

# GCSE Design & Technology Theory Curriculum Overview



## **GCSE Theory Overview**

Throughout the year, learners will develop a broad and in-depth understanding of technical principles and designing and making skills. In the **Autumn Term**, the focus is on the impact of design and technology in our world, exploring sustainability, emerging technologies, smart materials, composites, and electronic systems. Students will learn how products integrate sensors, control devices, and programmable components to enhance functionality. Moving into the **Spring Term**, attention shifts to mechanical components and devices, alongside the properties and applications of papers, boards, and timber. Learners will investigate mechanical systems such as gears, pulleys, and cams, and understand material categorisation, properties, and finishing techniques. In the **Summer Term**, the emphasis is on in-depth knowledge of natural and manufactured timber, including sources, properties, ecological footprint, and reinforcement methods. Students will explore stock forms, manufacturing processes for different scales of production, specialist techniques for shaping and assembling prototypes, and appropriate surface treatments and finishes. By the end of the year, learners will have a comprehensive foundation in materials, systems, and processes, preparing them for practical application and the Non-Exam Assessment (NEA) as well as the Exam element of the course.

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| Week Number        | Themes/ Topics                                                                                                                                                                                                                                                                         | Knowledge/Skills                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Key Assessments                                                                                                                                                                                                                                                                                                                                                                          |
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| <b>Autumn Term</b> | <ul style="list-style-type: none"> <li>Design and Technology and Our World</li> <li>Smart Materials, Composites, and Technical Textiles</li> <li>Electronic Systems and Programmable Components</li> </ul>                                                                             | <ul style="list-style-type: none"> <li>Impact of new and emerging technologies on industry, sustainability, society</li> <li>Critical evaluation of technologies and sustainability (Six R's, Life Cycle Analysis)</li> <li>Renewable and non-renewable energy sources</li> <li>Develop understanding of smart materials (e.g., SMA, QTC, photochromic, thermochromic)</li> <li>Basics of electronic systems: input-process-output, sensors, control devices</li> <li>Introduction to programmable components and microcontrollers</li> </ul>                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Short answer and extended response questions on sustainability and emerging technologies</li> <li>Circuit diagram interpretation and simple flowchart tasks</li> <li>Practical investigation of smart materials</li> <li>End of unit Exam questions</li> </ul>                                                                                    |
| <b>Spring Term</b> | <ul style="list-style-type: none"> <li>Mechanical Components and Devices</li> <li>Materials: Papers &amp; Boards; Natural &amp; Manufactured Timber</li> <li>Materials: Ferrous &amp; Non-Ferrous Metals; Thermoforming &amp; Thermosetting Polymers; Fibres &amp; Textiles</li> </ul> | <ul style="list-style-type: none"> <li>Functions of mechanical devices: levers, linkages, gears, pulleys, cams</li> <li>Simple calculations involving mechanical systems</li> <li>Categorisation and properties of papers, boards, and timber</li> <li>ISO paper sizes, grammage, microns</li> <li>Timber types: hardwoods, softwoods, manufactured boards</li> <li>Surface finishes and protection methods</li> <li>Properties and categorisation of metals and alloys</li> <li>Heat treatment processes</li> <li>Properties of polymers and differences between thermoplastics and thermosets</li> <li>Textile fibres: natural, synthetic, blended; woven, non-woven, knitted fabrics</li> <li>Reinforcement and stiffening techniques</li> <li>Sustainability and ecological footprint considerations</li> </ul> | <ul style="list-style-type: none"> <li>Mechanical systems analysis and calculations</li> <li>Material identification and property comparison tasks</li> <li>Design task using paper/board and timber</li> <li>End of unit exam questions.</li> <li>Comparative analysis of metals, polymers, and textiles</li> <li>Practical tasks involving joining and finishing techniques</li> </ul> |

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| Summer Term | In-depth study:<br>Natural and<br>Manufactured Timber | <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>Sources, origins, physical and working properties</li> <li>Ecological and social footprint</li> <li>Selection factors: functional, aesthetic, environmental, cost, social, cultural, ethical</li> <li>Impact of forces and stresses; reinforcement and stiffening</li> <li>Stock forms, types, and sizes</li> <li>Alternative manufacturing processes for different scales of production</li> <li>Specialist techniques and processes for shaping, fabricating, constructing, and assembling prototypes</li> <li>Surface treatments and finishes for functional and aesthetic purposes</li> </ul> </li> </ul> <p><b>Knowledge/Skills</b></p> <ul style="list-style-type: none"> <li> <b>Sources and Properties</b> <ul style="list-style-type: none"> <li>Hardwoods: beech, oak, mahogany, balsa, jelutong</li> <li>Softwoods: Scots pine, western red cedar, parana pine</li> <li>Manufactured boards: plywood, MDF, chipboard, hardboard</li> <li>Physical and working properties: toughness, flexibility, grain structure, strength, absorbency, surface finish, colour, hardness</li> <li>Common defects: shrinkage, splits, shakes, knots, fungal attack</li> </ul> </li> <li> <b>Ecological and Social Footprint</b> <ul style="list-style-type: none"> <li>Impact of deforestation</li> <li>Recycling and waste reduction</li> <li>Life-cycle analysis of timber products</li> </ul> </li> <li> <b>Selection Factors</b> <ul style="list-style-type: none"> <li>Compare costs of hardwoods, softwoods, and manufactured boards</li> <li>Consider environmental and ethical responsibilities</li> </ul> </li> <li> <b>Reinforcement and Stiffening</b> <ul style="list-style-type: none"> <li>Laminating natural timber</li> <li>Plywood strength depends on layers and grain orientation</li> </ul> </li> <li> <b>Stock Forms</b> <ul style="list-style-type: none"> <li>Natural timber: plank, board, strip, square, dowel</li> <li>Manufactured boards: sheet form in standard sizes and thicknesses</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>End-of-term test on in-depth timber knowledge and processes</li> <li>Exam questions</li> </ul> |

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|  |  | <ul style="list-style-type: none"><li>○ Calculate material costs including fixtures, fittings, and finishes</li><li>• <b>Manufacturing Processes</b><ul style="list-style-type: none"><li>○ One-off, batch, and high-volume production</li><li>○ Use of jigs and devices for repeat accuracy</li><li>○ CAM in modern production</li></ul></li><li>• <b>Specialist Techniques</b><ul style="list-style-type: none"><li>○ Wastage/addition: marking out, cutting, drilling, shaping</li><li>○ Deforming/reforming: jointing, veneering, laminating, steam bending</li><li>○ Wood joints: frame (mitre, dowel, mortise and tenon, halving, bridle); box/carcass (butt, lap, housing, dovetail, comb)</li><li>○ Adhesives: PVA, contact adhesive, epoxy resin</li><li>○ Temporary fixings: screws, knock-down fittings</li><li>○ Use of lasers and CAM machines</li></ul></li><li>• <b>Surface Treatments and Finishes</b><ul style="list-style-type: none"><li>○ Sealants, primers</li><li>○ Varnish, wood stains, oils, polishes, preservative paints</li></ul></li></ul> |  |
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