

Accredited

CAMBRIDGE NATIONALS IN ENGINEERING

R110 - PREPARING AND PLANNING FOR MANUFACTURE

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.

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 <u>www.ocr.org.uk</u>.

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



UNIT R110 - PREPARING AND PLANNING FOR MANUFACTURE

Guided learning hours: 30

PURPOSE OF THE UNIT

This unit develops learners' knowledge and understanding of procedures used during the planning and preparing stages in the manufacture of engineered products. Learners are required to plan and make a pre-production product by conventional (non-Computer Numerical Control (CNC)) methods to develop a suitable product.

This unit enables learners to have the opportunity to apply appropriate processes for making pre-production products and use hand-held tools, measuring and marking equipment safely. Learners will also carry out manually controlled machining operations such as drilling, turning and milling and perform quality control checks to review finished pre-production products.

On completion of this unit, learners will understand and be able to apply the processes for making pre-production products, using a range of hand tools, measuring and marking equipment safely.

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 R111 and R112.

Learning Outcome — The learner will:

LO1 Be able to plan for the making of a pre-production product

LO2 Be able to use processes, tools and equipment safely to make a pre-production product

LO3 Be able to modify a production plan for different scales of production

LO1: BE ABLE TO PLAN FOR THE MAKING OF A PRE-PRODUCTION PRODUCT

Learning Outcome — The learner will:

LO1 Be able to plan for the making of a pre-production product

Suggested content	Suggested activities	Activity duration	Links to other units
1 Interpreting 2D and 3D drawings	The teacher may be able to obtain or produce drawings to show learners which demonstrate third angle orthographic projection and isometric/oblique views for both 2D and 3D drawings. Learners might be given the opportunity to practice producing drawing views for simple components by hand and/or using CAD software. Internet sources might also prove useful to explain drawing projection (such as http://www.we-r- here.com/cad/tutorials/level_1/1-12.htm which explains third angle orthographic projection and isometric views). Practice at drawing simple objects with different views might nevertheless prove useful to embed learning and understanding. A number of drawing packages, such as AutoCAD (AutoDesk) and SoildWorks can be obtained at no or very low cost for educational use, and these might prove useful throughout this unit.	3 hours	R107
2 Standard drawing conventions	Understanding drawing conventions might form a natural extension of understanding drawing views in both 2D and 3D drawings. Learners might be provided with example drawings demonstrating standard conventions such as sectional views, exploded views, detail views, materials/ components, dimensions, tolerances, scale, annotations and revisions. Should learners have the opportunity to practice drawing by hand and/or using CAD then exercises and activities might be developed by the teacher for learners to identify and/or demonstrate these standard drawing conventions. Practice and familiarity may prove to be a good way of developing learning and embedding understanding.	3 hours	R107
3 Producing pre- production plans	Teachers might begin with a simple class example of a process that requires some element of planning. This could be making a cup of tea or changing a car tyre. Learners could, in groups, produce a simple plan to include interpretation of the requirements, sequence of operations, time estimates for each stage, tools/ equipment/processes required, health and safety considerations and quality control checks. This will demonstrate all stages required for a plan. Learners might then progress onto producing similar plans for producing a pre-production product where the first stage will include interpreting details and requirements from an engineering drawing. Again, practice and familiarity may be useful to develop understanding. See Lesson Element Producing Pre-production Plans.	3 hours	R108

LO2 - BE ABLE TO USE PROCESSES, TOOLS AND EQUIPMENT SAFELY TO MAKE A PRE-PRODUCTION PRODUCT

Learning Outcome — The learner will:

LO2 Be able to use processes, tools and equipment safely to make a pre-production product

Suggested content	Suggested activities	Activity duration	Links to other units
1 Safe working and personal protective equipment	Safe use of tools and equipment and the proper use of personal protective equipment (PPE) will undoubtedly be a key consideration throughout this unit. Teachers might begin with an introduction to health and safety and PPE prior to learners undertaking practical workshop based activities. A starting point could be the Health and Safety at Work Act <u>http://www.hse.gov.uk/legislation/hswa.htm</u> where teachers might highlight the responsibilities of employees and employers with respect to working safely. Students could be presented with a number of examples for them to identify hazards and risks and to consider how the risk can be mitigated through working safely and by using PPE. Although not specific to this Learning Outcome, a simple risk assessment activity might be developed by the teacher for learners to undertake. See Lesson Element Safe Working and Personal Protective Equipment.	2 hours	R108
2 Manual hand processes	Manual hand processes such as bench work, measuring, marking out, using hand saws and files etc. naturally lend themselves to undertaking practical workshop- based activities. The teacher might begin with an introduction to the application and function of a range of hand tools before learners undertake practical activities developed by the teacher. Theoretical knowledge might usefully be introduced throughout any activities. The teacher may be able to give learners access to a range of different hand tools and measuring equipment, explaining the application of each (eg flat file for filing straight edges, round file for filing holes; micrometer for outside measurements, vernier calliper for inside or outside measurements etc.).	5 hours	R108
3 Machine processes	Similarly to hand processes, the use of manually controlled machining operations lend themselves to practical activities. Learners may require more teacher guidance, support and intervention to undertake machining processes safely and accurately. Teachers might begin by developing knowledge of machine function and operation (including setting up and use) prior to learners undertaking any practical work. This could include health and safety, work and material holding, tooling, speeds and feeds. Machining operations could include drilling, turning, milling, fabrication and forming. Again theoretical understanding may be developed alongside practical activities developed by the teacher	5 hours	R108

Suggested content	Suggested activities	Activity duration	Links to other units
4 Quality control checks	The teacher might begin with an introduction to the purpose of carrying out quality control on finished pre- production products introducing techniques by which this can be carried out (eg comparison against drawing, dimensions, tolerances and finish). Internet videos might be useful showing commercial quality control and quality management techniques <u>https://www.youtube.com/watch?v=TiuaFwzJ4FU</u> . If hand and machining processes have been used to manufacture a pre-production product then learners may have the opportunity to practically undertake quality control checks. In order to undertake some checks teachers may need to introduce learners to suitable measuring equipment such as a rule, vernier caliper, micrometer etc. Learners might then review their pre-production product against original drawing specifications.	3 hours	R108

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LO3 - BE ABLE TO MODIFY A PRODUCTION PLAN FOR DIFFERENT SCALES OF PRODUCTION

Learning Outcome — The learner will:

LO3 Be able to modify a production plan for different scales of production

Suggested content	Suggested activities	Activity duration	Links to other units
1 Commercial production methods	For this Learning Outcome learners need to consider how production of pre-production products can be scaled up to commercial production. The teacher might begin by explaining a range of commercial production methods including one-off, batch and mass production (see http://www.bbc.co.uk/schools/gcsebitesize/design/ resistantmaterials/processindpracrev1.shtml). Learners may already be familiar with one-off production from practical work already undertaken. If possible, an industrial visit might be arranged by the teacher during which learners focus on how designs and pre-production items are taken into production. This might include visits to the research and development department, and manufacturing department giving learners the opportunity to ask questions about commercial production methods. If a visit is not possible then internet videos might prove useful which show production methods (eg http://www.youtube. com/watch?v=DTWnQDAhp9k). See Lesson Element Commercial Production Methods: One-off, Batch or Mass Production?	3 hours	R106 (LO1)
2 Scaling up production	Previous work within this unit may have already given learners an opportunity to appreciate the planning process for a pre-production product, and also an understanding of various commercial production methods. The teacher could draw this knowledge together by getting learners to consider in detail how they might scale up production for an item they have produced (or for one provided by the teacher). Learners might consider how a production plan can be modified to scale up production in terms of: processes, sequence of operations, timings, health and safety, quality control and product modifications. If an industrial visit were arranged then questions regarding scaling up production might also form part of this visit.	3 hours	

POSSIBLE SOFTWARE

Software	Website
AutoDesk (AutoCAD software)	www.autodesk.co.uk
SolidWorks	www.solidworks.co.uk

POSSIBLE INTERNET SOURCES

Source	Website
YouTube	www.youtube.com
Health and Safety Executive	http://www.hse.gov.uk/legislation/hswa.htm

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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