Design & Technology Product Design

"In a very real way, designers create the human environment; they make the things we use, the places we live and work, our modes of communication and mobility. Simply put, design matters. And at a moment in our history in which the scientific community has issued serious warnings about the negative impacts of our flawed designs-from global warming and water pollution to the loss of biodiversity and natural resources-designers have a critical role to play in the creation of a more just, healthful and sustainable world." — William McDonough, Architect, Designer and Author

Year 12

The Rationale

Design and technology is part of everyday life and is constantly evolving. This creative and thought-provoking qualification gives students the practical skills, theoretical knowledge and confidence to succeed in a number of careers. Especially those in the creative industries. They will investigate historical, social, cultural, environmental and economic influences on design and technology, whilst enjoying opportunities to put their learning in to practice by producing prototypes of their choice. Students will gain a real understanding of what it means to be a designer, alongside the knowledge and skills sought by higher education and employers. This single A-Level qualification is modern and relevant, so students can learn about contemporary technologies, materials and processes, as well as established practices. This qualification will place greater emphasis on understanding and applying iterative design processes. Students will use their creativity and imagination to design and make prototypes that solve real and relevant problems, considering their own and others' needs, wants and values.

	Autumn	**Spring**	**Summer**
Curriculum Knowledge	**Technical Principles** • Materials and applications • Classification of materials • Methods for investigating and testing materials • Performance characteristics of materials: Papers and boards, polymer based sheet and film, woods, metals, polymers (plastics) inc. biodegradable, composites, smart & modern materials • Enhancement of materials • Forming, redistribution and addition processes • The use of adhesives and fixings	**Technical Principles (cont.)** • Modern industrial and commercial practice • Digital design and manufacture • The requirements for product design and development • Health and safety • Protecting designs and intellectual property • Design for manufacturing, maintenance, repair and disposal • Feasibility studies • Enterprise and marketing in the development of products	**Non-Exam Assessment (NEA)** The practical application of the technical principles and designing and making principles in a single design and make project. Students must undertake a small-scale design and make task and produce a final prototype based on a context and design brief developed by the student. • **Section A: Identify and investigate design possibilities (20 marks)** • **Focus on written examinations, in preparation for Summer mock exams**

	• The use of finishes	• Design communication • Modern manufacturing systems	
Tier 3 Vocabulary for Technical Principles	Physical properties, mechanical properties, working characteristics, product function, aesthetics, ferrous, non-ferrous, alloys, manufactured boards, polymers, thermoplastics, thermoset, elastomers, composites, smart materials, modern materials, tensile strength, malleability, corrosion, conductivity, impact resistance, recyclability, biodegradability, bleed proof paper, bleached card, mount board, duplex card, foil backed, laminated card, metal effect card, moulded paper pulp, translucency, foam board, fluted polypropylene, translucent polypropylene sheets, styrofoam, low density polyethylene sheet, plastazote foam, cellulose acetate, polylactide sheet and film, rough sawn, planed square edge (PSE), planed all round (PAR), warpage, steam bending, machining qualities, resistance to decay, moisture resistance, toxicity, melamine formaldehyde laminates, elasticity, density, resistance to corrosion, thermal conductivity, electrical conductivity, melting points, alloyed, low carbon steel, high speed steel (HSS), medium carbon steel, cast iron, titanium, ferrous alloys, die steel (tool steel), non-ferrous alloys, duralumin, insulation (thermal and electrical), UV resistance, low density polyethylene (LDPE), high density polyethylene (HDPE), polypropylene (PP), high impact polystyrene (HIPS), acrylonitrile butadiene styrene (ABS), polymethylmethacrylate (PMMA), nylon, rigid and flexible polyvinyl chloride (PVC), Polyethylene terephthalate (PET), urea formaldehyde (UF), melamine formaldehyde (MF), polyester resin, epoxy resin, polybutadiene, neoprene, silicone, Thermoplastic Elastomer (TPE), corn starch polymers, potatopak, biopol (bio-batch additive), polylactide (PLA), polyhdroxyalkanoate (PHA), water soluble lactide, glycolide (Lactel and eco film), carbon fibre reinforced plastic (CFRP), glass reinforced plastic (GRP), tungsten carbide, aluminium composite board, reinforced concrete, fibre cement, engineered wood, e.g. glulam (glued laminated timber), shape memory alloys (SMA), e.g. Nitinol, thermochromatic pigment, phosphorescent pigment, photochromic pigment, electroluminescent wire, piezo electric material, Kevlar, precious metal clay (PMC), high density modelling foam, polymorph, UV stabilisers, case hardening, tempering, die cutting, laser cutting, vacuum forming, thermoforming, calendaring, line bending, laminating (layup), injection moulding, blow moulding, rotational moulding, extrusion, compression moulding, press forming, spinning, cupping, deep drawing, forging, drop forging, bending, rolling, sand casting, die casting, investment casting, low temperature casting (pewter), metal inert gas (MIG) welding, tungsten inert gas (TIG) welding, spot welding, oxy-acetylene welding, soldering (soft and hard), brazing, riveting, milling, turning, flame cutting, plasma cutting, punching/stamping, laminating, embossing, debossing, UV varnishing, spot varnishing, foil blocking, flexographic and offset lithographic printing, electro-plating, dip coating, powder coating, galvanising, anodising, cathodic protection, polyurethane varnish, unit production systems (UPS), quick response manufacturing (QRM), vertical in-house production, modular/cell production, just in time (JIT), flexible manufacturing systems, computational fluid dynamics (CFD), finite element analysis (FEA), component stress analysis, corporate identification, concept of global marketing	
Curriculum Opportunities	Beyond the classroom: A variety of trips and visits, competitions, links with industry and local businesses support and enrich the Design and Technology curriculum.		

Year 13

How you will be assessed:

This qualification is linear; students will sit all their exams and submit all their non-exam assessment at the end of the course.
The exams and non-exam assessment will measure how students have achieved in the following assessment objectives:

AO1: Identify, investigate and outline design possibilities to address needs and wants.
AO2: Design and make prototypes that are fit for purpose.
AO3: Analyse, evaluate design decisions and outcomes, including for prototypes made by themselves and others, and wider issues in design & technology.
AO4: Demonstrate and apply knowledge and understanding of technical principles, designing and making principles.

Written exams:

- Paper 1: Technical principles. 2.5 hours. 120 marks. 30% of A-level. Questions: Mixture of short answer and extended response.
- Paper 2: Designing and making principles. 1.5 hours. 80 marks. 20% of A-level. Questions: Mixture of short answer and extended response questions.
- Non-examined Assessment (NEA): Practical application of technical principles and designing and making principles.
  Substantial design and make project. 100 marks. 50% of A-level. Written or digital design portfolio and photographic evidence of final prototype is expected.

	Autumn	Spring	Summer
Curriculum Knowledge	**Non-Exam Assessment (NEA)** • **Section B: Producing a design brief and specification (10 marks)** • **Section C: Development of design proposals (25 marks)** **Designing and Making Principles** • Design methods and processes • Design theory • How technology and cultural changes can impact on the work of designers • Design processes • Critical analysis and evaluation	**Non-Exam Assessment (NEA)** • **Section D: Development of design prototypes (25 marks)** • **Section E: Analysing and evaluating (20 marks)** **Designing and Making Principles (cont.)** • Selecting appropriate tools, equipment and processes • Accuracy in design and manufacture • Responsible design • Design for manufacture and project management • National and international standards in product design	**Focus on written examinations:** • Further preparation, past exam papers and revision for written examinations. • Paper 1: Technical principles. 2.5 hours. 120 marks. 30% of A-level • Paper 2: Designing and making principles. 1.5 hours. 80 marks. 20% of A-level
Tier 3 Vocabulary for Designing & Making Principles	Primary and secondary data, human factors, anthropometric data and percentiles, ergonomic data, arts and craft movement, Art Deco, Modernism, e.g. Bauhaus, Post modernism, e.g. Memphis, microelectronics, product life cycle, prototype development, iterative design process, British Standards Institute (BSI), International Organisation for Standardisation (ISO), critical analysis, quality assurance, quality control, Restriction of Hazardous Substances (ROHS) directive, battery directive, polymer codes for identification and recycling, packaging directives, WEEE directives, energy ratings of products, eco-labelling, the Mobius Loop, the European Eco-label, NAPM recycled mark, EC energy label, Energy Efficient label and logo, Forest Stewardship Council (FSC), EPA energy star		
Curriculum Opportunities	This A Level is perfect for students who have an interest, or wish to study **design** or **engineering** at a higher level, and could lead on to employment, an apprenticeship or a degree in graphic design, illustration, product design, jewellery design, interior design, architecture, materials science, electrical, chemical, mechanical, structural and civil engineering.		