using engineering drawing techniques and annotation

LO3: Be able to use Computer Aided Design (CAD) software and techniques to produce and communicate design proposals

## LO1: BE ABLE TO GENERATE DESIGN PROPOSALS USING A RANGE OF TECHNIQUES

Learning Outcome — The learner will:



LO1: Be able to generate design proposals using a range of techniques

Suggested content	Suggested activities	Activity duration	Links to other units
1 Hand drawing techniques: freehand sketching 	Teachers will most likely adopt a practical approach to showing learners how to produce freehand sketches to design and present ideas and concepts. Websites could be useful to show learners a range of skills required to draw freehand drawing using 2D and 3D such as: <a href="http://www.slideshare.net/vino1393/engineering-graphics-free-hand-sketch">http://www.slideshare.net/vino1393/engineering-graphics-free-hand-sketch</a> . Various approaches might be adopted including the introduction of views and construction lines: <a href="http://ef.engr.utk.edu/ef101-2002/as/book/as_chap3.pdf">http://ef.engr.utk.edu/ef101-2002/as/book/as_chap3.pdf</a> Practice using suitably provided examples will most likely be the key to learners developing freehand sketching skills.	3 hours	
2 Rendering 	The application of rendering using shading, tone and texture will be a natural extension to producing freehand sketches. Teachers might demonstrate to learners these skills and could develop suitable examples for students to practice. Practice will be a key way in which to develop these skills to augment freehand sketches.	2 hours	
3 Annotation and labelling 	Further techniques to demonstrate design ideas may be introduced to learners for them to enhance freehand sketches. These include the use of annotation and labelling such as key features, functions, dimensions, materials, construction/manufacturing methods, access to components and areas for further investigation. Again, practice will most likely give learners an opportunity to develop and demonstrate using these skills.	3 hours	
4 Using ICT software 	The teacher might introduce learners to a range of different ICT applications which could be used by them to produce, modify and enrich design proposals. This could include simple CAD applications (such as Sketchup : <a href="http://www.sketchup.com/">http://www.sketchup.com/</a> ) and other computer applications for word processing and presentation (eg Word and PowerPoint). Learners will progress using CAD and presentation skills to communicate design proposals throughout this unit. A brief introduction to Sketchup can be found at: <a href="http://www.youtube.com/watch?v=gsfH_cyXa1o">http://www.youtube.com/watch?v=gsfH_cyXa1o</a> Suitable example exercises could be provided for learners to practice using ICT resulting in them presenting design concepts and proposals to the class. See Lesson Element Using ICT Software	4 hours	R110 (LO1)

## LO2: KNOW HOW TO DEVELOP DESIGNS USING ENGINEERING DRAWING TECHNIQUES AND ANNOTATION

Learning Outcome — The learner will:



LO2: Know how to develop designs using engineering drawing techniques and annotation

Suggested content	Suggested activities	Activity duration	Links to other units
1 2D engineering drawings 	Teachers will most likely devise practical activities alongside introducing theoretical knowledge to explain 2D technical drawing skills. Learners may develop their technical drawing skills for 2D objects through practice activities and teacher-introduced knowledge including third angle projection, orthographic views, scale, dimensions, materials, parts lists, sectioning, and adding relevant notes and annotations. Internet sources might also prove useful to explain drawing techniques such as <a href="http://www.we-r-here.com/cad/tutorials/level_1/1-12.htm">http://www.we-r-here.com/cad/tutorials/level_1/1-12.htm</a> which explains third angle orthographic projection and other drawing techniques. CAD software used to produce 2D drawings will most probably be able to accommodate 3D drawings.	5 hours	R110 (LO1)
2 3D engineering drawing 	Learners may further develop their technical drawing skills for 3D objects. This may include producing isometric/oblique views, exploded views and assembly drawings. Web resources might again prove useful in explaining drawing principles such as <a href="http://www.bbc.co.uk/schools/gcsebitesize/design/graphics/drawingformalrev1.shtml">http://www.bbc.co.uk/schools/gcsebitesize/design/graphics/drawingformalrev1.shtml</a> which explains a range of formal drawing techniques. Practice at drawing simple objects with different views might nevertheless prove useful to embed learning and understanding. A number of technical drawing packages, such as AutoCAD (AutoDesk) and SolidWorks can be obtained at no or very low cost for educational use, and these might prove useful throughout this unit. See Lesson Element 3D Engineering Drawings	5 hours	R110 (LO1)

## LO3: BE ABLE TO USE COMPUTER AIDED DESIGN (CAD) SOFTWARE AND TECHNIQUES TO PRODUCE AND COMMUNICATE DESIGN PROPOSALS

Learning Outcome — The learner will:

LO3: Be able to use Computer Aided Design (CAD) software and techniques to produce and communicate design proposals

Suggested content	Suggested activities	Activity duration	Links to other units
1 CAD applications 	<p>Learners might further develop and consolidate skills developed throughout this unit to produce drawings for design proposals. Teachers might extend learners knowledge by getting them to develop CAD drawings for a given design brief. This could include appropriate draughting for their design proposals to include 3D modelling, rendering, assemblies and animation. Internet sources and tutorials may prove useful to introduce enhanced skills such as <a href="http://www.we-r-here.com/cad/tutorials/level_3/3-9.htm">http://www.we-r-here.com/cad/tutorials/level_3/3-9.htm</a> which shows the use of materials and rendering for AutoCad.</p>	5 hours	R110 (LO1)
2 Communicating design proposals 	<p>Teachers might introduce learners to a number of ways in which they can communicate their design proposals including display boards, models and by using PowerPoint. Learners might be given the opportunity to take design drawings produced for a given design proposal and use suitable techniques to develop and present these. This might also include producing physical models. Some example presentations are shown at: <a href="http://www.technologystudent.com/despro_flash/desidea1.html">http://www.technologystudent.com/despro_flash/desidea1.html</a>. Learners could be more innovative with the presentation techniques they use to include videos, simple web pages and animations. See Lesson Element Communicating Design Proposals</p>	3 hours	

## POSSIBLE INTERNET SOURCES

Source	Website
AutoDesk (AutoCAD software)	<a href="http://www.autodesk.co.uk">www.autodesk.co.uk</a>
SolidWorks	<a href="http://www.solidworks.co.uk">www.solidworks.co.uk</a>
Sketchup	<a href="http://www.sketchup.com">www.sketchup.com</a>



## Contact us

Staff at the OCR Customer Contact Centre are available to take your call between 8am and 5.30pm, Monday to Friday.

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