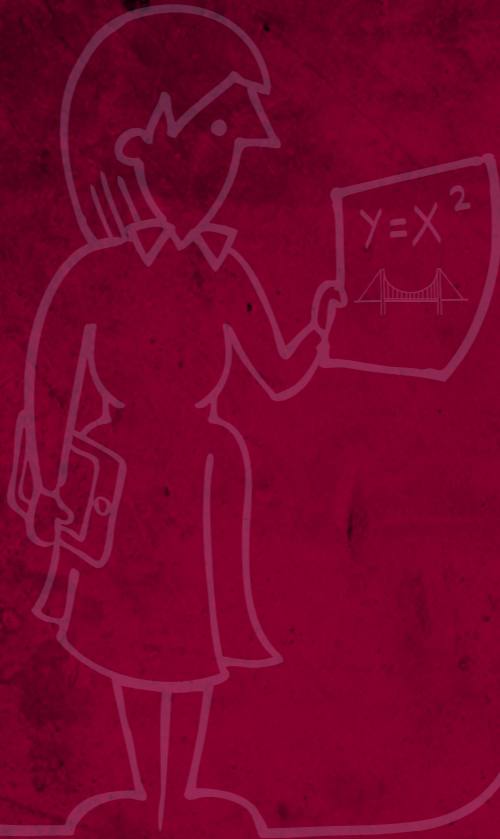




Accredited



# CAMBRIDGE NATIONALS IN ENGINEERING

R105 - DESIGN BRIEFS, DESIGN  
SPECIFICATIONS AND USER REQUIREMENTS

## DELIVERY GUIDE

VERSION 1

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To give us feedback on, or ideas feedback text the OCR resources you have used, email [resourcesfeedback@ocr.org.uk](mailto:resourcesfeedback@ocr.org.uk)

**OCR Resources: the small print**

OCR's resources are provided to support the teaching of OCR specifications, but in no way constitute an endorsed teaching method that is required by the Board and the decision to use them lies with the individual teacher. Whilst every effort is made to ensure the accuracy of the content, OCR cannot be held responsible for any errors or omissions within these resources.

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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.

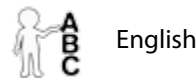
Assessment guidance can be found within the Unit document available from [www.ocr.org.uk](http://www.ocr.org.uk).

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 R105 - DESIGN BRIEFS, DESIGN SPECIFICATIONS AND USER REQUIREMENTS

Guided learning hours : 30

## PURPOSE OF THE UNIT

This unit provides the opportunity for learners to develop their understanding of the requirements of design briefs and design specifications for the development of new products. Through research and practical activities, learners will understand how consumer requirements and market opportunities inform design briefs. Learners will understand the overall design process through study of the design cycle, existing product and life cycle analysis, study of new and improved materials and manufacturing processes, and how these and other factors influence a design solution.

On completion of this unit, learners will understand the design cycle, the requirements for a design brief and design specification for the development of a new product and how effective research data is necessary to inform the development of a design solution.

Learners studying for the Certificate will be able to apply knowledge and understanding gained in this unit to help develop their skills further during the completion of units R107 and R108.

### Learning Outcome — The learner will:

LO1: Understand the design cycle and the relationship between design briefs and design specifications




LO2: Understand the requirements of design specifications for the development of a new product

LO3: Know about the wider influences on the design of new products

## LO1 - UNDERSTAND THE DESIGN CYCLE AND THE RELATIONSHIP BETWEEN DESIGN BRIEFS AND DESIGN SPECIFICATIONS

Learning Outcome — The learner will:




LO1: Understand the design cycle and the relationship between design briefs and design specifications





Suggested content	Suggested activities	Suggested timings	Possible relevance to
1 The design cycle: identify and design phases 	Learners could use a product case study in order to explore the four stages of the design cycle: identify, design, optimise and validation. The first two stages involve devising the design brief, undertaking research, process planning, producing a specification, design, and producing manufacturing plans. Websites might prove useful to teachers for explaining the design cycle such as BBC Bitesize: <a href="http://www.bbc.co.uk/schools/gcsebitesize/design/systemscontrol/designevaluationrev1.shtml">http://www.bbc.co.uk/schools/gcsebitesize/design/systemscontrol/designevaluationrev1.shtml</a>	2 hours	
2 The design cycle: optimise and validation phases 	The second two stages of the design cycle form a natural follow on in terms of optimising and validating a completed design. This often involves producing models and prototypes which are error proofed, tested and evaluated. The teacher might use websites which show and explain the design cycle (eg <a href="http://www.design-technology.info/designcycle/">http://www.design-technology.info/designcycle/</a> ). A case study approach (such as the car or mobile phone) in which learner's research the application of the design cycle might prove a useful approach to developing understanding.	2 hours	
3 Identifying design needs: design briefs 	Teachers might be able to provide learners with initial design briefs for them to explain and analyse showing needs of the client (such as branding and audience) and purpose and functions of the product. Websites might prove useful in explaining the key features of a design brief, such as <a href="http://www.technologystudent.com/designpro/problem1.htm">http://www.technologystudent.com/designpro/problem1.htm</a> . Learners might be given the opportunity to write their own design briefs, working in groups, for a product idea given to them by the teacher or chosen by the group.	2 hours	

## LO2 - UNDERSTAND THE REQUIREMENTS OF DESIGN SPECIFICATIONS FOR THE DEVELOPMENT OF A NEW PRODUCT

### Learning Outcome — The learner will:

LO2: Understand the requirements of design specifications for the development of a new product




Suggested content	Suggested activities	Suggested timings	Possible relevance to
1 Design specifications 	Learners may already have had the opportunity to explore design briefs before moving onto understanding and developing a full design specification. Website, such as BBC Bitesize, may prove useful in explaining the content of a typical product design specification ( <a href="http://www.bbc.co.uk/schools/gcsebitesize/design/resistantmaterials/designanalysisevaluationrev3.shtml">http://www.bbc.co.uk/schools/gcsebitesize/design/resistantmaterials/designanalysisevaluationrev3.shtml</a> ). Learners might begin by identifying user needs such as aesthetics, ergonomics, anthropometrics, benefits and features, and product safety. The teacher might develop a suitable case study approach undertaken as a group based activity.	2 hours	
2 Product requirements 	Learners might further develop their understanding of the content of a design brief by considering product function, features, performance, target group/intended users, working environment, limitations and constraints (size, weight, functional limitations), appearance, ergonomics and lifecycle. Again, the teacher might use a product case study around which learners can develop a design specification to incorporate some or all of these features.	2 hours	
3 Manufacturing considerations: materials and supply 	Materials availability and the management of a supply chain are an essential part of the product production process which should be considered at the design stage. Suitable videos, such as those here about the development, materials requirements and supply chain management for the Smart car might help with putting this into context ( <a href="http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/supply-chains-smart-cars">http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/supply-chains-smart-cars</a> ). Teachers might continue the case study approach by getting learners to research materials availability and the supply chain for a given or chosen product.	1 hour	R109 (LO1) R109 (LO4)

Suggested content	Suggested activities	Suggested timings	Possible relevance to
4 Manufacturing considerations: ease of manufacture 	Further considerations at the design stage that impact on manufacturing are: ease of manufacture (using standard components or pre-manufactured components), design for manufacturing assembly (DFMA), design for assembly, and manufacturing processes. The teacher might introduce learners to these through developing or continuing a case study approach, or may be able to arrange an industrial visit where learners could talk to designers and manufacturing engineers.	2 hours	R112 (LO4)
5 Manufacturing considerations: scale, reliability, safety and sustainability 	Teachers might continue a case study approach to developing product specifications by introducing further manufacturing considerations such as scale of production including prototypes, one-off, batch and mass production. Suitable videos might be useful in showing and explaining commercial production techniques (such as <a href="http://www.youtube.com/watch?v=DTWnQDAhp9k">http://www.youtube.com/watch?v=DTWnQDAhp9k</a> which shows job, batch and flow production taking place). It might be possible to arrange an industrial visit where the whole product design process can be seen from design to manufacture. Further items the teacher might introduce include: durability, reliability, tolerances, product safety, sustainability, and maintenance as part of the design specification process.	2 hours	R106 (LO1) R110 (LO3) R111 (LO1)
6 Production costs 	The teacher might develop a group based activity in which learners have to research and estimate the production costs for a given item. Teachers could explain that production costs are made up of direct and indirect costs, and suitable websites might be used to explain this (eg <a href="http://businesscasestudies.co.uk/business-theory/finance/calculating-costs-of-production.html">http://businesscasestudies.co.uk/business-theory/finance/calculating-costs-of-production.html</a> ). The teacher might develop this activity by giving learners a product and direct costs (for materials and components) and indirect costs (for lighting, rent and salaries) in order to produce the product. See Lesson Element Production Costs.	1 hour	
7 Regulations and safeguards 	The teacher might begin by explaining the importance of product conformity with standards (such as British Standards, European Conformity (CE)). This might be further developed into explaining how a design can be protected using copyright, patents, registered designs and trademarks. Learners could be tasked to undertake research of a given product (such as the iPhone or Dyson vacuum cleaners) to see how its design is protected and how it conforms to standards.	2 hours	



## LO3 - KNOW ABOUT THE WIDER INFLUENCES ON THE DESIGN OF NEW PRODUCTS

### Learning Outcome — The learner will:

LO3: Know about the wider influences on the design of new products

Suggested content	Suggested activities	Suggested timings	Possible relevance to
1 Market forces 	<p>The teacher might use suitable websites to explain the role of market pull/technological push in the development of new products (eg <a href="http://www.bbc.co.uk/schools/gcsebitesize/design/resistantmaterials/designsocialrev1.shtml">http://www.bbc.co.uk/schools/gcsebitesize/design/resistantmaterials/designsocialrev1.shtml</a>).</p> <p>Similarly, such websites might prove useful in explaining how cultural and fashion trends affect product development. Learners could be asked to identify research and explain a range of products that have resulted from market pull and technological push.</p>	2 hours	
2 Legislation and design 	<p>The teacher might begin by explaining how products are required to conform to legislative requirements – which include product safety and product and packaging labelling. In the UK products are supplied with a certificate of conformity, and this may be a useful starting point (<a href="http://www.hse.gov.uk/work-equipment-machinery/declaration-conformity.htm">http://www.hse.gov.uk/work-equipment-machinery/declaration-conformity.htm</a>)</p> <p>Learners might undertake a research activity in order to investigate the impact of legislation on design, including how safety requirements are met and also the use of signage and symbols to indicate this on products and packaging.</p>	2 hours	
3 Inspirational design and new materials technology 	<p>The teacher could use web based resources to show how inspirational and iconic designs and how new and emerging technologies and materials have influenced the field of product design. Some examples include the Smart car: <a href="http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/supply-chains-smart-cars">http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/supply-chains-smart-cars</a> and the iPhone <a href="http://www.youtube.com/watch?v=Etyt4osHgX0">http://www.youtube.com/watch?v=Etyt4osHgX0</a>.</p> <p>Learners could undertake a research activity to identify and explain iconic and inspirational designs, and might be challenged to present and argue their top 10 choices to the rest of the class. The following website suggests a top 50 iconic designs, and could be used to start a debate: <a href="http://www.complex.com/art-design/2013/02/the-50-most-iconic-designs-of-everyday-objects/">http://www.complex.com/art-design/2013/02/the-50-most-iconic-designs-of-everyday-objects/</a></p>	2 hours	



Suggested content	Suggested activities	Suggested timings	Possible relevance to
4 Life Cycle Analysis 	<p>The teacher might use suitable web resources to explain Life Cycle Analysis (LCA) to learners such as <a href="http://www.powerhousemuseum.com/ecologic/resources/lesson-plans-worksheets/lesson-plan-product-life-cycle-analysis/#worksheet">http://www.powerhousemuseum.com/ecologic/resources/lesson-plans-worksheets/lesson-plan-product-life-cycle-analysis/#worksheet</a></p> <p>Learners could be given an activity, working in groups, to develop a LCA for an everyday product, such as the newspaper or mobile phone. The following website gives a graphical representation of such examples, and may prove useful: <a href="http://www.technologystudent.com/prddes1/lifecy1.html">http://www.technologystudent.com/prddes1/lifecy1.html</a>.</p> <p>The teacher might extend this activity by introducing the idea of products becoming obsolete as part of the life cycle of a product (e.g. the typewriter or Model T Ford). See Lesson Element Life Cycle Analysis.</p>	2 hours	R112 (LO4)
5 Environmental pressures 	<p>The teacher could introduce ethical and social design responsibility and the importance of sustainable design (e.g. renewable resources, resource depletion, energy efficiency, disposal) through suitable videos (eg <a href="http://www.youtube.com/watch?v=gmpdqOerOF4">http://www.youtube.com/watch?v=gmpdqOerOF4</a>)</p> <p>Learners could research case studies, such as those in the following Royal Academy of Engineering document: <a href="http://www.raeng.org.uk/events/pdf/Engineering_for_Sustainable_Development.pdf">http://www.raeng.org.uk/events/pdf/Engineering_for_Sustainable_Development.pdf</a></p> <p>Learners could then be asked to consider, in groups, how given manufacturers respond to these issues.</p>	2 hours	R112 (LO4)

## POSSIBLE INTERNET SOURCES

Source	Website
BBC Bitesize	<a href="http://www.bbc.co.uk/schools/gcsebitesize">http://www.bbc.co.uk/schools/gcsebitesize</a>
Health & Safety Executive	<a href="http://www.hse.gov.uk/work-equipment-machinery/declaration-conformity.htm">http://www.hse.gov.uk/work-equipment-machinery/declaration-conformity.htm</a>
Open University	<a href="http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/supply-chains-smart-cars">http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/supply-chains-smart-cars</a>
Royal Academy of Engineering	<a href="http://www.raeng.org.uk/events/pdf/Engineering_for_Sustainable_Development.pdf">http://www.raeng.org.uk/events/pdf/Engineering_for_Sustainable_Development.pdf</a>
YouTube	<a href="http://www.youtube.com">www.youtube.com</a>

## Contact us

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