

Year 10 Product Design Curriculum End Points and Key Vocabulary

	Autumn Term 1	Autumn Term 2	Spring Term 1	Spring Term 2	Summer Term 1	Summer Term 2
Units of Work	Core Technical Principles: Materials & Their Working Properties (Papers, Timbers, Metals, Polymers, Textiles) and Forces & Stresses	Core Technical Principles: Ecological/Social Footprint, The 6Rs, Scales of Production & Intro to Designing Principles	Designing Principles (Communication & Strategies) & Making Principles (Selection, Tolerances, Material Management, Finishes)	Specialist Technical Principles & NEA Skills Project (Specialist Material Deep Dive)	New & Emerging Technologies, Energy Generation & Storage, Production Techniques (CAD/CAM, JIT, Lean)	Modern, Smart & Composite Materials, Systems Approach to Designing (Electronics), Mechanical Devices & Mock Exam Preparation
Ethos Links	<p>Sustainability: Consideration of primary material sources, renewable vs. finite resources, and recycling lifecycle.</p> <p>STEM: Application of scientific material properties (density, electrical/thermal conductivity) and mathematical calculations of stress/strain.</p> <p>Milton Keynes: Analysis of local architecture and sustainable manufacturing businesses in the MK area.</p>	<p>Sustainability: Life-cycle assessment, carbon footprint reduction, deforestation, and the 6Rs (Reduce, Refuse, Reuse, Repair, Recycle, Rethink).</p> <p>STEM: Mathematical calculations of product miles, carbon output, and energy consumption.</p> <p>Milton Keynes: Investigation of local eco-friendly transport initiatives and waste</p>	<p>Sustainability: Material management, minimisation of waste through nesting, tessellation, and efficient cutting layouts.</p> <p>STEM: Use of precise SI units, scaling drawings, angular measurements, and calculating surface areas/volumes.</p> <p>Milton Keynes: Evaluating ergonomic street furniture and public product designs around Milton Keynes.</p>	<p>Sustainability: Ethical sourcing of materials (e.g., FSC certified timber, fair trade textiles) and end-of-life disposal considerations.</p> <p>STEM: Mathematical calculation of material costs, quantities, and structural scaling; scientific understanding of material modifications (seasoning, annealing, stabilisers).</p>	<p>Sustainability: Green energy generation, reduction of industrial pollution, and design for disassembly/recycling</p> <p>STEM: Scientific comparison of renewable vs non-renewable energy sources; mathematical analysis of efficiency ratios and power ratings.</p> <p>Milton Keynes: Exploring smart city technologies, automated logistics, and renewable energy installations</p>	<p>Sustainability: Smart and composite material innovations that reduce resource consumption and enhance product longevity.</p> <p>STEM: Application of electronic circuit calculations (Ohm's law, resistor values), input/output logic systems, and mechanical advantage/gear ratios.</p> <p>Milton Keynes: Investigating advanced engineering materials used in automotive and technological sectors around Milton Keynes and surrounding science parks.</p>

		management systems in Milton Keynes.		Milton Keynes: Examining industrial manufacturing practices and material suppliers accessible from Milton Keynes logistics hubs.	implemented across Milton Keynes.	
Learning End Points	<ul style="list-style-type: none"> Primary sources, classification, and characteristics of papers/boards, natural/manufactured timbers, ferrous/non-ferrous metals, alloys, thermoforming/thermosetting polymers, and textiles. Physical properties (absorbency, density, fusibility, electrical/thermal conductivity) and working properties (strength, hardness, toughness, malleability, ductility, elasticity). The impact of five primary forces and stresses: tension, compression, bending, torsion, and shear. 	<ul style="list-style-type: none"> Environmental and social impacts of manufacturing (deforestation, mining, product miles, carbon footprint). The hierarchy of the 6Rs in sustainable design. Scales of production: prototype, batch, mass, and continuous production. Investigation techniques (primary/secondary data) and analysing the work of past/present designers and companies. 	<ul style="list-style-type: none"> Advanced communication techniques including freehand sketching, isometric, perspective, and third-angle orthographic projection. Making principles: material selection, manufacturing tolerances, quality control, and material management (nesting/tessellation). Purpose and application of surface treatments and finishes for functional and aesthetic protection. 	<ul style="list-style-type: none"> In-depth knowledge of sources, origins, commercial stock forms, and working properties of a chosen specialist material area (e.g., Timbers, Polymers, Metals, or Papers/Boards). Commercial processing techniques, wastage/addition methods, and surface treatments specific to the chosen material. Health and safety legislation, risk assessments, and safe operation of workshop tools and machinery. 	<ul style="list-style-type: none"> Impact of automation, robotics, CAD/CAM, Flexible Manufacturing Systems (FMS), Just in Time (JIT), and Lean manufacturing. Ethical, social, and cultural impacts of new technologies, planned obsolescence, and consumer demand (technology push vs market pull). Energy generation (fossil fuels, nuclear, renewable sources: wind, solar, tidal, hydroelectric, biomass) and energy storage systems (batteries, kinetic pumped storage). 	<ul style="list-style-type: none"> Modern materials (graphene, titanium, metal foams), smart materials (shape memory alloy, thermochromic/photochromic pigments), and composites (GRP, carbon fibre). Electronic systems: inputs (sensors, switches), processes (microcontrollers, PICs), and outputs (lamps, buzzers, speakers). Mechanical devices: types of movement (linear, rotary, reciprocating, oscillating), levers (first, second, third order), linkages, CAMS, gears, and pulleys.
	<ul style="list-style-type: none"> Conduct physical and working property tests on a 	<ul style="list-style-type: none"> Apply the 6Rs to evaluate and 	<ul style="list-style-type: none"> Communicate, record, and justify 	<ul style="list-style-type: none"> Select and work with 	<ul style="list-style-type: none"> Evaluate the advantages and 	<ul style="list-style-type: none"> Identify and specify modern, smart, and

	<p>handling collection of diverse materials.</p> <ul style="list-style-type: none"> • Recognise and characterize different material categories and select appropriate materials for specific product applications. • Analyse how different structures and stock forms resist various forces and stresses. 	<p>improve product sustainability during mini-projects.</p> <ul style="list-style-type: none"> • Link specialist manufacturing processes to appropriate production scales. • Collect and interpret primary/secondary data to identify client and user needs. 	<p>design ideas using formal 2D/3D drawing techniques and CAD.</p> <ul style="list-style-type: none"> • Work accurately to designated tolerances using quality control fixtures (go/no go templates). • Plan efficient material cutting layouts to minimise waste and apply appropriate surface finishes. 	<p>specialist materials, components, and tools with high precision and safety.</p> <ul style="list-style-type: none"> • Execute commercial processing techniques (e.g., vacuum forming, brazing, turning, routing) to build functional prototypes. • Apply rigorous quality control measures throughout the manufacturing process. 	<p>disadvantages of planned obsolescence and automated manufacturing systems.</p> <ul style="list-style-type: none"> • Analyse power generation data and compare energy storage solutions for specific product applications. • Consider ethical, cultural, and environmental perspectives when evaluating new product designs. 	<p>composite materials to enhance product functionality.</p> <ul style="list-style-type: none"> • Design and analyse electronic systems using flowcharts, systems diagrams, and programmable components. • Calculate mechanical advantage, velocity ratios, and select appropriate mechanisms to change force magnitude and direction.
Key Vocabulary	<p>Absorbency, Density, Fusibility, Conductivity, Tensile strength, Hardness, Toughness, Malleability, Ductility, Elasticity, Ferrous, Non-ferrous, Alloy, Thermoplastic, Thermosetting, Composite, Tension, Compression, Bending, Torsion, Shear.</p>	<p>Carbon footprint, Deforestation, Product miles, Finite resources, 6Rs (Reduce, Reuse, Recycle, Repair, Rethink, Refuse), Prototype, Batch production, Mass production, Continuous production, Primary data, Secondary data, Iterative design, Anthropometrics, Ergonomics.</p>	<p>Orthographic projection, Isometric, Perspective, Tolerance, Quality control, Go/no go gauge, Nesting, Tessellation, Datum point, Surface finish, Aesthetic, Functional, Lamination, Allowance, Prototype.</p>	<p>Conversion, Seasoning, Extrusion, Injection moulding, Vacuum forming, Annealing, Tanalising, Galvanising, Ferrous, Thermoplastic, Stock form, Jig, Template, Risk assessment, Health and safety.</p>	<p>Automation, Robotics, CAD, CAM, FMS (Flexible Manufacturing Systems), JIT (Just in Time), Lean manufacturing, Planned obsolescence, Technology push, Market pull, Biomass, Kinetic pumped storage, Fossil fuels, Renewable energy.</p>	<p>Modern material, Smart material, Shape memory alloy, Thermochromic, Composite material, Carbon fibre, GRP, Input, Process, Output, Microcontroller, Linear motion, Rotary motion, Reciprocating, Oscillating, Mechanical advantage, Gear ratio.</p>

By the end of Year 10, students will be able to apply their understanding of materials, manufacturing processes, sustainability, design communication, emerging technologies and mechanical systems to design, make, analyse and evaluate products. They will independently use the iterative design process, work safely and accurately in practical environments, and be fully prepared to undertake the GCSE Design and Technology NEA in Year 11.

