

**Key Stage 4
GCSE D&T**

Product Design
The Course

Scheme of Work

Product Design
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Key Elements of the Product Design Course

The GCSE Product Design course builds on the Key Stage 3 programme of study for Design and Technology. The course also allows for progression to post 16 courses such as: AS/2 level Product Design or related subjects such as GNVQ Advanced Manufacturing.

The 2 year course allows pupils to gain subject knowledge, design and making skills, and ICT, particularly CAD/CAM skills in Product Design using a wide range of different materials and manufacturing techniques to produce several outcomes throughout the course culminating in the production of a final coursework project consisting of a 3-dimensional product/s and a concise design folder and / or the appropriate ICT evidence.

1. Coursework will consist of approximately 40 hours of work by each student producing approximately 20, A3 sheets of work.
2. Pupils will take a written paper at the end of the course (Full Course)

Coursework - 60% of total marks

Written Paper - 40% of total marks

Products should be designed to meet a commercial need. Most commercial products require some form of labeling, packaging or instructions and therefore an element of Graphic Design is likely for the product to be complete.

Most commercial products are constructed or assembled using a variety of materials. Single material products are acceptable outcomes for this course but it is likely that other materials will have been used to create manufacturing aids such as moulds, jigs, formers etc.

The notion of designing products that can be manufactured in quantity rather than a one-off product is an important aspect of the course.

A significant amount of time will be given to addressing general manufacturing issues, environmental and social issues as detailed in the course specification.

Summary of Subject Content (Taken from Specification)

The specified general designing and making skills required for this course and the knowledge and understanding candidates should acquire follow the four broad areas of study:

- Designing and Making Skills;
- Materials and Components;
- Design and Market Influences;
- Processes and Manufacture.

Designing and Making Skills

Design and Technology is a practical subject area which requires the application of knowledge and understanding when developing ideas, planning, producing products and evaluating them. The distinction between Designing and Making is a convenient one to make, but in practice the two often merge. For example, research can involve not only investigating printed matter and people's opinions, but also investigating e.g. proportions, adhesives, colour, structures, circuits and materials through practical work. The skills which follow underpin all learning and cover the programme of study for Key Stage 4 Design and Technology.

9.1 Designing Skills

Candidates should be taught:

- to understand the basic design principles of line, form and colour and their application in designing;
- to develop and use design briefs, detailed specifications and criteria in relation to product development;
- to consider the conflicting demands that moral, cultural, economic, environmental, historical and social issues can make in the planning and in the designing of products;
- to consider their own health and safety and that of makers, manufacturers, individual users and society at large;
- to consider an increasing range of users of products and different societies in relation to their differing needs and values;.
- to anticipate and design for product maintenance;
- to design for manufacturing in quantity;
- to plan for quality control and quality assurance when designing products and to be aware of the difference;
- to generate design proposals against stated design criteria, and to modify their proposals in the light of on-going analysis, evaluation and product development;
- to use graphic techniques and ICT, including CAD to generate, develop, model and communicate design proposals;
- to match materials and components with tools, equipment and processes, taking account of critical dimensions and tolerances when deciding how to manufacture the product;
- to produce and use detailed working schedules that will achieve the desired objectives in the time available, setting realistic deadlines for the various stages of manufacture, identifying critical points in the making process and providing alternatives to possible problems;
- to devise and apply test procedures to check the quality of their work at critical points during development, and to indicate ways of modifying and improving it when necessary;
- to be flexible and adaptable in their designing, in order to respond to problems, changing circumstances and new opportunities;
- to ensure that the quality of their design solution will be suitable for intended clients and consumers;
- to understand the difference between quality of design and quality of manufacture and use essential criteria to evaluate the quality of products they have made and products which have been made commercially;

9.2 Making Skills

Candidates should be taught:

- to match materials and components with tools, equipment and processes to produce quality products;
- to use tools and equipment safely, accurately and efficiently to achieve an appropriate fit, finish and reliable functioning in products that match their specifications;
- to use a range of industrial applications when working with familiar materials and processes;
- to manufacture products singly and in quantity, including the practical application of quality control and quality assurance techniques;
- to use computer-aided manufacture (CAM) in single item production and in batch or volume production;
- to simulate production and assembly lines including the use of ICT;
- to be adaptable in their working practices, in order to respond to changing circumstances and new opportunities;
- to ensure, through testing, modification and evaluation, that the quality of their products is suitable for intended users and devise modifications where necessary that would improve performance.

Materials and Components

Candidates should build upon the National Curriculum Key Stage 3 Programmes of Study to develop a working knowledge of a wide range of materials appropriate to modelling, prototyping and manufacturing. Candidates should be aware of the processes and techniques which aid manufacture and of the commercial and industrial applications of a range of materials involved in manufacturing their products in quantity. It is expected that designing and making will address complete product issues and therefore deal with materials which would aid manufacture, such as moulds, cutting dies, printing blocks, jigs etc. as well as dealing with issues such as labelling, packaging etc. It will be important therefore that candidates can utilise a variety of suitable materials and components. Whilst undertaking product analysis activities, it is expected that candidates will make detailed references to the materials used as well as the associated manufacturing issues.

9.3 Classification and working properties of materials

The following materials and components are considered to be suitable for candidates following this course of study. Candidates are not required to study all materials, but centres must provide opportunities for candidates to learn about a **range** of materials and to use them in practical contexts, during both the development and manufacture of products and during product analysis. **As a minimum, candidates should study Paper/Card and one other material area.**

Candidates may employ/use any necessary materials in the modelling, prototyping or manufacture of their products.

Candidates will be required to demonstrate their application of knowledge, understanding and skills in both assessment units.

Health and Safety factors should be a major consideration when working with any of the materials

Paper/card

When working with paper/card materials candidates should:

- be able to identify common papers such as layout, cartridge, tracing, grid, card, corrugated, foam core board;
- understand the different properties and uses of such materials both as a media for communication and as a material for manufacturing products such as packaging;
- understand that many paper based boards are composites and that the composition can be adjusted to create different properties for specific purposes e.g. foil-backed for food packaging;
- understand the stock forms for such materials i.e. size, thickness, weight and colour; have a basic understanding of the source of pulp and the primary processes involved in conversion to workable materials.

Timber based materials

When working with timber based materials candidates should:

- be able to identify common timbers such as pine, mahogany, teak, ash, beech used in the production of toys, furniture and household goods;
- be able to identify common manufactured boards i.e. MDF, plywood, chipboard, blockboard, hardboard;
- understand the different properties and uses of such materials within the consumer markets of toys, furniture and household goods;
- understand that many timber-based materials are composites therefore the composition can be adjusted to create different properties for specific purposes;
- understand the stock forms for such materials i.e. rough sawn, PSE, sheet sizes and mouldings;
- have a basic understanding of the source of timber and the primary processes involved in conversion to workable materials.

Ferrous and non-ferrous metals

When working with metals candidates should:

- be able to identify common metals i.e. mild steel, brass, copper, aluminium, pewter;
- understand the different properties and uses of such materials within engineering and domestic products;
- understand that many metals are alloys therefore the composition can be adjusted to create different properties for specific purposes e.g. casting alloys;
- understand that the properties of metal can be changed by heat treatment;
- have an understanding of the stock forms for such materials i.e. sheet, rod, bar, tube;
- have a basic understanding of the source of metals and the primary processes involved in conversion to workable materials.

Plastics

When working with plastic materials candidates should:

- be able to identify common thermoplastics i.e. rigid polystyrene, acrylic, acetate, HDPE, PVC;
- be able to identify common thermosetting plastics i.e. GRP, Epoxy resin, UF, MF;
- understand the difference between thermoplastics and thermosetting plastics;
- understand the ways in which plastics can be formed, especially with regard to consumer products, i.e. vacuum forming, injection moulding, blow moulding, line bending;
- understand that most plastics are synthetic and that the composition can be adjusted to create different properties for specific purposes e.g. increase rigidity, reduce weight, insulation;
- understand the stock forms for such materials i.e. sheet, rod, powder, granules, foam;

- have a basic understanding of the source of plastics and the primary processes involved in conversion to workable materials.

Ceramics

When working with ceramic materials candidates should:

- be able to identify common clays and related materials such as St Thomas™, porcelain, plaster of Paris;
- understand that firing methods and temperatures affect both the clay structure and the effect of applied glazes;
- understand the different properties and uses of such materials particularly with regard to domestic pottery and the electrical industry;
- understand that most ceramic products are composites of clay and glaze and that the composition can be adjusted to create different properties for specific purposes.
- understand the stock forms for such materials i.e. slip, body, pigments, oxides;
- have a basic understanding of the source of ceramic materials and the primary processes involved in conversion to workable materials.

Textiles

When working with textile materials candidates should:

- be able to identify common natural and synthetic fibres such as cotton, wool, silk, polyester, nylon;
- understand the difference between woven, knitted and bonded fabrics and the different properties and uses of such fabrics;
- understand the stock forms for yarns and fabrics i.e. fabric roll size, weight, ply;
- understand the availability of common components e.g. threads, buttons, zips, fastenings;
- understand that many textile fabrics are composites and that the composition can be adjusted to create different properties for specific purposes;
- have a basic understanding of the source of textile fibres and the primary processes involved in conversion to workable materials.

Food

When working with food materials candidates should:

- be able to classify food materials as starch, sugar, protein, fats, fibre, vitamins, minerals;.
- understand the working characteristics of food materials;
- understand the way food components are specified i.e. by weight and volume;
- understand that food components are available in a variety of forms i.e. fresh, frozen, dehydrated, liquid, canned;
- have a basic understanding of the source of basic foods and the primary processes involved in conversion to workable materials..

Control components

When working with control components candidates should:

- be able to identify common electronic and mechanical components and understand their functions and uses;
- understand the way in which such components are specified;

9.4 Manipulating and Combining Materials

Candidates should learn:

- how materials can be combined and processed in order to create more useful, or desirable, properties;
- how these properties are utilised in industrial contexts;
- how a range of materials are prepared for manufacture, allowing for waste and fine finishing;
- about a variety of self-finishing and applied-finishing processes, and appreciate their importance for aesthetic and functional reasons;
- that to achieve the optimum use of materials and components, account needs to be taken of the complex inter-relationships between materials, form and manufacturing processes;
- how pre-manufactured standard components are used to improve the effectiveness of the manufacturing process.

Design and Market Influences

Candidates should develop an understanding of the broad perspectives of the designed world. This will include the appreciation of line, shape, form, proportion, colour, movement and texture within a critical awareness of aesthetics and ergonomics.

9.5 Evolution of Product Design

Candidates should:

Major developments in design and technology

- recognise that products evolve over time because of developments in ideas, materials, manufacturing processes and technologies as well as because of social changes;
- recognise that design movements and cultural influences are still influencing new product development;
- be aware that manufacturing industries are involved in *continuous improvement* (CI) and this is a major influence in product evolution;
- be aware that sometimes new products are developed because of marketing pull and sometimes because of technological push;

The study of natural forms

- recognise the impact of natural form, pattern and structure as a major influence for designing and making both historically and culturally;
- be able to use nature as a starting point for designing and making;

The study of manufactured products

- recognise the impact of the work of well known artists, designers, craftsmen and technologists as a major influence for innovation in designing and making both historically and culturally; engage in detailed product analysis as a means of developing ideas for new products or for improvements to existing products;

The use of mathematics

- recognise the impact of mathematical pattern and structure as a major influence for designing and making both historically and culturally;
- be able to use mathematics as a starting point for designing and making.

9.6 Design in Practice

Candidates should:

- identify situations where there is a need to produce a design solution to a problem;
- discuss and analyse the situation/problem;
- gather research, evaluate and select information and data to support the design and manufacture of products;
- consider the factors involved in the design of a product which is to be produced/manufactured in quantity;
- consider a wide range of users and produce designs which are inclusive rather than exclusive;
- determine the degree of accuracy required for the product to function as planned, taking account of critical dimensions and tolerances in determining methods of manufacture;
- understand how graphic techniques, ICT equipment and software, particularly CAD, can be used in a variety of ways to model aspects of
- design proposals and assist in making decisions;
- be aware that design ideas are protected in law through copyright, patents and registered designs;

Communication and representation of ideas

- use a range of graphical techniques such as annotated sketches, formal drawing conventions, CAD to communicate detail in a clear and appropriate manner;
- develop a range of presentation techniques and media to portray materials, texture or finish such as mood boards, presentation drawings, digital photography;
- use line, tone, colour rendering using a range of media;
- use formal page layout techniques as an aid to planning and presenting drawings and information;
- use a range of prototyping and modelling methods in order to explore design alternatives during the design process as well as a means of communicating proposals which can be used for evaluation purposes;
- use a range of ICT equipment and software to communicate, model
- and present ideas;

Design Methodology

- understand that designing is not a linear exercise but is iterative. The traditional design cycle is just one of many methods for successful designing;
- understand that empirical problem solving, a systems approach and intuitive designing are all valid approaches to designing;
- experience a variety of design approaches.

9.7 Design in the Human Context

Human needs and wants

Candidates should understand that:

- social, economic and ethnic groups of people often have specific values and needs which can be an aid to focused designing.

Human factors

- that for products to be effective, designers, manufacturers and craftsmen need to take account of anthropometrics and ergonomic considerations in an attempt to produce inclusive rather than exclusive designs;

- that efficient manufacturing systems result from the layout of materials and equipment such as working triangles in the kitchen, production lines;

Safety

- the relevance of safety with regard to themselves, the manufacturer and the product user;
- that designers and manufacturers have both a moral and legal responsibility for the artefacts that they produce.

Quality

Candidates should:

- ensure that their products are of a suitable quality for their intended user;
- understand that many judgements regarding quality are subjective and will be dependent upon factors such as cost, availability of resources and other social factors;
- investigate ways which are used commercially to improve quality assurance such as quality circles, team-working,

The Environment

- take into consideration the complete life cycle and the impact on the environment of a wide range of products, both their own and existing commercial designs;
- be aware of the main factors governing environmentally friendly products, or “Green Designs”, and be able to identify a range of these;
- be aware of the main factors relating to recycling materials or products i.e. material identification, material separation, collection, processing, energy costs, subsequent usage, wastage;
- take account of these issues in their own designing;

Consumer protection

- be aware of the work of consumer groups and pressure groups and the way products are evaluated - e.g. *Which?* reports;
- be aware of the work of standards agencies (BSI, ISO etc) and how these standards affect product design and manufacture and subsequent testing;
- be aware that a wide range of legislation exists to protect consumers and that designers and manufacturers need to conform to it;

Processes and Manufacture

Candidates are expected to be able to manufacture products using a range of materials and processes. They should have a broad understanding of manufacturing systems for the production of commercial products both in the industrial and the developing world.

9.8 Product Manufacture

Candidates should learn:

- how a range of materials are cut, shaped and formed to designated tolerances;
- the difference between quality control and quality assurance techniques;
- to produce detailed working schedules that will achieve the desired objectives, setting realistic deadlines for the various stages of manufacture, identifying critical points in the making process and providing alternatives to possible problems;

- to evaluate the quality of their personal project work and to devise modifications that will improve their products

9.9 Industrial and Commercial Practice

Candidates should:

Scales of production

- understand that products are manufactured to different scales of production i.e. one-offs, batch, mass, continuous;
- design and make for one-off, batch and mass production; work as part of a team on the batch production of a product;
- understand how computer-aided manufacture (CAM) is used both in manufacturing in quantity and in the production of single items and small batches.

Manufacturing systems

- understand that commercial manufacturing is a system, or group of sub-systems which requires:
 - ☐ special buildings or places of work;
 - ☐ the organisation of people;
 - ☐ the organisation of tools and equipment;
 - ☐ the organisation of materials;
 - ☐ information systems to help people communicate with each other reliably;
 - ☐ ways of changing the shape and form of materials to increase their usefulness;
 - ☐ ways of using tools and equipment to transform the materials into products;
 - ☐ the design and production of many products in a systematic way;
 - ☐ quality assurance procedures and quality checks to be made;
 - ☐ efficient working methods;
 - ☐ ways of safely taking care of the unwanted outputs of manufacturing i.e. disposing or recycling of waste materials, and ways of looking after the environment.

Equipment and materials processing

Candidates should:

- use a range of procedures including CAD/CAM to ensure consistency in the production of their products;
- use both hand and machine methods of cutting and shaping materials

9.10 Systems and Control

Candidates should learn:

- to devise and apply test procedures to check the quality of their work at critical points during development, and to indicate ways of improving it;
- how control systems and sub-systems can be designed, used and connected to achieve different purposes;
- how feedback is incorporated into systems;
- how to analyse the performance of systems;
- how microprocessors are increasingly used in control systems;
- how CAM allows for higher levels of accuracy and repeatability;
- how communication systems are increasingly being used for applications such as video conferencing, software sharing, data transfer, remote manufacturing and how these are changing working practices.

During year 10, students will undertake a series of FPTs which can help them with elements of their main coursework assignments or be substituted if problems are encountered. Appropriate homework's have been set that will further build on student's experiences in class. Deadlines for FPTs and the main coursework project are to be set each term to reflect the school calendar of events. * Extension activity

Term	Project Outline & Learning Experiences	Sequence of Lessons	Resources	Homework
Year 10 Term 1	<p>Project 1 - Storage Solutions</p> <p>Design Brief: Pupils need to store/keep their practical work safe during the course. Using appropriate resources, they will produce a storage box with a lid.</p> <p>Description: Using templates, pupils will manufacture a storage box for their practical work using corrugated cardboard and fasteners. Boxes will be able to hold A3 paper and be colour coded for group identification.</p> <p>Appropriate research opportunities: Disassembly of a range of storage boxes/cartons and methods of manufacture. Investigation of appropriate materials.</p> <p>Multi Material opportunities: Use of corrugated cardboard, vinyl, paper, adhesives and fasteners.</p> <p>Opportunities to manufacture in quantity: Evaluate one-off, batch and mass production using appropriate methods of manufacture.</p> <p>Industrial applications, systems and control: Templates, CAD/CAM, Flow charts showing manufacture of container</p>	<ol style="list-style-type: none"> 1. Research appropriate materials and carryout simple product analysis of similarly constructed container. 2. Understand the manufacturing processes involved in the production of a storage container 3. Use template and scale to produce development (net) using ICT – CAD 4. Manufacture storage container using appropriate equipment. 5. Using paper OR vinyl, produce appropriate labels to identify student and group (CAD/CAM) <p>Health and safety issues: sharp cutting tools. paper cuts.</p>	<p>A2 corrugated cardboard PVA glue Fasteners Vinyl Plotter/Cutter Packaging template software PCs Homework handouts</p>	<p>Collect an assortment of paper and card used in packaging for class discussion.</p> <p>List the common papers and card and understand their different properties</p> <p>Produce flow chart showing production process of corrugated card.</p>

Term	Project Outline & Learning Experiences	Sequence of Lessons	Resources	Homework
Year 10 Term 1	<p>Project 2 – Focus on our World - Disposable Cameras</p> <p>Design Brief: The LRC are to put on an exhibition about our ‘Disposable World’. They would like some display material to illustrate how disposable cameras are manufactured and recycled. They would also like to see some new ideas for DCs which will be displayed</p> <p>Description: Using discarded disposable cameras, students will carry out a product analysis and produce a ‘mounted’ display board for display on the wall of the LRC (client)</p> <p>Appropriate research opportunities: Disassembly of a range of disposable cameras and methods of manufacture. Investigation of appropriate materials. Environmental issues. Modern methods of photography.</p> <p>Multi Material opportunities: Investigating the properties of plastics, card and electronic components. Modelling with wood and/or foam</p> <p>Opportunities to manufacture in quantity: Evaluate one-off, batch and mass production using appropriate methods of manufacture.</p> <p>Industrial applications, systems and control: Production of exhibition resources to convey information. Flow chart showing disassembly. Flow chart showing product lifecycle.</p>	<ol style="list-style-type: none"> 1. Produce sketches of disposable cameras (DC) and render using appropriate hand rendering techniques and CAD. (Label functions). 2. Carry out a full product analysis of DC, produce a disassembly drawing and label. 3. Students to produce an exhibition display board (A4 size) showing components and manufacturing techniques. (Produce flow chart) 4. Students to design their own DC based on the information gathered and model from Jelutong or other suitable medium available, 5. Investigate the effects of the ‘disposable culture’ on the environment – In pairs, students to make a presentation to class. Recycling 6. Students take digital photographs of their own models and insert into a catalogue page e.g. Argos to advertise their product * Produce www advertisement <p>Health and safety issues: Disassembly of disposable camera</p>	<p>Disposable cameras</p> <p>A4 MDF</p> <p>PVA glue</p> <p>Hot glue gun</p> <p>PCs</p> <p>DTP package</p> <p>Course handouts</p> <p>Homework handouts</p> <p>Digital camera</p>	<p>Types of formal / informal drawing methods</p> <p>Product analysis of household product</p> <p>Investigate injection moulding</p> <p>Effects of production on the environment</p> <p>Produce a Product lifecycle chart of a well known product</p> <p>How do digital cameras work using howstuffworks.com</p> <p>POS displays</p>

Homework

Homework will be set regularly in line with current school policies for the first three terms of the two year course. (Year 10)

Homework will consist of the following:

Year 10

Term 1	Term 2	Term 3
<ol style="list-style-type: none"> 1. Drawing and Presentation skills. 2. Product Analysis. 3. Product Modelling. 4. Production methods – injection moulding. 5. Environmental issues. 6. Product Lifecycle. 7. Digital photography. 8. Advertising – point of sale. 	<ol style="list-style-type: none"> 1. Research for project using different techniques. 2. Computer modeling. 3. Ergonomics. 4. Anthropometrics. 5. Desk Top publishing 6. CAD/CAM 7. Vacuum Forming 8. Product modeling 9. Quality assurance 10. Homework will focus on end of year examinations using exemplar exam questions focused on relevant areas of study. 	<ol style="list-style-type: none"> 1. Homework will focus on end of year examinations using exemplar exam questions focused on relevant areas of study. 2. Brainstorm exercise for main project.. 3. Preliminary research for main project 4. Researching existing products for main project

Year 11

Term 3	Term 3	Term 3
<ol style="list-style-type: none"> 1. Individual needs for student's coursework. 	<ol style="list-style-type: none"> 1. Individual needs for student's coursework 	<ol style="list-style-type: none"> 1. Homework will focus on end of year examinations using exemplar exam questions focused on relevant areas of study

Coursework Monitoring and Feedback

- During the 2 year course, feedback will be continuous and cumulative. Students will be issued with a sheets/booklet that will be used to record progress throughout the course for each project and main coursework project. (APPENDIX)
- Common deadlines will be set for each piece of coursework for the entire course.
- Letters will be sent home at the start of the first and second year notifying parents of deadlines. (APPENDIX)
- Positive letters of commendation will also be sent home as appropriate. (APPENDIX)

Coursework Assessment

Because of the nature of design and technology work, students work will be marked in a flexible, integrated and holistic way.

Work will be informally assessed during project work with feedback given to the student and formally when estimating the candidates overall final grade.

Candidate's work shall be measured against exemplar material which illustrates standards with criteria for grades (A*-G)

Grade Descriptions

The following grade descriptors indicate the level of attainment characteristic of the given grade at GCSE. They give a general indication of the required learning outcomes at each specific grade. The descriptors should be interpreted in relation to the content outlined in the specification; they are not designed to define that content. The grade awarded will depend in practice upon the extent to which the candidate has met the assessment objectives overall. Shortcomings in some aspects of the examination may be balanced by better performances in others.

Grade F

- When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates draw on and use various sources of information.
- They clarify their ideas through discussion, drawing and modelling; use their understanding of the characteristics of familiar products when developing and communicating their own ideas and work from their own plans, modifying them where appropriate.
- Candidates work with a range of tools, materials, equipment, components and processes with some precision; check their work as it develops and modify their approach in the light of progress; test and evaluate their products, showing that they understand the situations in which their designs will have to function and are aware of resources as a constraint and evaluate their use of basic information sources.

Grade C

- When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates use a wide range of appropriate sources of information and strategies to develop ideas, responding to information they have identified.
- They investigate form, function and production processes and communicate ideas, using appropriate media.
- Candidates recognise the needs of users and develop realistic designs.
- They produce plans that make use of time and resources to carry out the main stages of making products.
- They work with a range of tools, materials, equipment, components and processes, taking account of their characteristics, and organise their work so that they can carry out processes accurately and consistently, and use tools, equipment, materials and components with precision.

- Candidates adapt their methods of manufacture to changing circumstances, providing a sound explanation for any change from the initial specification.
- They select appropriate techniques to test and evaluate how their products would perform when used and modify their products in the light of ongoing evaluation to improve their performance.
- They evaluate their use of information sources.

Grade A

- When designing and making products, and acquiring and applying knowledge, skills and understanding, candidates seek out and use information to help their detailed design thinking, and recognise the needs of a variety of client groups.
- They are discriminating in their selection and use of information sources to support their work and they use a wide range of strategies to develop appropriate ideas, responding to information they have identified.
- Candidates investigate form, function and production processes and communicate ideas using a variety of appropriate media.
- They recognise the different needs of a range of users when developing fully realistic designs. When planning, they make sound decisions on materials and techniques based on their understanding of the physical properties and working characteristics of materials.
- They work from formal plans that make the best use of time and resources; work with a range of tools, equipment, materials and components to a high degree of precision and make products that are reliable and robust and that fully meet the quality requirements given in the design proposal.
- Candidates identify conflicting demands on their design, explain how their ideas address these demands and use this analysis to produce proposals. They identify a broad range of criteria for evaluating and testing their products, clearly relating their findings to the purpose for which the products were designed and the appropriate use of resources, and fully evaluate their use of information sources.

Assessment Units

The Scheme of Assessment comprises two components.

All questions are compulsory.

Questions will test the application of knowledge and understanding of materials, components, processes, techniques, technologies and the evaluation of commercial practices and products.

Questions will largely address general aspects of product design which cross all material area, although some questions will allow subject specific knowledge to be shown.

The coursework project will be internally assessed and externally moderated.

The project should address all three assessment objectives in an integrated way.

Candidates are required to submit a 3-dimensional product or outcome and a concise design folder and/or the appropriate ICT evidence.

Candidates have the freedom in product design to use the type and variety of materials necessary to satisfy their design brief.

Throughout the project candidates should address the industrial and commercial practices, and the moral, social, cultural and environmental issues, arising from their work.

Weighting of Assessment Objectives

The approximate relationship between the relative percentage weighting of the Assessment Objectives (AOs) and the overall Scheme of Assessment is shown in the following table:

Assessment Objectives	Component Weightings (%)		Overall Weighting of AOs (%)
	Coursework	Written Paper	
1 Materials and Components	10	10	20
2 Designing and Making	40	20	60
3 Evaluation and Social Issues	10	10	20
Overall Weighting of Units (%)	60	40	100

Moderation / Standardisation Main Coursework Project Work

Students work will initially be internally moderated by teachers delivering the course thus enabling teachers to achieve a common agreement about standards. To facilitate this, a minimum sample (where possible) of one of each of the following pieces of students work should be used for standardising grades; 'A', 'C', 'D' and 'F'. Teachers from other D&T subject focus areas will be invited to standardize a sample of work. Once a standard has been agreed, teachers will continue to mark the cohort of work.

Examining body moderation of the coursework is by inspection of a sample of candidates' work. This will initially involve design folders for the sample being sent by post from the centre to the moderator appointed by the examination board.

Preparing Coursework Portfolios for Assessment

The following checklist should be used before work is finally assessed and moderated before the set deadline has expired:

Ensure that:

- candidate's work should have a front cover with their name, candidate number, the name of the project, the name of the school and the school center number.
- each portfolio has a contents sheet.
- each page is individually numbered to correlate with the contents sheet.
- references and bibliography is included listing all sources of information.
- the student has met all of the assessment criteria.
- the work is in the correct order.

Some work carried out will not result in hard evidence, for example, visits to industry or business and phone calls to companies or watching a video. It is helpful to have at least a record of all activities undertaken by a student by including a log sheet in the portfolio to complement the reference section.

Key Skills

Opportunities to develop and generate evidence of achievement in all six of the key skills will be offered during the Product Design course:

Communication
 Application of Number
 Information Technology
 Working with Others
 Improving Own Learning Performance
 Problem Solving

Examples of the application of Key Skills in Design and Technology will be displayed appropriately 'Signposting' opportunities.

Course Resources

Resources for the course consists of a range of text books, handouts with information and/or tasks, references to internet sites etc.

Title	Publisher	ISBN
Nuffield Design and Technology – Product Design	Longman	0582 23469 7
Design & Make It Product Design for Key Stage	Nelson Thornes	0 7487 4429 0
Design & Make It Graphic Products	Nelson Thornes	0 7487 2474 5
Design Topics Series:		
Product Design	Oxford	0 19 832784 6
Product Modelling	Oxford	0 19 832784 6
Design in Society	Oxford	0 19 832761 7
Human Factors	Oxford	0 19 832783 8

Project 'Programmes of Study' are mapped out using an 'EXCEL' spreadsheet which should be readily available in the D&T department and updated accordingly.

Project Assessment – 1**Name:****PROJECT - Storage Solutions**

Your work has been marked against GCSE grade descriptors as if it was your major project. The grades indicated are for the descriptions shown in this pack and on the notice boards in the department. Check your grade against the chart.

Designing										Making					
Grade										Grade					
G	1	2	3	4	5	6	7	8		G	1	2	3	4	
F	1	2	3	4	5	6	7	8		F	1	2	3	4	
E	1	2	3	4	5	6	7	8	9	E	1	2	3	4	5
D	1	2	3	4	5	6	7	8	9	D	1	2	3	4	5
C	1	2	3	4	5	6	7	8	9	C	1	2	3	4	5
B	1	2	3	4	5	6	7	8	9	B	1	2	3	4	5
A	1	2	3	4	5	6	7	8	9	A	1	2	3	4	5

Final Designing Grade	A	B	C	D	E	F	G
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Final Making Grade	A	B	C	D	E	F	G
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Comments:**Targets for next project:**