



Curriculum Overview – Design and Technology - Year 12

Unit Title	Learning	How can parents best support?
1.1 Materials and their applications	<p>Students are expected to be able to name specific materials for a wide range of applications. They must also be able to provide detailed and justified explanations of why specific materials and combinations of materials are suitable for given applications, with reference to:</p> <ul style="list-style-type: none">• physical and mechanical properties (working characteristics)• product function• aesthetics• cost• manufacture and disposal. <p>Students should know and understand the classifications of the following materials and be able to name examples that belong to each category:</p> <ul style="list-style-type: none">• metals (ferrous, non-ferrous, alloys)• woods (hardwoods, softwoods, manufactured boards)• polymers (thermoplastics, thermoset polymers, elastomers)• papers and boards• composites• smart materials• modern materials.	<p>Encourage your child to research all materials shown in this section, pupils will need to understand the materials in detail and show a variety of different options and opinions surrounding them.</p>

<p>1.2 Performance characterises of materials</p>	<p>Performance characteristics of papers and boards Performance characteristics of polymer based sheet and film Performance characteristics of woods Performance characteristics of metals Performance characteristics of polymers Elastomers Biodegradable polymers Composites Smart materials Modern materials</p>	<p>Encourage your child to create a table or mind map for each material and display the characteristics that make them suitable for certain products</p>
<p>1.3 Enhancement of materials</p>	<p>Students are expected to be able to describe enhancement methods for given materials and explain their suitability for specific product applications</p> <p>The use of additives to enhance properties, including:</p> <ul style="list-style-type: none"> • UV stabilisers to prolong the life of polymers • bio-batch materials to encourage biodegradability. Students should be familiar with how additives are used in specific polymer products, eg patio furniture, food packaging and carrier bags. <p>The combining of natural timber with resins and lamination to give enhanced properties, eg increased strength and stability. Enhancing timber products with preservatives, finishes and coatings.</p>	<p>Encourage your child to research into workshop testing vs industrial testing of materials</p>

	<p>Students should be aware of heat treatment methods of enhancing metals, including:</p> <ul style="list-style-type: none"> • case hardening • hardening and tempering. • new methods of manufacture 	
<p>1.4 Forming, redistribution and addition processes</p>	<p>Paper and board forming processes</p> <p>Students should be aware of the ways that paper and board can be shaped into different products such as packaging. Specific process to include:</p> <ul style="list-style-type: none"> • die cutting • laser cutting • creasing • bending. <p>Polymer processes</p> <p>They should be able to explain the suitability of the different forming methods for a range of specific products and scales of production. Specific process to include:</p> <ul style="list-style-type: none"> • vacuum forming • thermoforming • calendaring 	<p>Encourage your child to explore the variety of different processes surrounding each materials. Pupils can create revision pages to help them revise the vast amount of processes.</p>

- line bending
- laminating (layup)
- injection moulding
- blow moulding
- rotational moulding
- extrusion
- compression moulding.

Metal processes

Students should be aware of the different wasting processes. They should be able to describe the different processes. They should be able to explain the suitability of the different wasting processes for a range of specific components and products. Specific processes to include:

- milling
- turning
- flame cutting
- plasma cutting
- laser cutting
- punching/stamping.

Wood processes

Students should be aware of how timber can be formed into 3D products. They should be able to describe the different processes. They should be able to explain the suitability of the different wasting processes for a range of specific products. Specific processes to include:

- laminating
- steam bending

	<ul style="list-style-type: none"> • machine processes: • turning between centre • use of the chuck and faceplate • milling • routing to produce slots, holes and profiles. 	
<p>1.5 the use of adhesives and fixings</p>	<p>Paper and board finishing Paper and board printing processes Polymer finishing Metal finishing Wood finishing</p>	<p>Encourage your child to develop their understanding of each finish applied to the materials in this topic</p>

<p>1.6 Modern industrial and commercial practice</p>	<p>Students should be aware of, and be able to describe, the different scales of production giving example products and specific manufacturing methods. Specific scales of production to include:</p> <ul style="list-style-type: none"> • one-off, bespoke • batch production • mass/line production • unit production systems (UPS) • quick response manufacturing (QRM) • vertical in-house production.. 	<p>Encourage your child to discuss the tools and equipment they would use to make certain manufactured products if they were to make them in the workshop.</p>
<p>1.7 Digital design and manufacture</p>	<p>Students should be aware of, and be able to describe, the following:</p> <ul style="list-style-type: none"> • the advantages and disadvantages of using CAD compared to a manually generated alternative • the use of CAD to develop and present ideas for products, including: <ul style="list-style-type: none"> • the use of 2D CAD for working drawings • the use of 3D CAD to produce presentation drawings • how CAD is used in industrial applications. <p>Students should be aware of, and be able to describe, how CAM is used in the manufacture of products. Specific processes to include:</p> <ul style="list-style-type: none"> • laser cutting • routing • milling 	<p>Encourage your child to research tolerances and how they are applied to a variety of different manufacturing products</p>

	<ul style="list-style-type: none"> • turning • plotter cutting. 	
<p>1.8 The requirements for product design and development</p>	<p>Through the study and critical analysis of existing products, students should develop an understanding of the requirements of the following:</p> <ul style="list-style-type: none"> • the design, development and manufacture of products to meet specification criteria • fitness for purpose • accuracy of production • how the critical assessment of products can lead to the development of new designs. <p>Students should develop the skills to critically assess products and develop new design proposals. Students should development their ability to work with a variety of materials, including two and three-dimensional forms, to produce creative and original products which satisfy the demands of the target market, and consider accurate and efficient</p>	<p>Encourage your child to research into a variety of environmental impacts that affect a product during manufacture</p>

	<p>manufacture. When designing products Students should consider aesthetics, ergonomics and anthropometrics.</p> <p>Students should be aware of, and be able to explain, the development of products that are inclusive in their design so that they can be used by a wide range of users including the disabled, children and the elderly.</p> <p>.</p>	
<p>1.9 Health and safety</p>	<p>Students should be aware of, and able to explain, health and safety procedures related to products and manufacturing, including:</p> <ul style="list-style-type: none"> • knowledge of the Health and Safety at Work Act (1974), and how it influences the safe manufacture of products • control of Substances Hazardous to Health (COSHH) and safety precautions that should be taken with relevant materials • safe working practices and identifying potential hazards for the school or college workshop and industrial contexts • safety precautions that should be taken with specific manufacturing processes • the concept of risk assessment and its application to given manufacturing processes. • the monitoring, checking and testing of materials, components, equipment and products throughout production to ensure they conform to acceptable tolerances 	<p>Encourage your child to research the different scales of production and create an advantage/disadvantage sheet for both</p>

	<ul style="list-style-type: none"> • specific quality control methods including the use of ‘go-no go’ gauges, laser or probe scanning and measuring • use of digital measuring devices such as vernier callipers and micrometers • non-destructive testing such as x-rays and ultrasound. 	
<p>1.10 Protecting designs and intellectual property</p>	<p>Students should be aware of, and able to explain, the importance of the following to the designer:</p> <ul style="list-style-type: none"> • copyright and design rights • patents • registered designs • trademarks • logos. <p>Students should be aware of, and able to explain, the concept of ‘open design’. Specifically referring to the development of products for the common good of society, including potential use. Students should be able to give examples of this in practice, eg humanitarian projects and file sharing for 3D printing.</p>	<p>Encourage your child to research the differences of standards required for a designer. Create either flashcards, mood boards or mind maps for each.</p>

<p>1.11 Design for manufacturing, maintenance, repair and disposal</p>	<p>Students should be aware of, and able to explain, the need to modify designs to make them more efficient to manufacture, including:</p> <ul style="list-style-type: none"> • reducing the number of manufacturing processes <p>How the choice of materials affects the use, care and disposal of products:</p> <ul style="list-style-type: none"> • labelling of materials to aid separation for recycling • making products easy to disassemble or separate <p>Application of the six Rs of sustainability:</p> <ul style="list-style-type: none"> • reduce the quantity of materials, of toxic materials, of damaging materials and associated energy use • reuse components and parts • rethink by using eco friendly alternative materials • recycle materials and/or components into new products <p>Maintenance:</p> <ul style="list-style-type: none"> • temporary and integral fixings • use of standardised parts • allowing for service and repair/ replacement of parts • ability to upgrade with software downloads. 	<p>Encourage your child to focus on the 6 rs of sustainability. The pupils could develop a further understanding of each R by creating a mini essay on each</p>
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<p>1.12 Feasibility studies</p>	<p>Students should be aware of, and able to explain, the use of feasibility studies to assess the practicality for production of proposed designs, including the testing of prototypes with potential consumers.</p>	<p>Encourage your child to create quick 5 minute prototypes either with online 3D software or physical models to help develop the prototypes</p>
<p>1.13 Enterprise and marketing in the development of products</p>	<p>Students should be aware of, and able to explain, the importance of marketing and brand identity, including:</p> <p>customer identification</p> <ul style="list-style-type: none"> • labelling • packaging • corporate identification <p>Concept of global marketing:</p> <ul style="list-style-type: none"> • the promotion and advertisement of products including the use of new technologies, eg social media, viral marketing • product costing and profit 	<p>Encourage your child to disassemble different types of product and food packaging and take note of all symbols and signs on the packaging</p>