Cambridge NATIONALS

Accredited

CAMBRIDGE NATIONALS IN ENGINEERING

R109, R110, R111 AND R112

RESOURCES LINK

VERSION 2

OCR
Oxford Cambridge and RSA

WELCOME

A Resources Link is an e-resource, provided by OCR, for teachers of OCR qualifications. It provides descriptions of, and links to, a variety of independent teaching and learning resources that you may find helpful.

In a Resources Link you will find details of independent resources, many of which are free: where this is the case this has been indicated.

If you know of other resources you would like to see included here, or discover broken links, please let us know. We would also like to hear from you if have any feedback about your use of these, or other, OCR resources. Please contact us at resources.feedback@ocr.org.uk.

We leave it to you, as a professional educator, to decide if any of these resources are right for you and your students, and how best to use them.

To give us feedback on, or ideas about the OCR resources you have used, email resources.feedback@ocr.org.uk

OCR Oxford Cambridge and RSA
Engineering Manufacture Level 1/2
Cambridge NATIONALS

Resources Index

click on a resource to go to the appropriate page.

Unit R111 - Computer aided manufacturing

- CNC-SIMULATOR 2.2
- CNC lathe setup
- PowerSHAPE-e Download
- The Journeyman's Guide to CNC Machines
- CNC Programming Handbook
- CNC turning machines – HSE data sheets
- TATA Technologies
- Prototype Projects gallery of projects
- Enhance understanding of maths and science for engineering

Unit R112 - Quality control of engineered products

- The 8 principles of quality management
- Quality Management Systems
- Implementing quality systems – a BSI case study
- Beginner's Guide to Measurement in Mechanical Engineering
- NDT Education Resources – from the NDT Resource Centre
- Measuring instruments for Physics - Micrometer
- How to read calipers
- 3D Scanners UK case study
- Top 25 Lean Tools
- Seven Deadly Wastes - The Essence Of Lean
- Enhance understanding of maths and science for engineering

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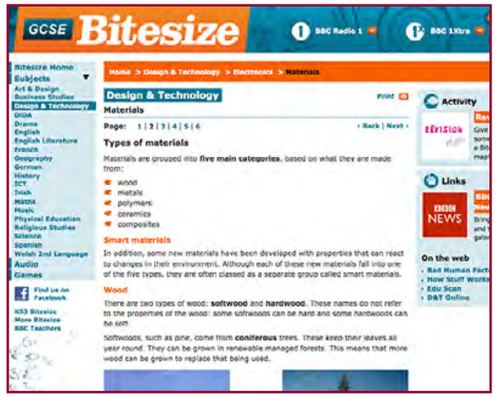
Engineering Manufacture Level 1/2
Cambridge NATIONALS

BBC Bitesize – materials



A revision site listing and comparing different materials and their properties.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO1 Know about properties and uses of engineering materials
Cost:	Free
Format:	Website

http://www.bbc.co.uk/schools/gcsebitesize/design/electronics/materialsrev2.shtml

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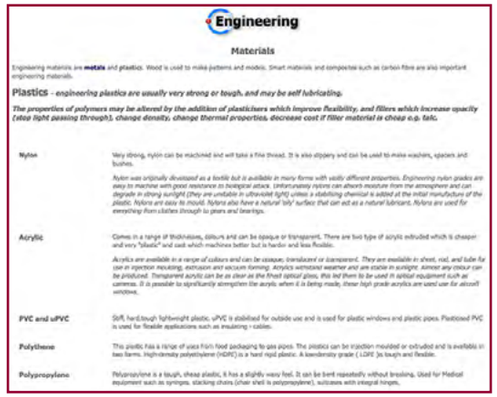
Engineering Materials


Engineering

Materials

Engineering materials are **metals** and plastics. Wood is used to make patterns and models. Smart materials and composites such as carbon fibre are also important engineering materials.

Plastics - *engineering plastics are usually very strong or tough, and may be self lubricating.*

The properties of polymers may be altered by the addition of plasticisers which improve flexibility, and fillers which increase opacity (stop light passing through), change density, change thermal properties, decrease cost if filler material is cheap e.g. talc.

Nylon

Very strong, nylon can be machined and will take a fine thread. It is also slippery and can be used to make washers, spacers and bushes.

Nylon was originally developed as a textile but is available in many forms with vastly different properties. Engineering nylon grades are easy to machine with good resistance to biological attack. Unfortunately nylons can absorb moisture from the atmosphere and can degrade in strong sunlight (they are unstable in ultraviolet light) unless a stabilising chemical is added at the initial manufacture of the plastic. Nylons are easy to mould. Nylons also have a natural 'oily' surface that can act as a natural lubricant. Nylons are used for everything from clothes through to gears and bearings.

Acrylic

Comes in a range of thicknesses, colours and can be opaque or transparent. There are two type of acrylic extruded which is cheaper and very "plastic" and cast which machines better but is harder and less flexible.

Acrylics are available in a range of colours and can be opaque, translucent or transparent. They are available in sheet, rod, and tube for use in injection moulding, extrusion and vacuum forming. Acrylics withstand weather and are stable in sunlight. Almost any colour can be produced. Transparent acrylic can be as clear as the finest optical glass, this led them to be used in optical equipment such as cameras. It is possible to significantly strengthen the acrylic when it is being made, these high grade acrylics are used user for aircraft windows.

PVC and uPVC

Stiff, hard,tough lightweight plastic. uPVC is stabilised for outside use and is used for plastic windows and plastic pipes. Plasticised PVC is used for flexible applications such as insulating r cables.

Polythene

This plastic has a range of uses from food packaging to gas pipes. The plastics can be injection moulded or extruded and is available in two forms. High-density polyethylene (HDPE) is a hard rigid plastic. A low-density grade (LDPE)is tough and flexible.

Polypropylene

Polypropylene is a tough, cheap plastic, it has a slightly waxy feel. It can be bent repeatedly without breaking. Used for Medical equipment such as syringes, stacking chairs (chair shell is polypropylene), suitcases with integral hinges.

A comparison of plastics and metals with numerous examples and some basic quizzes.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO1 Know about properties and uses of engineering materials
Cost:	Free
Format:	Informational website with online quiz

http://www.the-warren.org/GCSERevision/engineering/engineering%20materials.html

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Engineering Manufacture Level 1/2
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National Physics Laboratory – materials

Information on different materials and a printable educational poster.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO1 Know about properties and uses of engineering materials
Cost:	Free
Format:	Website and printable poster

http://www.npl.co.uk/educate-explore/factsheets/materials/

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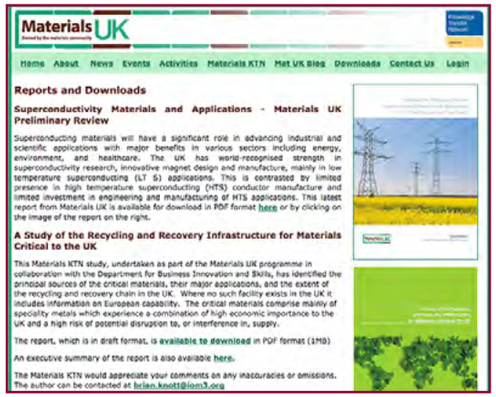
Materials UK Reports and Downloads



A web site with links to a range of reports and downloadable information.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO1 Know about properties and uses of engineering materials
Cost:	Free
Format:	Website

http://www.matuk.co.uk/reports.htm

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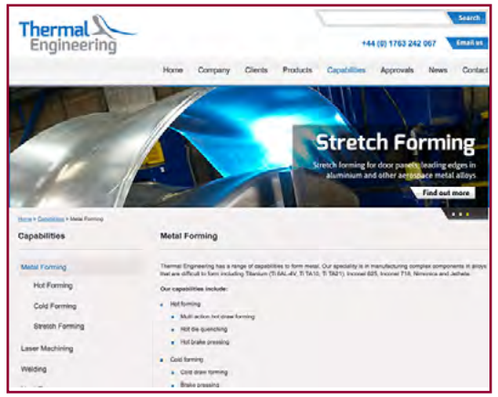
Thermal Engineering Capabilities



A commercial web site which lists the processes used by the organisation to produce products for a range of customers. Includes the a range of metal forming aspect.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO2 Understand engineering processes and their application
Cost:	Free
Format:	Website

http://www.thermalengineering.co.uk/capabilities/metal-forming/

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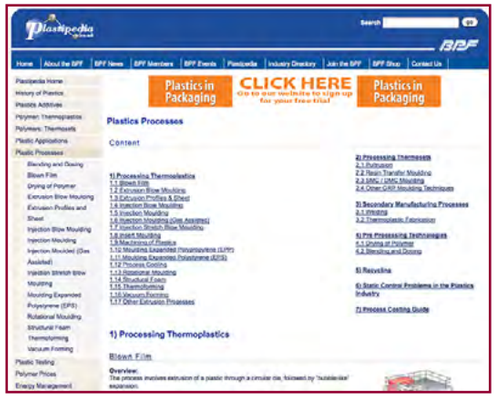
Plastipedia



A commercial plastics web site that contains a number of useful flash animations demonstrating numerous plastics processes.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO2 Understand engineering processes and their application
Cost:	Free
Format:	Website – Embedded flash animations.

http://www.bpf.co.uk/Plastipedia/Processes/Default.aspx

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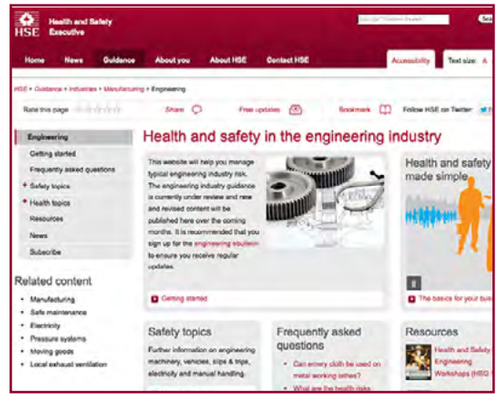
Health and safety in the engineering industry



The official health and safety executive site relating to the engineering industry.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO2 The official health and safety executive site relating to the engineering industry
Cost:	Free
Format:	Website

http://www.hse.gov.uk/engineering/

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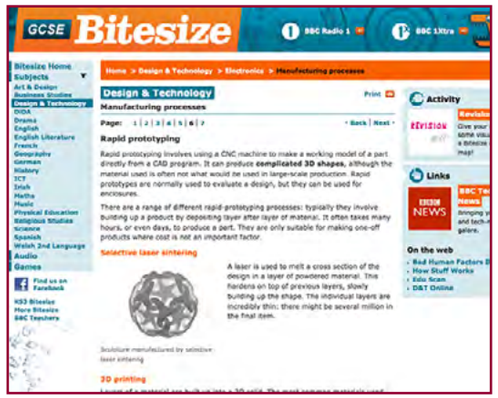
BBC Bitesize – Rapid Prototyping



BBC revision site with seven pages of information on rapid prototyping, presented in an easy to understand way.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO3 Know about developments in engineering processes
Cost:	Free
Format:	Website

http://www.bbc.co.uk/schools/gcsebitesize/design/electronics/manufacturing_processesrev6.shtml

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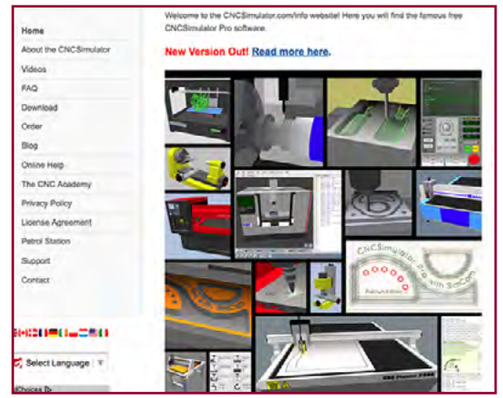
CNC Simulator Software



A CNC simulation that can be used to practice CNC programming, instructions and user guides are included in PDF.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO3 Know about developments in engineering processes, LO4 Understand the impact of modern technologies on engineering production
Cost:	Free to download – some programme limitations.
Format:	Simulation software and guide

http://cncsimulator.info/download

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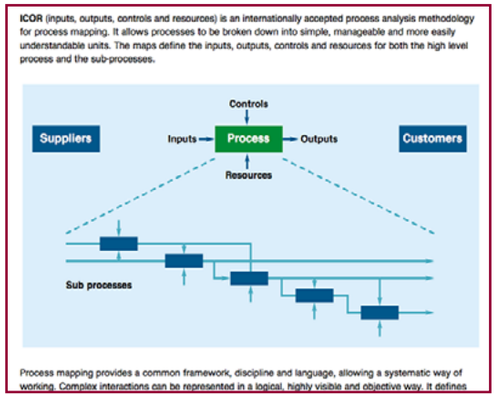
Tools & Techniques for Process Improvement



A DTI resource introducing models for improving processes. The resource describes how each technique can be used.

Supports: OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO4 Understand the impact of modern technologies on engineering production

Cost: Free

Format: Online list of techniques with explanation.

http://www.businessballs.com/dtiresources/TQM_process_improvement_tools.pdf

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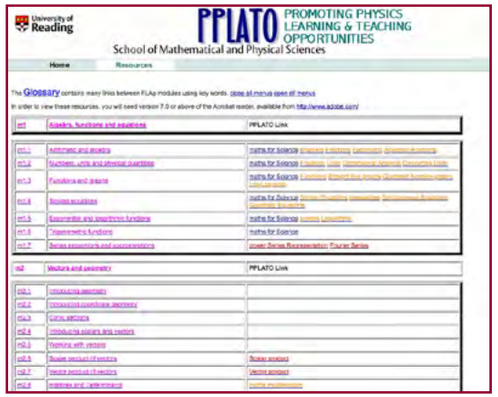
Enhance understanding of maths and science for engineering



A free to access self-learning website for supporting engineering maths and science.

Supports: OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO1 Know about properties and uses of engineering materials, LO2 Understand engineering processes and their application, LO3 Know about developments in engineering processes, LO4 Understand the impact of modern technologies on engineering production

Cost: Free

Format: Website

http://www.met.reading.ac.uk/pplato/resources/

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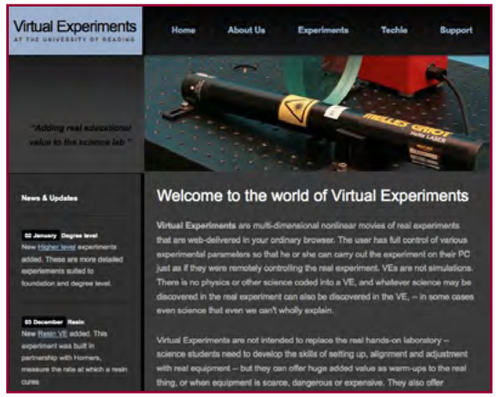
Virtual science experiments



A free to access self-learning website for science in engineering.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R109, LO1 Know about properties and uses of engineering materials, LO2 Understand engineering processes and their application
Cost:	Free
Format:	Website
	http://www.reading.ac.uk/virtualexperiments

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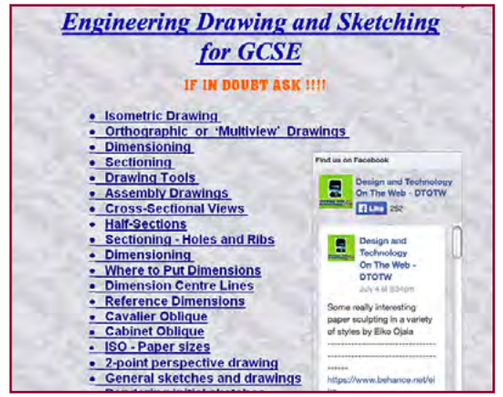
Engineering Drawing and Sketching for GCSE



A website with links to the most common engineering drawing conventions, written for GCSE students.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO1 Be able to plan for the making of a pre-production product
Cost:	Free
Format:	Web site with links and diagrams.
	http://www.design-technology.info/IndProd/drawings/

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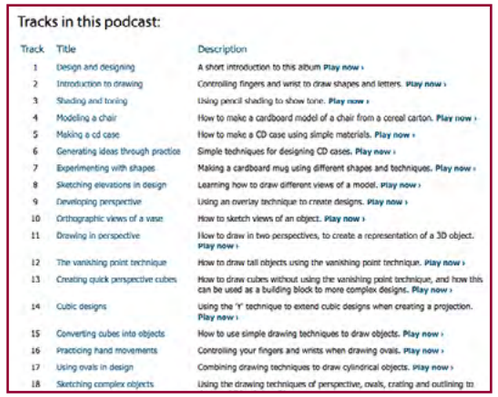
Design and Designing



Tracks in this podcast:

Track	Title	Description
1	Design and designing	A short introduction to this album Play now ›
2	Introduction to drawing	Controlling fingers and wrist to draw shapes and letters. Play now ›
3	Shading and toning	Using pencil shading to show tone. Play now ›
4	Modelling a chair	How to make a cardboard model of a chair from a cereal carton. Play now ›
5	Making a cd case	How to make a CD case using simple materials. Play now ›
6	Generating ideas through practice	Simple techniques for designing CD cases. Play now ›
7	Experimenting with shapes	Making a cardboard mug using different shapes and techniques. Play now ›
8	Sketching elevations in design	Learning how to draw different views of a model. Play now ›
9	Developing perspective	Using an overlay technique to create designs. Play now ›
10	Orthographic views of a vase	How to sketch views of an object. Play now ›
11	Drawing in perspective	How to draw in two perspectives, to create a representation of a 3D object. Play now ›
12	The vanishing point technique	How to draw tall objects using the vanishing point technique. Play now ›
13	Creating quick perspective cubes	How to draw cubes without using the vanishing point technique, and how this can be used as a building block to more complex designs. Play now ›
14	Cubic designs	Using the 'Y' technique to extend cubic designs when creating a projection. Play now ›
15	Converting cubes into objects	How to use simple drawing techniques to draw objects. Play now ›
16	Practising hand movements	Controlling your fingers and wrists when drawing ovals. Play now ›
17	Using ovals in design	Combining drawing techniques to draw cylindrical objects. Play now ›
18	Sketching complex objects	Using the drawing techniques of perspective, ovals, crating and outlining to

A series of short videos from the Open University, part of the iTunes U initiative. The series contains 22 short videos lasting 75 minutes in total.

The series covers a range of drawing and designing techniques with practical examples of product design.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, 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
Cost:	Free
Format:	Series of educational videos, transcripts are also available.

http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/design-and-designing

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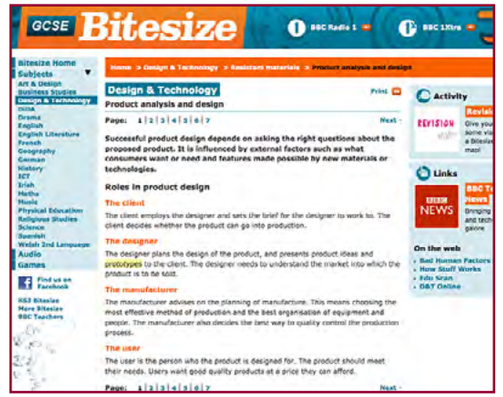
BBC Bitesize – Product analysis and design



A series of web pages looking at product design covering stakeholders, analysis, design, specification, prototype, modelling and quality control.

Short revision type content with additional links.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO1 Be able to plan for the making of a pre-production product
Cost:	Free
Format:	Website

http://www.bbc.co.uk/schools/gcsebitesize/design/resistantmaterials/designanalysisevaluationrev1.shtml

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Supporting business through standards A BSI case study

An online case study which demonstrates how BSI (British Standards Institute) supports new product development and production.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, 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
Cost:	Free – numerous adverts are embedded in the pages.
Format:	Case study over 6 web pages

http://businesscasestudies.co.uk/bsi/supporting-business-through-standards/introduction.html#ixzz2z2jKzdOZ

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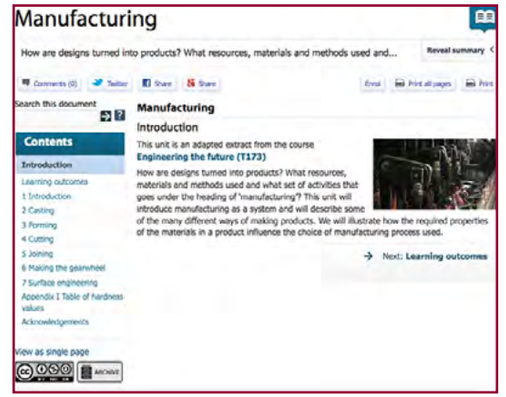
Open Learn – Manufacturing and Production



Part of the Open University Open Learn series, this link is for the whole manufacturing module. The module takes 20 hours in total but selected elements can be chosen as required. The module covers:

- How designs are turned into products?
- What resources, materials and methods used and what set of activities that goes under the heading of 'manufacturing'?

The module illustrates how the required properties of the materials in a product influence the choice of manufacturing process used.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, 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
Cost:	Free
Format:	Online module

http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/design-and-innovation/design/manufacturing/content-section-0

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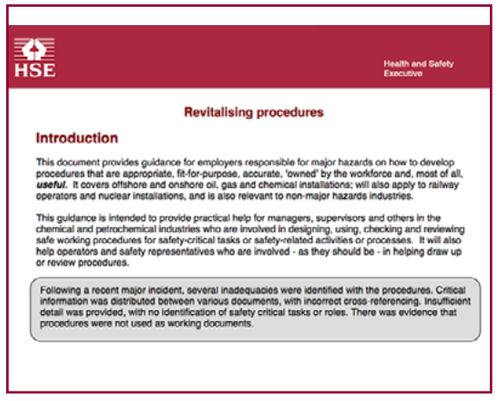
HSE Guide to Revitalising procedures


HSE
Health and Safety Executive

Revitalising procedures

Introduction

This document provides guidance for employers responsible for major hazards on how to develop procedures that are appropriate, fit-for-purpose, accurate, 'owned' by the workforce and, most of all, *useful*. It covers offshore and onshore oil, gas and chemical installations; will also apply to railway operators and nuclear installations, and is also relevant to non-major hazards industries.

This guidance is intended to provide practical help for managers, supervisors and others in the chemical and petrochemical industries who are involved in designing, using, checking and reviewing safe working procedures for safety-critical tasks or safety-related activities or processes. It will also help operators and safety representatives who are involved - as they should be - in helping draw up or review procedures.

Following a recent major incident, several inadequacies were identified with the procedures. Critical information was distributed between various documents, with incorrect cross-referencing. Insufficient detail was provided, with no identification of safety critical tasks or roles. There was evidence that procedures were not used as working documents.

The document is a guide for employers on developing safe working procedures with reference to near miss and incident investigations. The document approaches the procedures from a development angle rather than a compliance angle. The emphasis is on the WHY of safe working procedures rather than the WHAT.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO2 Be able to use processes, tools and equipment safely to make a pre-production product
Cost:	Free
Format:	8 page document, available for download
	http://www.hse.gov.uk/humanfactors/topics/procinfo.pdf

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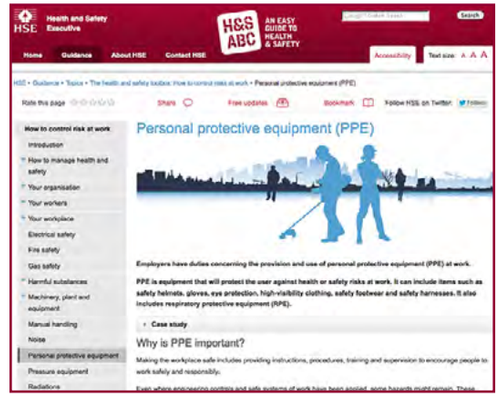
HSE – Personal protective equipment (PPE)



The HSE official web page explaining when PPE is required, including a simple case study.

The site explains the different hazards and appropriate PPE.

The emphasis is on removal of hazard in preference to PPE. The page links to the official regulations on PPE.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO2 Be able to use processes, tools and equipment safely to make a pre-production product
Cost:	Free
Format:	Website
	http://www.hse.gov.uk/Toolbox/ppe.htm

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BBC Bitesize – Design & Technology – Systems and practices

A brief overview of the different production methods and the relative benefits of each. Covers One-off, Batch and Mass production.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO3 Be able to modify a production plan for different scales of production
Cost:	Free
Format:	Website

http://www.bbc.co.uk/schools/gcsebitesize/design/textiles/texsystemspracticesrev3.shtml

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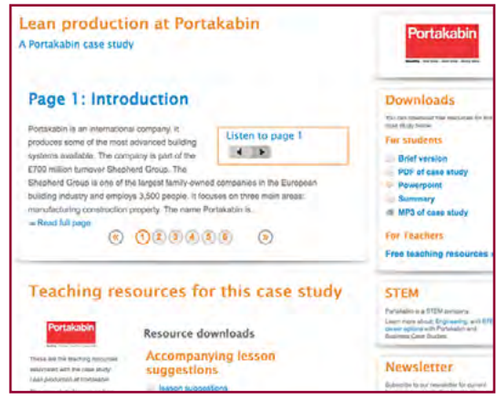
Lean production at Portakabin



A downloadable case study for use with students. Comprising of the case study, activities, MP3 Audio and a worksheet, this case study focuses on how Portakabin uses lean production methods to ensure it produces a quality product that gives value to the customer.

There are numerous case studies on the page, to access this case study

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO3 Be able to modify a production plan for different scales of production
Cost:	Free
Format:	Downloadable case study materials

http://businesscasestudies.co.uk/portakabin/lean-production-at-portakabin/#axzz2z2i3VV5U

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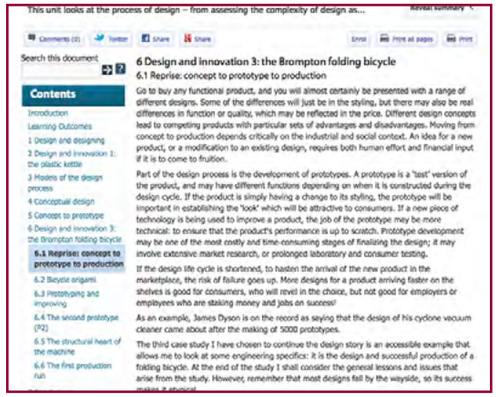
6 Design and innovation 3: the Brompton folding bicycle


This unit looks at the process of design – from assessing the complexity of design an...

Search this document

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- Introduction
- Learning Outcomes
- 1 Design and designing
- 2 Design and innovation 1: the plastic kettle
- 3 Models of the design process
- 4 Conceptual design
- 5 Concept to prototype
- 6 Design and innovation 3: the Brompton folding bicycle
  - 6.1 Reprise: concept to prototype to production
  - 6.2 Bicycle origami
  - 6.3 Prototyping and improving
  - 6.4 The second prototype (P2)
  - 6.5 The structural heart of the machine
  - 6.6 The first production run

6 Design and innovation 3: the Brompton folding bicycle

6.1 Reprise: concept to prototype to production

Go to buy any functional product, and you will almost certainly be presented with a range of different designs. Some of the differences will just be in the styling, but there may also be real differences in function or quality, which may be reflected in the price. Different design concepts lead to competing products with particular sets of advantages and disadvantages. Moving from concept to production depends critically on the industrial and social context. An idea for a new product, or a modification to an existing design, requires both human effort and financial input if it is to come to fruition.

Part of the design process is the development of prototypes. A prototype is a 'test' version of the product, and may have different functions depending on when it is constructed during the design cycle. If the product is simply having a change to its styling, the prototype will be important in establishing the 'look' which will be attractive to consumers. If a new piece of technology is being used to improve a product, the job of the prototype may be more technical: to ensure that the product's performance is up to scratch. Prototype development may be one of the most costly and time-consuming stages of finalizing the design; it may involve extensive market research, or prolonged laboratory and consumer testing.

If the design life cycle is shortened, to hasten the arrival of the new product in the marketplace, the risk of failure goes up. More designs for a product arriving faster on the shelves is good for consumers, who will revel in the choice, but not good for employers or employees who are staking money and jobs on success!

As an example, James Dyson is on the record as saying that the design of his cyclone vacuum cleaner came about after the making of 5000 prototypes.

The third case study I have chosen to continue the design story is an accessible example that allows me to look at some engineering specifics: it is the design and successful production of a folding bicycle. At the end of the study I shall consider the general lessons and issues that arise from the study. However, remember that most designs fall by the wayside, so its success

An Open University – Open Learn resource. The module looks at the design process. Chapter six is a case study based on the Brompton folding bicycle and explores the stages from concept to the first production run.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO3 Be able to modify a production plan for different scales of production
Cost:	Free
Format:	Online course

http://www.open.edu/openlearn/science-maths-technology/engineering-and-technology/design-and-innovation/design/design/content-section-8.1

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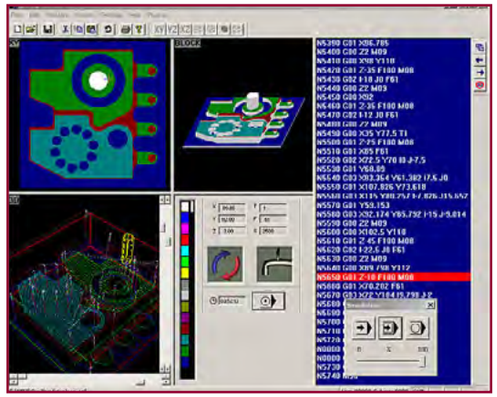
CNC-SIMULATOR 2.2



A basic CNC simulator for practice away from the CNC machine.
Some of the CncSimulator's capabilities:
Plug-in interface for developers.
Simulation in 2D and 3D of both mill and lathe nc-code.
3D Block graphics.
Advanced NC Editor, complete with machine communications.
Simulation of machine time to aid in the calculation of costs etc.
(Not tested for by reviewer)

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, LO1 Be able to plan the production of components on Computer Numerical Control (CNC) machines, LO2 Be able to interpret information from CAD to manufacture components on CNC equipment, LO3 Be able to set-up and use Computer Numerical Control (CNC) equipment to manufacture components, LO4 Know about applications of computer control processes used to manufacture products
Cost:	Free
Format:	Simulation software

http://cnc-simulator.software.informer.com/2.2/

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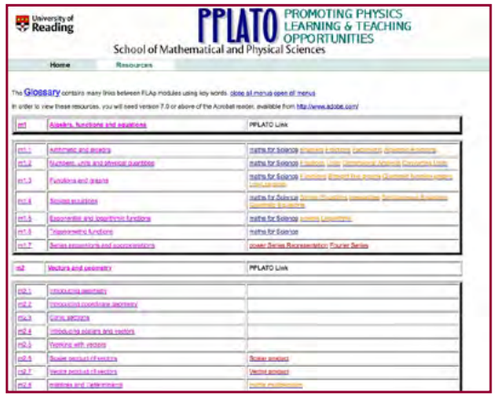
Enhance understanding of maths and science for engineering



A free to access self-learning website for supporting engineering maths and science.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R110, 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
Cost:	Free
Format:	Website

http://www.met.reading.ac.uk/pplato/resources/

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Swansoft CNC Simulator (SSCNC) Features

An advanced virtual CNC environment. Part of the Swansoft simulator range.

The software licence is not free but a 7 day evaluation version is available to try out the simulator.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO1 Be able to plan the production of components on Computer Numerical Control (CNC) machines, LO2 Be able to interpret information from CAD to manufacture components on CNC equipment, LO3 Be able to set-up and use Computer Numerical Control (CNC) equipment to manufacture components, LO4 Know about applications of computer control processes used to manufacture products
Cost:	Approximately £230 for the licence
Format:	Commercial software

http://swansoftcncsimulator.com/

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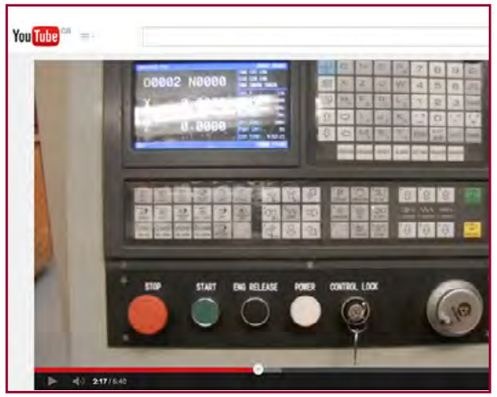
CNC lathe setup – YouTube videos



Two short videos demonstrating the set up process for a CNC lathe.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO1 Be able to plan the production of components on Computer Numerical Control (CNC) machines
Cost:	Free
Format:	Two video demonstrations

http://youtu.be/fTPluUa6be0 Part 1

http://youtu.be/ph79hia_LTw Part 2

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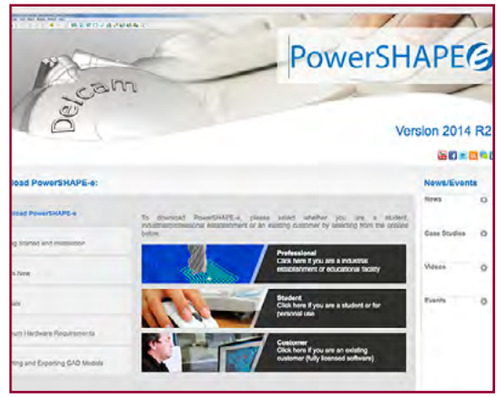
PowerSHAPE-e Download



Free CAD software Students can use PowerSHAPE-e to learn how a modern 3D CAD system works. Create complex 3D models quickly and simply, and share them with lecturers or other students. PowerSHAPE-e is perfect for design projects and engineering course work as it is easy to use, powerful, and flexible.

Tutorials and videos are available on the site.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO2 Be able to interpret information from CAD to manufacture components on CNC equipment
Cost:	Free
Format:	Fully functioning software

http://www.delcam.com/software-downloads/powershape-e/index.asp?from=PSHAPE

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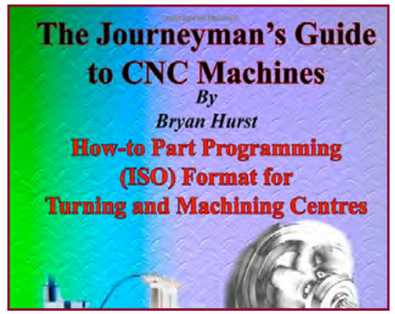
The Journeyman's Guide to CNC Machines



Explanation of how to use and programme CNC machines, requires a basic understanding to get the most out of the publication.

The Guide provides instruction in ISO code programming for Turning & Machining Centres covering a series of important aspects giving a thorough grounding in programme preparation, the programming possibilities and the extent of the standard functions. Automatic Cycles and Subroutines are controller specific, the OEM decides on Auxiliary Functions; included are examples that will give an understanding of the principles to apply to any machine and control, also featured are GE Fanuc and Siemens Controls. The Guide lists functions and codes under the reference JG and provides space to include data for specific machines and controls. Extensive examples show how-to programme the options and features. Component drawings have metric and imperial dimensions simply substitute the dimensions with those of the system of your choice. The Guide is your starting point; use the instructions and suggestions to build your own unique evolvable folder from here creating an invaluable personal handbook.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, L02 Be able to interpret information from CAD to manufacture components on CNC equipment, LO3 Be able to set-up and use Computer Numerical Control (CNC) equipment to manufacture components
Cost:	Approximately £25
Format:	Published text book
	ISBN-13: 978-1411699212

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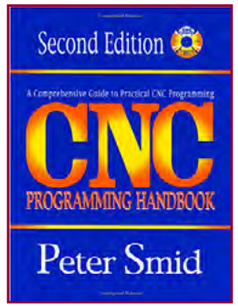
CNC Programming Handbook



Comprehensive, this book covers just about every possible subject a typical CNC programmer may encounter on a daily basis and is equally applicable to both CNC milling and CNC turning operations. Filled with over one thousand illustrations, tables, formulas, tips, shortcuts, and practical examples, this widely respected publication is structured in a logical order that is readily adaptable to virtually all levels of CNC training, from the basic to the advanced.

A CD-ROM, packed with actual problem-solving projects and enhancing the material presented in the book, is included. Users will find programming projects and exercises for most chapters, special programming and machining projects, solutions to problems, and numerous reference files useful in CNC programming, as well as several utilities. With the majority of files in Adobe PDF, instructors will be able to quickly and easily print and distribute any of the projects, exercises, and references to their classes. Meanwhile, students and professionals will find this CD an effective self-study aid that allows them to enhance their understanding of the subject one topic at a time. Presents complete information on various programming techniques, from the basic areas to dozens of advanced concepts.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO1 Be able to plan the production of components on Computer Numerical Control (CNC) machines, LO2 Be able to interpret information from CAD to manufacture components on CNC equipment, LO3 Be able to set-up and use Computer Numerical Control (CNC) equipment to manufacture components, LO4 Know about applications of computer control processes used to manufacture products
Cost:	Approximately £120
Format:	Published text book and interactive CD. ISBN-13: 978-0831131586

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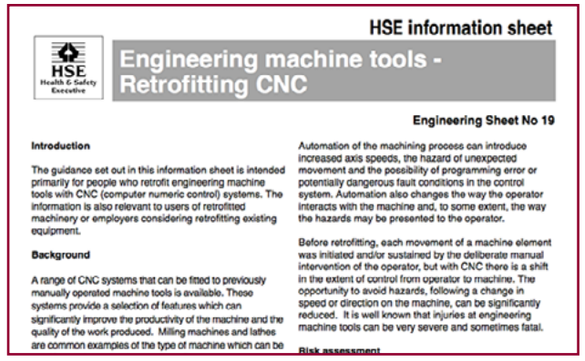
CNC turning machines – HSE data sheets



HSE information sheet

HSE Health & Safety Executive

Engineering machine tools - Retrofitting CNC

Engineering Sheet No 19

Introduction

The guidance set out in this information sheet is intended primarily for people who retrofit engineering machine tools with CNC (computer numeric control) systems. The information is also relevant to users of retrofitted machinery or employers considering retrofitting existing equipment.

Background

A range of CNC systems that can be fitted to previously manually operated machine tools is available. These systems provide a selection of features which can significantly improve the productivity of the machine and the quality of the work produced. Milling machines and lathes are common examples of the type of machine which can be

Automation of the machining process can introduce increased axis speeds, the hazard of unexpected movement and the possibility of programming error or potentially dangerous fault conditions in the control system. Automation also changes the way the operator interacts with the machine and, to some extent, the way the hazards may be presented to the operator.

Before retrofitting, each movement of a machine element was initiated and/or sustained by the deliberate manual intervention of the operator, but with CNC there is a shift in the extent of control from operator to machine. The opportunity to avoid hazards, following a change in speed or direction on the machine, can be significantly reduced. It is well known that injuries at engineering machine tools can be very severe and sometimes fatal.

Risk assessment

Two CNC related data sheets from the official HSE web site. They cover retrofitting CNC machines and controlling ejected waste.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO3 Be able to set-up and use Computer Numerical Control (CNC) equipment to manufacture components
Cost:	Free
Format:	PDFsheets (8 pages total)

http://www.hse.gov.uk/pubns/eis19.pdf http://www.hse.gov.uk/pubns/eis33.pdf

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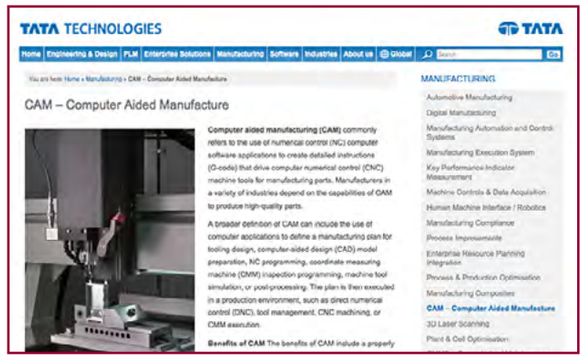
TATA Technologies



TATA TECHNOLOGIES

TATA

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You are here: Home » Manufacturing » CAM – Computer Aided Manufacture

CAM – Computer Aided Manufacture

Computer aided manufacturing (CAM) commonly refers to the use of numerical control (NC) computer software applications to create detailed instructions (G-code) that drive computer numerical control (CNC) machine tools for manufacturing parts. Manufacturers in a variety of industries depend on the capabilities of CAM to produce high-quality parts.

A broader definition of CAM can include the use of computer applications to define a manufacturing plan for tooling design, computer-aided design (CAD) model preparation, NC programming, coordinate measuring machine (CMM) inspection programming, machine tool simulation, or post-processing. The plan is then executed in a production environment, such as direct numerical control (DNC), tool management, CNC machining, or CMM execution.

Benefits of CAM The benefits of CAM include a properly

MANUFACTURING

- Automotive Manufacturing
- Digital Manufacturing
- Manufacturing Automation and Control Systems
- Manufacturing Execution System
- Key Performance Indicator Measurement
- Machine Controls & Data Acquisition
- Human Machine Interface / Robotics
- Manufacturing Compliance
- Process Improvements
- Enterprise Resource Planning Integration
- Process & Production Optimization
- Manufacturing Companies
- CAM – Computer Aided Manufacture
- 3D Laser Scanning
- Plant & Cell Optimization

The TATA organisational web site. The site describes how TATA utilise computer aided manufacture.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO4 Know about applications of computer control processes used to manufacture products
Cost:	Free
Format:	Website

http://www.tatatechnologies.co.uk/manufacturing/cam-computer-aided-manufacture/

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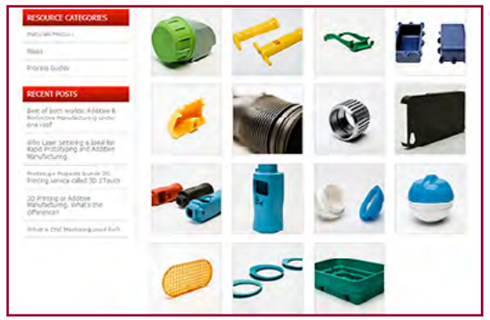
Prototype Projects gallery of projects



A commercial web site that has images of projects, explanations of technologies and discussion papers on rapid prototyping. The organisation delivers rapid prototyping services.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO4 Know about applications of computer control processes used to manufacture products
Cost:	Free
Format:	Website

http://www.prototypeprojects.com/

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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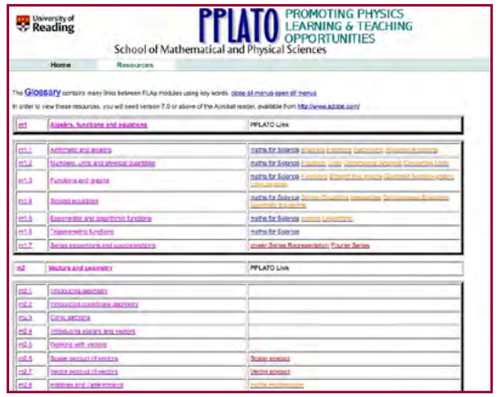
Enhance understanding of maths and science for engineering



A free to access self-learning website for supporting engineering maths and science.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R111, LO2 Be able to interpret information from Computer Aided Design (CAD) to manufacture components on CNC equipment
Cost:	Free
Format:	Website

http://www.met.reading.ac.uk/pplato/resources/

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The 8 principles of quality management


The 8 Principles of Quality Management

ISO 9001 is based upon 8 Principles of Quality Management. As well as being guiding principles for the development of the most popular quality standard, they are also useful resources for management professionals looking to implement or improve a quality management programme.

Principle 1: Customer Focus
This standard relates to customer needs and customer service: a business should understand their customers and seek to meet their requirements. Where possible, they should aim to exceed customer expectations.

The benefits of this are increased customer loyalty, increased revenue due to the ability to

From 'The British Assessment Bureau' this article discusses the underpinning principles of quality management. There is also a useful link to the 'history of ISO 9000' on this page.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO1 Understand the importance of quality control
Cost:	Free
Format:	Online article

http://www.british-assessment.co.uk/articles/the-8-principles-of-quality-management

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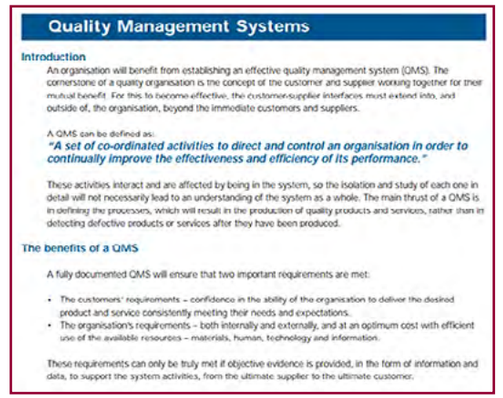
Quality Management Systems


Quality Management Systems

Introduction

An organisation will benefit from establishing an effective quality management system (QMS). The cornerstone of a quality organisation is the concept of the customer and supplier working together for their mutual benefit. For this to become effective, the customer-supplier interfaces must extend into, and outside of, the organisation, beyond the immediate customers and suppliers.

A QMS can be defined as:
"A set of co-ordinated activities to direct and control an organisation in order to continually improve the effectiveness and efficiency of its performance."

These activities interact and are affected by being in the system, so the isolation and study of each one in detail will not necessarily lead to an understanding of the system as a whole. The main thrust of a QMS is in defining the processes, which will result in the production of quality products and services, rather than in detecting defective products or services after they have been produced.

The benefits of a QMS

A fully documented QMS will ensure that two important requirements are met:

- The customers' requirements – confidence in the ability of the organisation to deliver the desired product and service consistently meeting their needs and expectations.
- The organisation's requirements – both internally and externally, and at an optimum cost with efficient use of the available resources – materials, human, technology and information.

These requirements can only be truly met if objective evidence is provided, in the form of information and data, to support the system activities, from the ultimate supplier to the ultimate customer.

A DTI overview of the elements of a quality management system.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO1 Understand the importance of quality control
Cost:	Free
Format:	Online paper

http://www.businessballs.com/dtiresources/quality_management_systems_QMS.pdf

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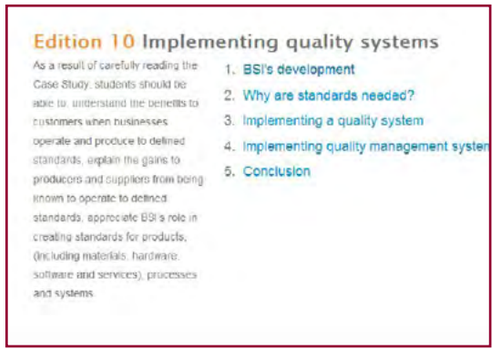
Implementing quality systems – a BSI case study


Edition 10 Implementing quality systems

As a result of carefully reading the Case Study, students should be able to: understand the benefits to customers when businesses operate and produce to defined standards; explain the gains to producers and suppliers from being known to operate to defined standards; appreciate BSI's role in creating standards for products, (including materials, hardware, software and services), processes and systems.

1. BSI's development
2. Why are standards needed?
3. Implementing a quality system
4. Implementing quality management system
5. Conclusion

Implementing quality systems in full in PDF format taken from edition 10 of The Times 100.

As a result of reading the Case Study, students should be able to:

Understand the benefits to customers when businesses operate and produce to defined standards.

Explain the gains to producers and suppliers from being known to operate to defined standards.

Appreciate BSI's role in creating standards for products, (including materials, hardware, software and services), processes and systems.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO1 Understand the importance of quality control, LO2 Be able to assess product quality from inspection and quality control techniques
Cost:	£2.29 to download the exercise. Can be read on line free of charge.
Format:	Downloadable PDF exercises

http://businesscasestudies.co.uk/bsi/#axzz38I9zTcVG

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Beginner's Guide to Measurement in Mechanical Engineering

A beginner's guide from the National Physical Laboratory and the Institute of Mechanical Engineers.

This 54 page publication covers a broad range of measurements techniques, standards and considerations.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO1 Understand the importance of quality control, LO2 Be able to assess product quality from inspection and quality control techniques, LO3 Know how modern technologies can be used in quality control
Cost:	Free to download
Format:	Downloadable PDF publication

http://www.npl.co.uk/upload/pdf/beg-guide-measurement-mech-eng.pdf

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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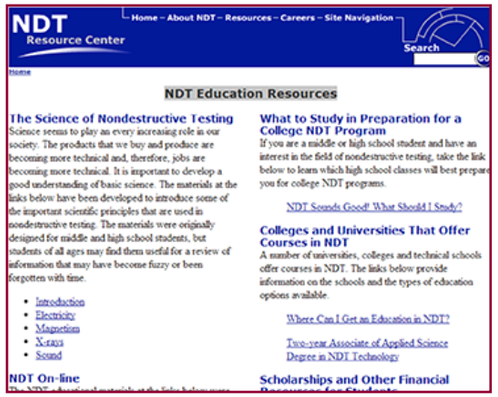
NDT Education Resources – from the NDT Resource Centre



An introduction to non-destructive testing and coverage of a range of techniques including:
Electricity
Magnetism
X-Rays
Ultrasonic
An American web site.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO2 Be able to assess product quality from inspection and quality control techniques, LO3 Know how modern technologies can be used in quality control
Cost:	Free
Format:	Website with a range of links and resources

http://www.ndt-ed.org/EducationResources/educationresource.htm

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

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Measuring instruments for Physics – Micrometer

A detailed video demonstrating how to use a micrometer correctly. Demonstrated on wire and paper.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO2 Be able to assess product quality from inspection and quality control techniques
Cost:	Free
Format:	YouTube video

http://youtu.be/7Me6QVpVgkM

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

resources.feedback@ocr.org.uk

How to read calipers

A short video demonstrating how a range of calipers can be read accurately. Sound but no narration.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO2 Be able to assess product quality from inspection and quality control techniques, LO3 Know how modern technologies can be used in quality control
Cost:	Free
Format:	YouTube video

http://youtu.be/qcrWzOH2oLs

OCR Oxford Cambridge and RSA
Engineering Manufacture Level 1/2
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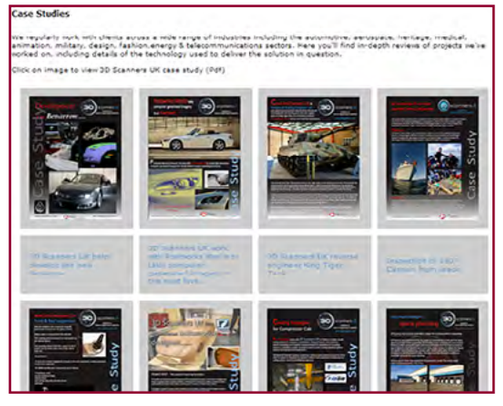
3D Scanners UK case study



A series of case studies from an organisation offering 3d scanning. Links on the page also explain the different scanning technologies and has a useful FAQ section.

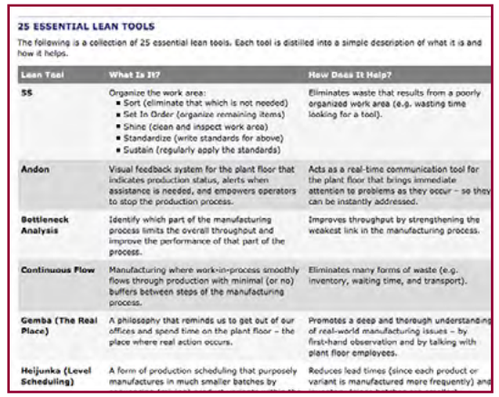
Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO2 Be able to assess product quality from inspection and quality control techniques, LO3 Know how modern technologies can be used in quality control
Cost:	Free
Format:	Commercial website with information pages and PDF downloads.

http://www.3dscanners.co.uk/casestudies.html

If you know of any resources that you think should appear here, or if you identify broken links please let us know. We would also like to hear from you with your feedback about your use of any of the resources listed here. Please contact us at

resources.feedback@ocr.org.uk

Top 25 Lean Tools



25 ESSENTIAL LEAN TOOLS

The following is a collection of 25 essential lean tools. Each tool is distilled into a simple description of what it is and how it helps.

Lean Tool	What Is It?	How Does It Help?
5S	Organize the work area: ▪ Sort (eliminate that which is not needed) ▪ Set In Order (organize remaining items) ▪ Shine (clean and inspect work area) ▪ Standardize (write standards for above) ▪ Sustain (regularly apply the standards)	Eliminates waste that results from a poorly organized work area (e.g. wasting time looking for a tool).
Andon	Visual feedback system for the plant floor that indicates production status, alerts when assistance is needed, and empowers operators to stop the production process.	Acts as a real-time communication tool for the plant floor that brings immediate attention to problems as they occur – so they can be instantly addressed.
Bottleneck Analysis	Identify which part of the manufacturing process limits the overall throughput and improve the performance of that part of the process.	Improves throughput by strengthening the weakest link in the manufacturing process.
Continuous Flow	Manufacturing where work-in-process smoothly flows through production with minimal (or no) buffers between steps of the manufacturing process.	Eliminates many forms of waste (e.g. inventory, waiting time, and transport).
Gemba (The Real Place)	A philosophy that reminds us to get out of our offices and spend time on the plant floor – the place where real action occurs.	Promotes a deep and thorough understanding of real-world manufacturing issues – by first-hand observation and by talking with plant floor employees.
Heijunka (Level Scheduling)	A form of production scheduling that purposely manufactures in much smaller batches by	Reduces lead times (since each product or variant is manufactured more frequently) and

A quick overview of 25 key lean tools with a link to download more detail on a selected number of the tools. Useful as a checklist and overview. The PDF resources give more detail.

Supports:	OCR Cambridge Nationals in Engineering Level 1/2 Unit R112, LO4 Know the principles of lean manufacturing
Cost:	Free to access site – email must be supplied to download the PDF resources.
Format:	Website and PDF resources
	http://www.leanproduction.com/top-25-lean-tools.html

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Seven Deadly Wastes – The Essence Of Lean

Seven Deadly Wastes

The Essence Of Lean

The Core Idea of lean manufacturing is actually quite simple, relentlessly work on eliminating the seven deadly wastes from the manufacturing process.

What exactly is waste? It can take on many forms, but the basic idea is to eliminate anything and everything that does not add value from the perspective of your customer.

Another way to look at lean manufacturing is as a collection of tips, tools, and techniques or best practices, that have been proven effective for driving waste out of the manufacturing process.

Seven Deadly Wastes

Let us talk a bit more about waste. Traditional lean manufacturing identifies seven key areas of waste, they're typically referred to as the *Seven Deadly Wastes*. These are described below

An effective presentation of the TIMWOOD wastes from the lean philosophy. A short video (music – no narration) and a short description of each waste with a suggested technique to resolve it.

Supports:	OCR Cambridge Nationals in Engineering Level 1/2 Unit R112, LO4 Know the principles of lean manufacturing
Cost:	Free
Format:	Instructional website
	http://lean-timer.com/seven-deadly-wastes/

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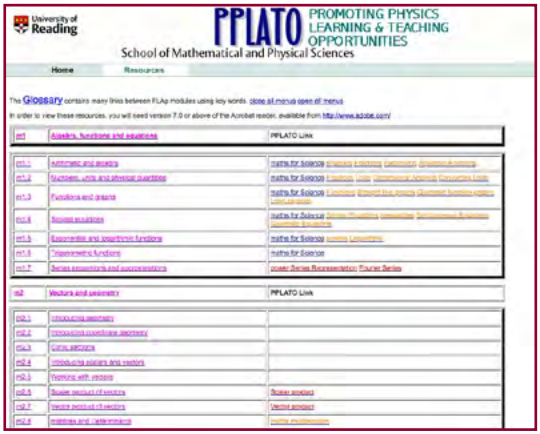
Enhance understanding of maths and science for engineering



A free to access self-learning website for supporting engineering maths and science.

Supports:	OCR Cambridge Nationals in Engineering Manufacture Level 1/2 Unit R112, LO2 Be able to assess product quality from inspection and quality control techniques
Cost:	Free
Format:	Website

http://www.met.reading.ac.uk/pplato/resources/

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Contact us

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

We're always delighted to answer questions and give advice.

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