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# Dear friends and colleagues

It's been 10 years!

We have all loved every minute of it too. Writing, editing, checking, designing and dreaming up newer and better resources to support our community of teachers.

I could not have imagined how well received our materials would have been in 2013, nor could I have imagined the impact that they have had on teachers and students. This year, we have added further support for GCSE Design and Technology with our new Exam Tutor workbook, which provides a complete exam walkthrough and a full practice paper.

We very much look forward to supporting you and your students for another decade. Thank you very much for all your support and let's see what the future brings...

Rob

Rob Heathcote  
Director



Clear**Revise** guides, see page 27.



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Did you know...



**You can download free sample resources and lesson plans for any of our published units from [www.pgonline.co.uk](http://www.pgonline.co.uk)**



# Ordering units

We have created a simple, online ordering facility designed to accept school purchase order numbers.

For those who prefer the more traditional methods, please download an order form from [www.pgonline.co.uk](http://www.pgonline.co.uk).

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As DT teachers we often struggle to find resources that come up to standard so it was refreshing to find your resources which look fantastic by the way!!

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Andrew White,  
Head of Design Technology,  
Monmouth School for Boys



I have used PG Online with my GCSE and A level students, and it is the most reliable set of resources I have ever purchased.

Pav Mears Sagoo,  
Head of Design Technology  
Kesteven & Grantham  
Girls School



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## Series authors

**Series authors:** Emma Arnold, Dawne Bell, Emma Berry, Rebecca Brown, Ellie Crawford, David Greenwood, Phil Hall, Halil Ibrahim, Barry Lambert, Nicholas Lowson, Daniel Markham, Ian McCarthy, Heather Park, Mike Ross, Keith Richards and Jason Ward.

All the material in the units is fully editable – if you wish, you can customise it to your own teaching style, the department timetable and your pupils' needs.



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# KS3 National Curriculum Map



## Design and Technology Units

The KS3 series of units has been written to satisfy the new National Curriculum for Design and Technology.

We recommend that, where possible, each NC requirement is covered by two or more units to ensure full coverage.

Design	Use research and exploration, such as the study of different cultures, to identify and understand user needs
	Identify and solve their own design problems and understand how to reformulate problems given to them
	Develop specifications to inform the design of innovative, functional, appealing products that respond to needs in a variety of situations
	Use a variety of approaches [for example, biomimicry and user-centred design], to generate creative ideas and avoid stereotypical responses
	Develop and communicate design ideas using annotated sketches, detailed plans, 3D and mathematical modelling, oral and digital presentations and computer-based tools
Make	Select from and use specialist tools, techniques, processes, equipment and machinery precisely, including computer-aided manufacture
	Select from and use a wider, more complex range of materials, components and ingredients, taking into account their properties
Evaluate	Investigate new and emerging technologies
	Test, evaluate and refine their ideas and products against a specification, taking into account the views of intended users and other interested groups
	Understand developments in design and technology, its impact on individuals, society and the environment, and the responsibilities of designers, engineers and technologists
Technical knowledge	Understand and use the properties of materials and the performance of structural elements to achieve functioning solutions
	Understand how more advanced mechanical systems used in their products enable changes in movement and force
	Understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs]
	Apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors], and control outputs [for example, actuators], using programmable components [for example, microcontrollers]
Cooking and nutrition	Understand and apply the principles of nutrition and health
	Cook a repertoire of predominantly savoury dishes, understand how to plan a meal for a healthy and varied diet
	Become competent in a range of cooking techniques [for example, selecting and preparing ingredients; using utensils and electrical equipment; applying heat in different ways; using awareness of taste, texture and smell to decide how to season dishes and combine ingredients; adapting and using their own recipes]
	Understand the source, seasonality and characteristics of a broad range of ingredients

[illegible]



# Key Stage 3 Design and Technology



£120  
+ VAT

Each unit is intended to cover specific parts of the KS3 curriculum, with a supporting introduction to the new theory topics at GCSE.

The units are designed for teaching at any point in KS3 depending on class ability and prior learning. Each unit contains a **FREE** lesson which can be downloaded from our website.

Get in touch to  
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## In partnership with:

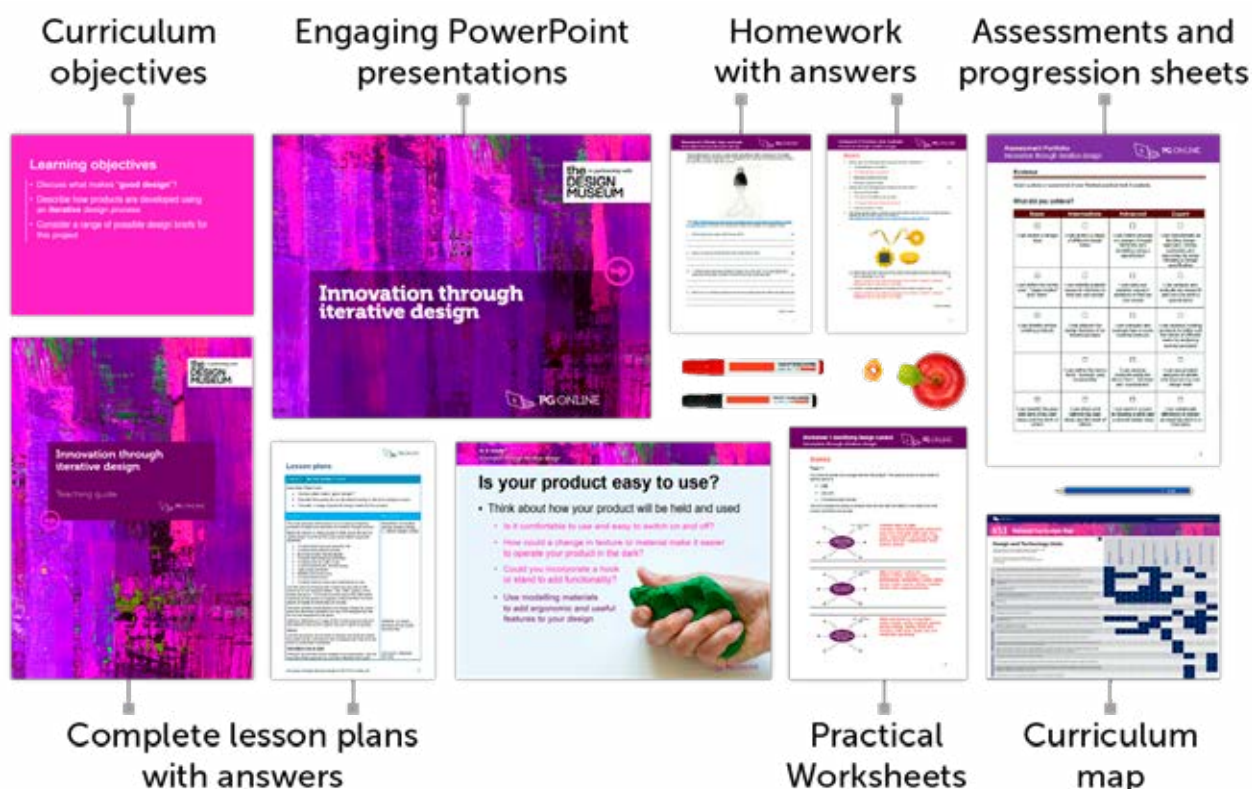
We are delighted to bring you a free teaching unit to inspire and engage students to follow a career in D&T

**Free Unit**  
**the  
DESIGN  
MUSEUM**

## Innovation through iterative design - FREE Unit

We have teamed up with the **Design Museum** to produce a series of six lessons that allow students to experience the freedom of a truly iterative approach to designing. While reducing the rigid structure of a linear design approach, this unit adds enough scaffolding and idea-generating suggestions to enable innovation and inspiration to flow freely. Students are encouraged to design and model in a way that suits them best, using strategies that work to avoid design fixation, resulting in inspiring outcomes.

**Lesson 1** Identify design context  
**Lesson 2** Model, test, evaluate  
**Lesson 3** Prototype  
**Lesson 4** Develop, test, evaluate  
**Lesson 5** Is it ready?  
**Lesson 6** Present your progress





# Mechanical systems and movement

This theory based unit uses practical activities to reinforce technical principles. Working from basic forms of motion, the lessons slowly build in complexity culminating in a 'design and make' activity that will support understanding of KS4 concepts in relation to mechanical systems. Cams and followers, gears and pulleys are used to create specific movements. Elements of mathematics and science are covered in an accessible and logical way allowing calculations and performance of systems to be predicted.



Significant parts of this unit can be taught without computers or access to a workshop.

## FREE LESSON

- Lesson 1 Motion and movement
- Lesson 2 Cams and followers
- Lesson 3 Gear trains, pulleys and drive mechanisms
- Lesson 4 Card-based automaton - DMA pt1
- Lesson 5 Card-based automaton - DMA pt2
- Lesson 6 Teambuilding and collaborative design

# Designing through sketching and modelling

This hands-on unit follows a series of easy-to-follow tasks that develop students' drawing and modelling skills. The unit moves quickly from basic to advanced drawing and modelling activities offering an easily extendable variety of skills based lessons. Students are encouraged to work out which is the most appropriate format to use for specific tasks. The unit concludes in the development of CAD models using freely available software.



Significant parts of this unit can be taught without computers or access to a workshop.

## FREE LESSON

- Lesson 1 2D and 3D sketching skills
- Lesson 2 Turning 2D into 3D
- Lesson 3 Perspective and technical drawing
- Lesson 4 Physical modelling
- Lesson 5 3D CAD modelling
- Lesson 6 SketchUp project

# Forces and stresses

This dynamic unit fuses mathematical content with physics based solutions to create a series of predominately practical investigations that deliver theory in a fun and interactive way. It encourages problem solving and teamwork as well as planning and budgeting. The lessons work through basic stresses and forces before looking at solutions through the manipulation of materials. A team challenge is set which leads to destructive testing in a competitive environment.



Significant parts of this unit can be taught without computers or access to a workshop.

## FREE LESSON

- Lesson 1 Understanding forces and stresses
- Lesson 2 Reinforcing and stiffening
- Lesson 3 Structures and strength
- Lesson 4 Bridge building challenge
- Lesson 5 Testing and evaluation
- Lesson 6 Material properties



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Students are easily able to consolidate their class learning during homework exercises, as the tasks have been created to link with the class worksheets, which aid independent understanding.

Simon Kirk, Head of Design Technology,  
Sutton Valence School

## 3D printing and prototyping

This unit examines the impact and technical processes of 3D printing in society and in the classroom before building CAD skills to design 3D components. A practical problem-solving approach to creating connecting parts for a structure is encouraged using techniques demonstrated throughout the unit. Finally, pupils are encouraged to critically review and analyse their successes or failures to inform future design decisions.

- Lesson 1 Introduction to 3D printing
- FREE LESSON** Lesson 2 Understanding 3D printing
- Lesson 3 Designing components
- Lesson 4 CAD modelling
- Lesson 5 Making structures
- Lesson 6 Developing skills

## Programming microcontrollers with Circuit Wizard

This unit demonstrates effective use of microcontrollers to perform fun and exciting tasks. The straightforward control of light and sound output leads logically on to more involved challenges including time delays and counting devices. Using Circuit Wizard\*, simple flowchart-based operations allow for detailed functionality and adaptability. This unit is designed as a starting point for understanding the concept of controlling programmable embedded electronics into D&T products and prototypes.

\* Circuit Wizard software and Genie 08M boards are required for this unit.

- Lesson 1 Circuit construction principles **FREE LESSON**
- Lesson 2 Using feedback to control a system
- Lesson 3 Developing delays and timing systems

- Lesson 4 Counters
- Lesson 5 Embedding music
- Lesson 6 Problem solving using microcontrollers

## Problem solving

This unit enables students to understand how products are created to solve users' needs and wants. It is set in a context that ensures empathy is used to realise that everybody is different and may have very specific requirements. Starting with product analysis, students are taught to question form, function and accessibility in order to decide on design criteria in the form of a specification. Through practical activities, students experience physical restrictions allowing them to empathise with disabled users, arming them with motivation to design and make innovative prototypes using iterative design. Reflection and critical evaluation are encouraged throughout the unit.

- Lesson 1 Identifying users' needs and wants
- Lesson 2 Specification development
- Lesson 3 Design for the disabled

- Lesson 4 Problem solving - DMA pt1 **FREE LESSON**
- Lesson 5 Personalised design - DMA pt2
- Lesson 6 Critical evaluation



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member of staff who is a non-specialist.**

Phil Andrews, Head of Design and Technology,  
St Joseph's Catholic High School

# Functionality and aesthetics

Form and function are brought to life through a series of lessons which look at the roles that nature plays in the design of the built environment. Students are encouraged to find inspiration from natural forms to stimulate design proposals, creating both drawn and physical outcomes. Biomimicry is used to convey theory based on science, mathematics and art. The use of digital media is encouraged throughout to assist folio generation and to present a proposal for further evaluation.



**Significant parts of this unit can be taught without computers or access to a workshop.**

**FREE LESSON**

- Lesson 1 Product comparison**
- Lesson 2 Natural structures and systems**
- Lesson 3 Organic architecture**
- Lesson 4 Finding and using geometric shapes in nature**
- Lesson 5 Constructing naturally inspired forms**
- Lesson 6 Presentation of ideas and concepts**

## KS3 Food teaching units The perfect foundation for GCSE Food Preparation and Nutrition

### Principles of nutrition and health

Understanding basic dietary requirements and what constitutes a healthy meal is at the core of this discrete unit. It has been designed so that it can be delivered in a regular non-specialist classroom, however if access to specialist facilities is available it will complement their use too. The lessons balance current thinking from NHS recommendations with inspiring and occasionally shocking statistics that provide a factual basis for understanding our nutritional needs. Delivered as a fun series of tasks and challenges, students will be better informed to make personal dietary choices.

**FREE LESSON**



- Lesson 1 Basic nutrition and dietary requirements**
- Lesson 2 Food sources, provenance and sustainability**
- Lesson 3 Food for everyone**
- Lesson 4 Taste testing**
- Lesson 5 A healthy lunch**
- Lesson 6 How much is too much sugar?**

### Building a food repertoire

This unit enables pupils to build a repertoire of primarily savoury dishes whilst learning about traditional dishes. The course is delivered with an underpinning ethos of experimentation and acceptance of diversity in food culture. The importance of food-waste management is covered throughout encouraging meal planning and other strategies.

The last lessons in the unit set-up the skills for designing and planning meals and include a reflective self-evaluation process so that pupils can become increasingly proficient at creating their own repertoire. Numerous suggestions and recipes for an additional half-term of practical lessons are also included in this unit.

**Please note** that access to a food room or kitchen is required for this predominantly practical Unit.

**FREE LESSON**



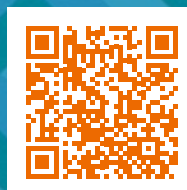
- Lesson 1 Origins of food**
- Lesson 2 Discovering flavours**
- Lesson 3 Kitchen management**
- Lesson 4 Developing a recipe**
- Lesson 5 Writing a recipe**
- Lesson 6 Creating a dish**
- Lesson 7 Perfecting a dish**
- Lesson 8+ Building a food repertoire**



# Edexcel GCSE 1DT0 (9-1) Design and Technology

The new Edexcel GCSE (9-1) series comprises five core units and six specialist units covering each of the material areas.

Unit 1: New and emerging technologies is **FREE**.



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## Unit 1: New and emerging technologies – FREE

This free unit is subdivided into four topics plus an end-of-unit assessment spread across roughly five lessons. It is a theoretical unit covering the latest Edexcel Design and Technology specification 1DT0. The first lesson looks at the impact of new and emerging technology on industry and enterprise before moving on to look at the effect that industry can have on the environment. The influence that people, culture and society have on product development and vice versa are covered in the third lesson. Contemporary production techniques and scales are then covered in the final lesson before students subsequently sit an assessment test comprising questions similar to those found on the GCSE exam paper.

**Lesson 1 Industry and enterprise**

**Lesson 2 Sustainability and the environment**

**Lesson 3 People, culture and society**

**Lesson 4 Production techniques and systems**

**Lesson 5 Unit assessment**

**This unit is free. Order today.**

## Unit 2: Informing design decisions

This unit covers section 1.2 of the core specification content in the new Edexcel 1DT0 specification. The first lesson looks at each of the factors that may inform design decisions. The subsequent lesson looks at contemporary and future scenarios including the areas of travel and medicine. Ethical and environmental perspectives are covered in the third lesson with specific coverage of global warming and the technologies used to reduce our impact on Earth.

**Lesson 1 Critical evaluation of technologies**

**Lesson 2 Contemporary and future scenarios**

**FREE LESSON ▶ Lesson 3 Ethical and environmental perspectives**

**Lesson 4 Assessment**



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**Many thanks for providing excellent  
detailed resources which will help my  
team endlessly!**

Julia George, Head of Design and Technology,  
Thurston Community College

## Unit 3: Energy, materials, devices and systems

This unit explores sections 1.3 - 1.7 of the new Edexcel 1DT0 Design and Technology GCSE. Energy generation from finite and non-finite sources is argued in the initial lesson before looking at energy storage in the second lesson. Developments in modern and smart materials, and their properties are covered in the following two lessons. The unit progresses to cover composite materials and technical textiles including GRP, CRP and Kevlar®. Electronic systems and mechanical devices are covered in the final lessons.

FREE LESSON

**Lesson 1 Energy generation**  
**Lesson 2 Powering systems**  
**Lesson 3 Modern and smart materials**  
**Lesson 4 Composite materials**  
**Lesson 5 Technical textiles**  
**Lesson 6 Mechanical devices**  
**Lesson 7 Electronic systems**  
**Lesson 8 Programmable components**

## Unit 4: Material types, properties and structures

This unit covers the categories and properties of a complete range of core materials within each of five specialist areas. The materials are covered through practical applications and with reference to the key material category in which they belong. The specific physical and working properties that best describe each material subcategory are identified and defined with reference to use and knowledge that will underpin practical designing and making activities.

FREE LESSON

**Lesson 1 Ferrous and non-ferrous metals**  
**Lesson 2 Papers and boards**  
**Lesson 3 Polymers**  
**Lesson 4 Textiles**  
**Lesson 5 Natural and manufactured timbers**  
**Lesson 6 Assessment**

## Unit 5: Designing principles

This unit concentrates on the main factors relating to social, economic and ecological issues. The work of past and present designers and design companies is studied before looking at design fixation and the development of design ideas.

FREE LESSON

**Lesson 1 Social and economic challenge**  
**Lesson 2 The work of others**  
**Lesson 3 Avoiding design fixation**  
**Lesson 4 Developing design ideas**  
**Lesson 5 Assessment**



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Don Jones,  
Assistant Principal: Achievement and Data,  
Ormiston Chadwick Academy.

# Edexcel GCSE 1DT0 (9-1)

## Specialist material categories

The 1DT0 Material categories (Units 6-1 to 6-6) cover Timbers, Metals, Papers and boards, Polymers, Systems and Textiles.



## Edexcel GCSE 1DT0 (9-1)

### Design and Technology Textbook

ISBN: 978-1-910523-13-1    £20    336pp, Ross, Arnold and Berry    Available in print and digital formats

This is a complete text that provides detailed and concise coverage of all the topics and disciplines covered in the new Edexcel 1DT0 Design and Technology (9-1) specification, written and presented in a way that is accessible to teenagers and easy to teach from. It will be invaluable as a course text for students throughout their course.

It is divided into neat sections covering every element of the specification. Sections 6-1 to 6-6 of the textbook cover each of the six specialist material categories. These sections would complement practical classroom experience.

**Section 1: New and emerging technologies**  
**Section 2: Informing design decisions**  
**Section 3: Energy, materials, devices and systems**  
**Section 4: Material types, properties and structures**  
**Section 5: Designing principles**

Material categories:

**Section 6-1: Timbers**  
**Section 6-2: Metals**  
**Section 6-3: Papers and boards**  
**Section 6-4: Polymers**  
**Section 6-5: Systems**  
**Section 6-6: Textiles**

Published May 2019



## Maths skills for D&T

### Cross-board support at GCSE and A Level

In this series of context driven lessons, students will learn the necessary mathematical content needed to feel confident answering number- and graphically-based examination questions for any board. They will also know how to calculate the size and volume of materials as well as the tolerances and allowances needed to produce an accurate product or prototype for their NEA.

All lessons use specific Design and Technology related scenarios to deliver the content, incorporating all six specialist material areas.

The unit includes an end of unit assessment test, which includes challenging questions similar to those found in the sample assessment materials.

**FREE LESSON**    **Topic 1 Decimal places and significant figures**  
**Topic 2 Ratios and fractions**  
**Topic 3 Percentages and standard form**  
**Topic 4 2D and 3D shapes - area and volume**  
**Topic 5 Working with data**  
**Topic 6 Solving D&T problems**  
**Topic 7 Maths for A level**  
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Jennifer Peirce, Head of Faculty of Engineering,  
SGS Berkeley Green UTC



# AQA GCSE 8552 (9-1) Design and Technology

To help teachers with the delivery of the new AQA GCSE (9-1) qualification, we are pleased to offer a range of teaching units.

Unit 1: New and emerging technologies is **FREE**.



## Unit 1: New and emerging technologies – FREE

This free unit is subdivided into five topics plus an end-of-unit assessment spread across roughly six lessons. It is a theoretical unit covering the latest AQA Design and Technology specification 8552. The first lesson looks at the impact of new and emerging technology on industry and enterprise before moving on to look at the effect that industry can have on the environment. The influence that people, culture and society have on product development and vice versa are covered in the third lesson. Contemporary production techniques are then covered before a final lesson on planned obsolescence and informing design decisions. Students can then sit an assessment test comprising questions similar to those found on the GCSE exam paper

**Lesson 1 Industry and enterprise**  
**Lesson 2 Sustainability and the environment**  
**Lesson 3 People, culture and society**  
**Lesson 4 Production techniques and systems**  
**Lesson 5 Informing design decisions**  
**Lesson 6 Assessment**

This unit is free. Order online.

## Unit 2: Energy, materials, systems and devices

This unit explores sections 3.1.2 – 3.1.5 of the new AQA 8552 Design and Technology GCSE. Energy generation from finite and non-finite sources is argued in the initial lesson before looking at energy storage in the second lesson. Developments in modern and smart materials, and their properties are covered in the following two lessons. The unit progresses to cover composite materials and technical textiles including GRP, CRP and Kevlar®. Electronic systems and mechanical devices are covered in the final lessons.

**FREE LESSON**

**Lesson 1 Energy generation**  
**Lesson 2 Energy storage**  
**Lesson 3 Modern materials**  
**Lesson 4 Smart materials**  
**Lesson 5 Composite materials and technical textiles**  
**Lesson 6 Systems approach to designing**  
**Lesson 7 Electronic systems processing**  
**Lesson 8 Mechanical devices**  
**Lesson 9 Assessment**



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**These materials are excellent for teaching the AQA course and convenient for setting homework.**

Lyndsay Cooper, D&T Teacher,  
Newton Abbot College

## Unit 3: Materials and their working properties

This unit focuses on Sections 3.1.6.1 and 3.1.6.2 of the AQA specification. It covers the categories and properties of a range of core materials within each of five specialist areas. Each lesson covers a separate specialist material area and explores the common materials used within that area related to their use when designing and making. The physical and mechanical properties of each material subcategory are also covered.

[Lesson 1 Papers and boards](#)  
[Lesson 2 Natural and manufactured timbers](#)  
**FREE LESSON** [Lesson 3 Metals and alloys](#)  
[Lesson 4 Polymers](#)  
[Lesson 5 Textiles](#)  
[Lesson 6 Assessment](#)

## Unit 4: Common specialist technical principles

This unit focuses on the specialist technical principles that are common to all material areas in Section 3.2 of the 8552 specification. The suite of lessons begins by covering the various forces and stresses on materials and objects, before looking at how to enhance them to improve their functionality. Ecological issues including product mileage and the six Rs are covered in detail across two lessons. The final lesson covers the effect of scale in production and production methods.

[Lesson 1 Forces and stresses on materials and objects](#)  
[Lesson 2 Improving functionality](#)  
**FREE LESSON** [Lesson 3 Ecological and social footprint](#)  
[Lesson 4 The six Rs](#)  
[Lesson 5 Scales of production](#)  
[Lesson 6 Assessment](#)

## Unit 5A: Papers and boards

This specialist unit covers papers and boards and is suitable for those wishing to study this area in more detail as one or more of the specialist technical option areas.

The sources, origins and properties of papers and boards are covered in the first lesson along with the processes and environmental considerations involved in converting fibres into paper. Commercial and school-based uses are covered in the second lesson with an emphasis on stock forms. Commercial production techniques such as lamination, lithography and embossing are covered in the final lesson, including specialist tools, treatments and finishes.

**FREE LESSON** [Lesson 1 Sources, origins and properties](#)  
[Lesson 2 Working with papers and boards](#)  
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## Unit 5B: Timber based materials

The processes involved in sourcing, converting and seasoning timber are covered in the first topic. This also covers sustainability and ethical issues, as well as the comparative advantages of manufactured boards and natural wood. The second lesson focuses on commercial stock forms, fittings and school based processing methods. Commercial processing techniques, surface treatments and finishes are covered in the final topic within the contexts of flat-packed furniture and wooden toys.

Quality control techniques using go / no go gauges to check tolerances are also covered before a final assessment test using examination style questions.

**Lesson 1 Sources, origins and properties**

**Lesson 2 Working with timber based materials**

**FREE LESSON** **Lesson 3 Commercial manufacturing, surface treatments and finishes**

**Lesson 4 Assessment**

## Unit 5C: Metal based materials

This specialist unit covers metal based materials and is suitable for those wishing to study this area in more detail as one or more of the specialist technical option areas. The sources, origins and properties of different metals are covered in the first lesson. Commercial and school-based uses, production techniques and modifications are covered in the subsequent two lessons, including specialist tools, treatments and finishes.

**FREE LESSON** **Lesson 1 Sources, origins and properties**  
**Lesson 2 Working with metal based materials and fixings**

**Lesson 3 Commercial manufacturing, surface treatments and finishes**

**Lesson 4 Assessment**

## Unit 5D: Polymers

In this unit, the sources, origins and properties of polymers are covered in the first lesson, along with the processes of fractional distillation and cracking. The use of plastic additives is also covered. Lesson two concentrates on working with polymers in school environments. This covers school-based processes, fixings and production techniques. Commercial cutting, forming and processing techniques in manufacture are covered in the third lesson. These include extrusion, blow moulding and injection moulding. Finishing techniques and quality control are also covered as well as reinforcing students' understanding of the properties of the different types of plastic available.

In the final lesson, students sit an assessment test comprising questions similar to those found on the GCSE exam paper.

**Lesson 1 Sources, origins and properties**

**Lesson 2 Working with polymer based materials**

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## Unit 5E: Textile based materials

This specialist unit covers textile based materials and is suitable for those wishing to study this area in more detail as one or more of the specialist technical option areas. The sources, origins and properties of different textiles are covered in the first lesson. Commercial and school-based uses, production techniques and modifications are covered in the subsequent two lessons, including specialist tools, treatments and finishes.

**Lesson 1 Sources, origins and properties**

**FREE LESSON** **Lesson 2 Working with textile based materials**

**Lesson 3 Commercial manufacturing, surface treatments and finishes**

**Lesson 4 Assessment**

## Unit 5F: Electronic systems

This specialist unit covers electronic and mechanical systems and is suitable for those wishing to study this area in more detail as one of the specialist technical option areas. The selection of materials and components, and their properties are covered in the first lesson. Commercial and school-based uses, production techniques and modifications are covered in the subsequent two lessons, including specialist tools, treatments and finishes.

**Lesson 1 Selection of materials and components**

**Lesson 2 Working with electronic systems**

**FREE LESSON** **Lesson 3 Commercial manufacturing and finishing**

**Lesson 4 Assessment**

## Unit 6: Designing principles

This unit covers the designing principles in Section 3.3.1 – 3.3.6 of the 8552 specification. The unit begins by looking at the various investigation techniques and the collection of data. Challenges that influence design are covered before looking at the work of other influential designers in the second lesson. Imaginative and creative design strategies are subsequently explored. The final lesson focuses on the conception and communication of ideas including prototype development.

The unit concludes with an examination style assessment test.

**Lesson 1 Investigation, primary and secondary data**

**FREE LESSON** **Lesson 2A The work of other designers**

**Lesson 2B The work of other design companies**

**Lesson 3 Design strategies**

**Lesson 4 Communication of design ideas and prototype development**

**Lesson 5 Assessment**



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Leah Skellam, Head of Design Technology, Epsom College, Malaysia

# Unit 7: Making principles

The final unit in the series explores the making principles in Section 3.3.7 – 3.3.11 of the 8552 specification. The first lessons analyse the functional need, cost and availability of materials required for prototype development, using appropriate tolerances when working. Material management skills including marking out are covered in Lesson 3 before looking at the use of specialist tools and equipment in the penultimate lesson. The final lesson covers the surface treatments and finishes that can be applied to materials to improve functionality and aesthetics.

**FREE LESSON** Lesson 1 Selection of material and components  
Lesson 2 Tolerances and allowances  
Lesson 3 Material management and marking out  
Lesson 4 Specialist tools, equipment and techniques  
Lesson 5 Surface treatments and finishes  
Lesson 6 Assessment

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**Section B** - Specialist Technical Principles [30 Marks]

**Section C** - Designing and making principles [50 Marks]

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Section 5A: Papers and boards  
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**Topic 1: Scales of production**

**Topic 2: Efficient use of materials and resources**

**Topic 3: Computer systems in manufacturing**

**Topic 4: Digital design and manufacture**

**Topic 5: Modelling, testing, marketing and scheduling**

**End of unit assessment**

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## Unit 1: Performance characteristics of paper and boards

After a tour through the fundamentals of paper and board production, this unit gives detailed information covering a broad range of paper and board stock. It enables students to discern between similar stock forms and make decisions about their specific properties, characteristics, uses and methods of manipulation. It culminates with a lesson on testing for specific factors and the types of finishes that can be applied to a variety of materials.

**Topic 1: Performance characteristics** FREE LESSON

**Topic 2: Applications of papers and boards**

**Topic 3: Recycling of papers and boards**

**End of unit assessment**



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## Unit 2: Performance characteristics of polymers

The many varied and contrasting types of polymers are explained and classified in this in-depth unit. The standard range of commonly used plastics are included along with the lesser known elastomers and biodegradable polymers that are more frequently being used, both in schools and in industry. A plethora of stock forms, characteristics and properties are discussed in a format that makes it easy for students to both recall and apply the performance of polymers in use.

**Topic 1: Characteristics of polymers and additives** **FREE LESSON**

**Topic 2: Applications of polymers**

**Topic 3: Stock forms and types of polymer**

**Topic 4: Elastomers**

**Topic 5: Biodegradable polymers**

**End of unit assessment**

## Unit 3: Performance characteristics of woods

This unit delivers informative and clear information on a wide range of natural and manufactured woods. It will enable students to differentiate between available stock forms and learn why different woods are chosen for different tasks. Also covered are the common characteristics and faults found in a broad selection of woods, as well as ways to protect them against common issues and how to enhance the natural benefits woods have to offer.

**Topic 1: Stock forms and types of woods**

**Topic 2: Performance characteristics**

**Topic 3: Testing and finishing of woods** **FREE LESSON**

**End of unit assessment**

## Unit 4: Performance characteristics of metals

Containing specific information about a broad selection of ferrous, non-ferrous and alloyed metals, this unit explains their performance characteristics as well as the stock forms in which they are likely to be available. The enhancement of metals through heat treatment is explained as well as how the testing of different metal properties is conducted.

**Topic 1: Stock forms and types of metals** **FREE LESSON**

**Topic 2: Performance characteristics of metals**

**Topic 3: Testing and treatments of metals**

**End of unit assessment**



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## Unit 5: Composite, smart and modern materials

A fascinating unit explaining a broad selection of composite materials and the applications they are specifically designed for. The unit moves on to discover the interesting world of smart and modern materials, incorporating all material areas. The chance for practical engagement and experimentation is encouraged throughout the unit.

**Topic 1: Performance characteristics of composites**

**Topic 2: Performance characteristics of smart materials**

**FREE LESSON**

**Topic 3: Performance characteristics of modern materials**

**End of unit assessment**

## Unit 6: Processing and working with papers and boards

Brought together in a short series of topics are the main ways to manipulate paper and board to produce the types of products produced in industry. The processes covered include many hand, machine and digital techniques. The use of industry standard printing and finishing methods is specifically highlighted in addition to common forming and bonding techniques, of which many can be modelled in school.

**Topic 1: Forming processes**

**Topic 2: Bonding, jigs and fixtures**

**FREE LESSON**

**Topic 3: Finishing papers and boards**

**End of unit assessment**

## Unit 7: Processing and working with polymers

The second of the polymers units investigates the processes involved in manipulating a multitude of different plastics in a variety of stock forms. Both school workshop- and industry-based processing is clearly explained using simple diagrams, bringing to life the incredibly versatile range of polymers.

**Topic 1: Working with polymers**

**FREE LESSON**

**Topic 2: Forming polymers**

**Topic 3: Finishing polymers**

**End of unit assessment**



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## Unit 8: Processing and working with woods

Throughout this unit, students learn how to use additive and subtractive forming techniques using a wide range of tools and equipment, in both the school workshop and modern industrial environments. The unit includes both basic and advanced joining methods and how CNC machines are used specifically for wood-based products. Additionally, the use of bought-in components and a range of finishing techniques are covered in depth.

**Topic 1: Working with woods** **FREE LESSON**  
**Topic 2: Forming woods**  
**Topic 3: Finishing woods**  
**End of unit assessment**

## Unit 9: Processing and working with metals

This very comprehensive unit covers a multitude of forging and forming techniques, explaining which metals are best used for each. The lessons cover many temporary, semi-permanent and permanent methods of bonding, including welding techniques. Wasting processes are also explained as are a number of external finishes including different plating methods and less permanent applications.

**Topic 1: Forming metals** **FREE LESSON**  
**Topic 2: Joining metals**  
**Topic 3: Wasting metals**  
**Topic 4: Finishing metals**  
**End of unit assessment**

## Unit 11: Product design considerations

In this unit, students will critically analyse and evaluate products, draw up design and manufacturing specifications, and create two- and three-dimensional prototypes in a variety of materials. Considerations for end users is highlighted, including a wide range of adaptations for the very young, the elderly and less abled users. A deep understanding of health and safety issues is delivered in addition to conducting risk assessments. The unit also ensures students show an awareness of protecting intellectual property, understand the 6Rs of sustainability and know how manufacturers create responsible products that are fit for purpose.

**Topic 1: Product development and improvement** **FREE LESSON**  
**Topic 2: Inclusive design**  
**Topic 3: Safe working practices**  
**Topic 4: Protecting designs and intellectual property**  
**Topic 5: Manufacture, repair, maintenance and disposal**  
**Topic 6: Efficient manufacturing techniques**  
**Topic 7: Designed for disassembly**  
**End of unit assessment**



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Kieran Mullan, Subject Lead for Design & Technology,  
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## Unit 12: Product design and development

The journey that an idea for a product takes can vary dramatically depending on the research and testing methods used. This four-topic unit covers different enterprise opportunities as well as the post product realisation processes of branding and marketing in the modern digital age. Students will learn how to conduct a feasibility study to gauge a product's potential and why it is vital in a product's success. The unit culminates by looking at the many forms of design communication and suggest which may be better for any given task.

**Topic 1: Feasibility studies** **FREE LESSON**  
**Topic 2: Enterprise and marketing**  
**Topic 3: Communicating data**  
**Topic 4: Design communication**  
**End of unit assessment**

## Unit 13: Design methods

The use of alternative design strategies and the understanding of how to gather and use research data begins this informative and inspirational unit. Design history and theory is delivered through case study investigation of design movements, influential design houses and world class designers. The unit leads students to draw conclusions about how design has shaped our modern world and how designers need to work responsibly to reduce negative global impact. The methodology for tackling this reduction concludes the lessons by unpicking a product's lifecycle and the choices that this analysis presents a designer.

**Topic 1: Design methods and processes** **FREE LESSON**  
**Topic 2: Design influences styles and movements**  
**Topic 3: Designers and their work**  
**Topic 4: Socio-economic influences**  
**Topic 5: Developments in technology**  
**Topic 6: Social, moral and ethical considerations**  
**Topic 7: Product life cycle**  
**End of unit assessment**

## Unit 14: Design processes

This unit takes a very thorough guided tour through the design process and the many varied routes that can be taken. From idea generation, through to planning and prototyping, critical evaluation, testing and modification, lessons look at how to get the best from an NEA project brief. The unit also considers the selection of tools and equipment and the strategies employed to achieve accuracy in manufacturing.

**Topic 1: The use of a design process**  
**Topic 2: Prototype development**  
**Topic 3: Industrial and commercial contexts**  
**Topic 4: Critical analysis, testing and evaluation** **FREE LESSON**  
**Topic 5: Third party testing and evaluation**  
**Topic 6: Tools, equipment and processes**  
**Topic 7: Accuracy in design and manufacture**  
**End of unit assessment**



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# Unit 15: Responsible design

Building on the previously covered environmental responsibilities that designers need to consider, this unit challenges wasteful attitudes and presents a modern methodology for responsible designing. Industry standard quality control implementation is investigated including an array of testing methods. The unit culminates in a lesson on national and international standards, government and EU directives and the role NGOs play in the protection and monitoring of the welfare of people and places.

**Topic 1: Environmental issues**

**Topic 2: Circular economy** FREE LESSON

**Topic 3: Conservation of energy**

**Topic 4: Planning for accuracy**

**Topic 5: Quality assurance and quality control**

**Topic 6: National and international standards**

**End of unit assessment**

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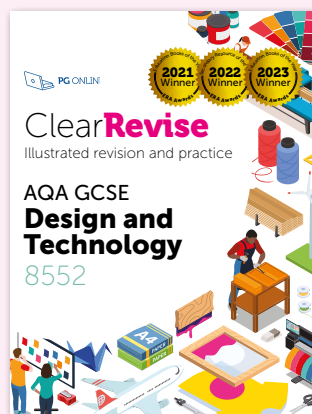
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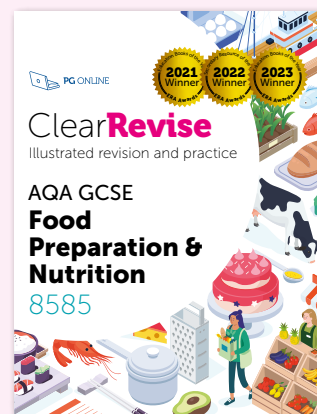
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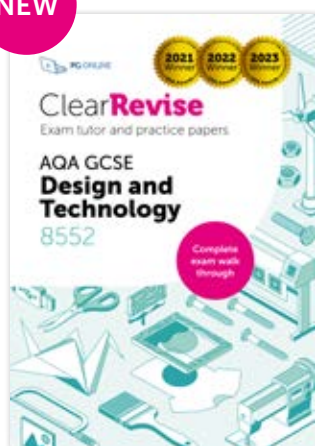
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