

DESIGN & TECHNOLOGY: KS3 Progress Map

YEAR GROUP	TOPIC/ PROJECT/ DISCIPLINE	PRIOR SUBJECT KNOWLEDGE	SUBSTANTIVE KNOWLEDGE	ASSESSMENT	SKILLS/ TECHNIQUES	META SKILLS
YEAR 7	PRODUCT DESIGN: ICT PHONE HOLDER	<ul style="list-style-type: none"> ➤ General use of ICT (Office Suite as a minimum). 	<ul style="list-style-type: none"> ➤ Digital file management ➤ ICT: how to use Coreldraw. ➤ Using the work of others as a starting point to creativity. ➤ Creating a laser pathway ➤ Knowledge of CNC machining ➤ Plastic-Forming ➤ Health & Safety ➤ Working to a specification ➤ How to produce a high quality product 	<ul style="list-style-type: none"> ➤ Technical ability to use the Bezier tool in Adobe Illustrator to create a CNC pathway to export to a laser-cutter. 	<ul style="list-style-type: none"> ➤ Creating folders; naming files ➤ Navigating the various areas of the software ➤ Using keyboard/ mouse short-cuts ➤ Shape tool; Bezier tool; virtual segment tool ➤ Manipulating Bezier nodes ➤ Weld/ trim and intersect ➤ Fill, outline, copy and paste ➤ Grouping, dimensioning ➤ Using the laser-cutter ➤ How to use a line bender ➤ Working to specific sizes (templates); fit for purpose 	<ul style="list-style-type: none"> ➤ Independent learning ➤ Selective decision-making ➤ Sensitivity to a design brief ➤ Working within a limited set of criteria ➤ Growth mindset; mastery through effort/ time.
	PRODUCT DESIGN: IN THE STYLE OF ALESSI	<ul style="list-style-type: none"> ➤ Drawing skills ➤ Descriptive writing 	<ul style="list-style-type: none"> ➤ Concept of Product Design ➤ Design styles / intentions ➤ Product analysis ➤ Working to a specification ➤ Writing a specification ➤ Using the work of others as a starting point to creativity. ➤ Plastic-Forming ➤ Use of Jigs and templates ➤ Electronic Circuit Knowledge ➤ Health and Safety ➤ How to produce a high quality product 	<ul style="list-style-type: none"> ➤ Standard of practical work including safely and accurately working with hand tools and machines and finishing a specific material to a high standard. 	<ul style="list-style-type: none"> ➤ Workshop safety; safety signs; emergency stop buttons; hidden dangers; self-discipline ➤ Use of FAME as a scaffold to initial product analysis ➤ How to use a Vacuum Former ➤ How to use various machines including; Hegner Saw, Pillar drill, Soldering iron ➤ How to design a successful Vacuum Form mould ➤ Quality of finish ➤ Working Properties of MDF and HIPS ➤ Understand and be able to Identify polarity of electrical components ➤ Produce a viable working circuit and be able to identify and rectify faults ➤ 	<ul style="list-style-type: none"> ➤ Selective decision-making ➤ Sensitivity to a design brief ➤ Working within a limited set of criteria ➤ Growth mindset; mastery through effort/ time. ➤ Self-management of risk
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YEAR 8	PRODUCT DESIGN: ICT PAPER MECHANISMS	<ul style="list-style-type: none"> ➤ Digital file management ➤ ICT: how to use Coreldraw. ➤ Using the work of others as a starting point to creativity. ➤ Health & Safety ➤ Working to a specification 	<ul style="list-style-type: none"> ➤ ICT: Coreldraw as a graphics package ➤ Concept of digital graphic design ➤ Iterative design process ➤ Health & safety ➤ Safe and skilful use of tools ➤ Working to a specification ➤ Digital printing 	<ul style="list-style-type: none"> ➤ Iterative design. ➤ Development of a product through the use of modelling. Being able to assess a piece of work and make working modifications to aid the successful development of a product. 	<ul style="list-style-type: none"> ➤ Fonts/ lettering styles; fills; line weight; transformations; importing and manipulation of images; advanced layering ➤ Safe and accurate use of craft knives; safety rulers; cutting mats. ➤ Prototyping; modelling; modifications ➤ Evaluation/ analysis ➤ Understanding of print margins/ page set-up 	<ul style="list-style-type: none"> ➤ Independent learning ➤ Selective decision-making ➤ Sensitivity to a design brief ➤ Working within a limited set of criteria ➤ Growth mindset; mastery through effort/ time. ➤ Time management/ working to deadlines ➤ Using feedback to improve work ➤ Self-management of risk 	
	PRODUCT DESIGN: SWEET DISPENSER	<ul style="list-style-type: none"> ➤ Concept of Product Design ➤ Product analysis ➤ Working to a specification ➤ Writing a specification ➤ Using the work of others as a starting point to creativity. ➤ Use of Jigs and templates ➤ Health and Safety ➤ How to produce a high quality, finished product ➤ How to use various machines including; Hegner Saw, Pillar drill ➤ Quality of finish ➤ Working Properties of MDF and HIPS 	<ul style="list-style-type: none"> ➤ Understanding the iterative design process ➤ Target markets ➤ How to produce orthographic drawings ➤ Commercial standards ➤ British standards dimensioning ➤ 	<ul style="list-style-type: none"> ➤ Showing an understanding of how to produce a technical drawing using British Standards Conventions. 	<ul style="list-style-type: none"> ➤ Scale drawing ➤ Technical drawing ➤ Workshop safety; safety signs; emergency stop buttons; hidden dangers; self-discipline ➤ How to use various machines including; Hegner Saw, Pillar drill, Soldering iron ➤ Quality of finish ➤ Working Properties of MDF 	<ul style="list-style-type: none"> ➤ Independent learning ➤ Selective decision-making ➤ Sensitivity to the needs of others ➤ Working to specifications ➤ Growth mindset; mastery through effort/ time. ➤ Self-management of time and risks ➤ Self-reflection ➤ Taking pride in your work 	
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YEAR GROUP	TOPIC/ PROJECT/ DISCIPLINE	PRIOR SUBJECT KNOWLEDGE	SUBSTANTIVE KNOWLEDGE	ASSESSMENT	SKILLS/ TECHNIQUES	META SKILLS
YEAR 9	PRODUCT DESIGN: MINI-SKILLS	<ul style="list-style-type: none"> ➤ Workshop safety; safety signs; emergency stop buttons; hidden dangers; self-discipline ➤ How to use various machines including; Hegner Saw, Pillar drill, ➤ How to design a successful Vacuum Form mould ➤ Quality of finish 	<ul style="list-style-type: none"> ➤ Bottle-opener ➤ Working with Aluminium ➤ Health and Safety ➤ Milling Machine ➤ Pillar Drill (metal) ➤ Finishing ➤ Set dimensions (accuracy) ➤ Surfboard ➤ Lamination ➤ Working with natural timber ➤ Adhesives ➤ Timber conversion ➤ Finishes sanding/ filing ➤ Skateboard ➤ Bag-pressing ➤ Veneers ➤ Working with manufactured boards ➤ Adhesive ➤ Lamination ➤ Formers ➤ Acrylic Pebble ➤ Adhesives ➤ Lamination ➤ Finishing 	<ul style="list-style-type: none"> ➤ To be able to describe various processes regarding the working properties of woods, metals and plastics and to understand the use of various tools and methods of joining specific to each material area. 	<ul style="list-style-type: none"> ➤ Workshop safety ➤ Use of various machines including: Milling Pillar drill, Rotary/ belt sander, Bag Pressing, ➤ Appropriate use of adhesives including: PVA, Tensol Cement, Cross-linking PVA ➤ Hand tools inc; Files, ➤ Use of templates/ jigs/ formers ➤ Finishing techniques for wood, metals and plastics (Beeswax, T-cut, wet and dry, ➤ Lamination of woods and plastics 	<ul style="list-style-type: none"> ➤ Independent learning ➤ Selective decision-making ➤ Taking on board verbal audio and kinaesthetic instruction. ➤ Growth mindset; mastery through effort/ time. ➤ Time management/ working to deadlines ➤ Managing multiple practical outcomes and ensuring a high level of quality control ➤ Using verbal feedback to improve work ➤ Self-management of risk
	PRODUCT DESIGN: CAD/CAM SOLIDWORKS	<ul style="list-style-type: none"> ➤ Digital file management ➤ Understanding general ICT platforms along with short-cut keys and manipulation of virtual environments ➤ Using the work of others as a starting point to creativity. ➤ Knowledge of CNC machining ➤ Plastic-Forming ➤ Working to a specification 	<ul style="list-style-type: none"> ➤ Understanding of the term CAD/CAM and how it relates to design within industry ➤ How to use an industry-standard solid-modelling platform to create product designs ready for rapid prototyping ➤ Rapid prototyping (3D printing) ➤ Working within constraints and producing designs to exact measurements and requirements ➤ Designing multiple parts ready for assembly 	<ul style="list-style-type: none"> ➤ Demonstrate the use and understanding of 3D design software through a variety of exercises with increasing levels of difficulty. To use technical terminology when describing each process. 	<ul style="list-style-type: none"> ➤ Manipulation of a virtual, 3D environment ➤ Tools: extrude cut; revolve; sketch patterning; creating valid profiles; shape tools; Bezier tool; creating workplanes; dimensioning 	

YEAR 10		<ul style="list-style-type: none"> ➤ How to produce a high quality product 	<ul style="list-style-type: none"> ➤ Final render and presentation of finished product 				
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		<p>PROJECT MODULE 1: ERGONOMICS Generating and presenting ideas through sketching, Photoshop and modelling</p>	<ul style="list-style-type: none"> ➤ Digital file management ➤ Understanding general ICT platforms along with short-cut keys and manipulation of virtual environments ➤ Health & Safety ➤ Working to a specification ➤ How to use various machines including; Hegner Saw, Pillar drill, disc sander ➤ Hand tools inc files, ➤ Using modelling materials such as styrofoam and card 	<ul style="list-style-type: none"> ➤ Organising digital work and creating good, extensive file management systems ➤ Understanding how ergonomics affect designs. ➤ Understanding the need to use anthropometrical data ➤ Production of 2D and 3D sketch ideas ➤ Using CAD to enhance and render design work ➤ Produce a working, 3D prototype based on 2D design work. 	<ul style="list-style-type: none"> ➤ Ongoing assessment throughout project. ➤ Summative assessment of the final portfolio of work showing the Iterative design process from sketch ideas, development, CAD work through to prototyping 	<ul style="list-style-type: none"> ➤ 2D and 3D drawing systems ➤ Digitising design work to enhance it using CAD ➤ Photoshop skills including: Importing digitised work ➤ Use of layers, ➤ Using a variety of colour, contrast and hue adjustment tools ➤ Application of colour to render drawings ➤ Use of the brush and fill tools ➤ How to remove the background of a design in order to import to different platforms ➤ Using a variety of modelling materials, processes and techniques in order to produce high-quality prototypes. ➤ Analyse and evaluate at each stage to ensure quality outcomes. 	<ul style="list-style-type: none"> ➤ Self-assessing difficult skills and understanding the route to improvement ➤ Time management ➤ The intrinsic need to improve as a designer ➤ Analysis and self-evaluation skills

YEAR 10

THEORY MODULE 1: MATERIALS Understand the source and application of a wide range of materials used in all aspects of Product Design

- Students have worked with Polymers (HIPS and Acrylic) and understand the difference between thermo and thermosetting plastics
- Have used plastic-forming processes including: vacuum-forming, line-bending, 3D printing and laser-cutting
- Have worked with hard and softwoods and MDF and used the processes of laminating and bag-pressing.
- Have worked with aluminium (bottle-opener)
- Have worked with a variety of textiles including natural and man-made fibres.
- Have worked with paper and card

- Look at all material areas including: woods, metals, polymers, textiles, paper and board and composite materials.
- Understand the different manufacturing processes used to shape each material area (focus on Polymers)

- Summative exam-style test at the end of the module

- Understand the source of all materials
- Material names
- Material categories such as:
- Ferrous/ non-ferrous metals
- Alloys
- Thermo/ thermosetting polymers
- Soft and Hard wood
- Manufactured boards
- Paper and boards
- Textiles
- Composite materials
- Smart materials
- Modern materials
- Stock forms used in manufacture
- Material properties
- Finishes
- Manufacturing processes including:
- Injection Moulding
- Vacuum-forming
- Blow-moulding
- Press-forming
- Calendaring
- Extrusion
- Rotational Moulding

- Resilience
- Independent learning and thinking
- Discussion skills
- Time management/ working to deadlines
- Revision techniques
- Examination techniques

YEAR 10	<p>THEORY MODULE 2: Material properties mechanical systems; Structures; Forces Understand the source and application of a wide range of materials used in all aspects of Product Design</p>	<ul style="list-style-type: none"> ➤ Use of a variety of different materials throughout KS3 ➤ Simplistic use of structures and mechanical systems in KS3 projects including: Sweet dispenser; Mobile phone holder; Alessi nightlight; Paper mechanisms 	<ul style="list-style-type: none"> ➤ The working properties of materials ➤ Mechanical systems ➤ Structures ➤ Forces 		<ul style="list-style-type: none"> ➤ Properties of materials including: <ul style="list-style-type: none"> ➤ Thermal and Electrical Conductivity. ➤ Ductility ➤ Malleability. ➤ Elasticity ➤ Toughness. ➤ Hardness. ➤ Plasticity ➤ Mechanical systems including: Levers, gears, linkages, cams and pulleys. ➤ Forces including: <ul style="list-style-type: none"> ➤ Compression, tension, torque, bending and shearing. ➤ Four forms of motion: Rotary, Linear, reciprocating, oscillating. ➤ Structures including: Natural; man-made; frame and monocoque. 	
YEAR 10	<p>PROJECT MODULE 2: Bridge building and design: Structural Modelling</p>	<ul style="list-style-type: none"> ➤ Mechanical systems including: Levers, gears, linkages, cams and pulleys. ➤ Forces including: <ul style="list-style-type: none"> ➤ Compression, tension, torque, bending and shearing. ➤ Four forms of motion: Rotary, Linear, reciprocating, oscillating. ➤ Structures including: Natural; man-made; frame and monocoque. 	<ul style="list-style-type: none"> ➤ Practical application of structures and forces through a bridge building project. ➤ Students given limited materials and a deadline to design and make a frame structure bridge. ➤ Judging will cover: Use of structures, aesthetics, use of glue, weight of bridge and amount of weight held by the bridge until defamation. 	<ul style="list-style-type: none"> ➤ Success of bridge against success criteria (use of structures, aesthetics, use of glue, weight of bridge and amount of weight held by the bridge until defamation). ➤ Students to evaluate their final structure and look at modifications needed for improvements 	<ul style="list-style-type: none"> ➤ Accurate use of tools and machinery including: rotary sander; fret saw; hand saw; bench hook; glue gun ➤ Working safely in a workshop environment ➤ Measuring and cutting angles and lengths accurately ➤ Working to a specification 	<ul style="list-style-type: none"> ➤ Problem solving ➤ Teamwork ➤ Delegation ➤ Practical application of theoretical work ➤ Time management

YEAR 10	<p>THEORY MODULE 3: Industrial processes; Environmental, ethical and moral impact of products and materials</p> <p>Understand the life cycle of a product from the 'cradle to the grave' and the wider impacts upon society.</p>	<ul style="list-style-type: none"> ➤ Plastics theory ➤ Vacuum Forming ➤ Line-bending ➤ Manufactured Boards ➤ 6Rs 	<ul style="list-style-type: none"> ➤ Environmental impact of woods, metals and plastics ➤ Extraction and Processing of materials ➤ Energy production and use ➤ Pollution ➤ 6Rs ➤ Transportation ➤ Globalisation ➤ Recycling ➤ Social, moral and ethical products 	<ul style="list-style-type: none"> ➤ Summative exam-style test at the end of the module 	<ul style="list-style-type: none"> ➤ Explain the impact that resource consumption has on the environment ➤ Understand the effects that waste disposal has on the environment and state more sustainable alternatives to landfill that make use of new technologies ➤ Understand that developing new products can contribute to pollution and global warming ➤ Explain how continuous improvement of products and efficient working can reduce the environmental impact of a product on the environment 	<ul style="list-style-type: none"> ➤ Resilience ➤ Independent learning and thinking ➤ Discussion skills ➤ Time management/ working to deadlines ➤ Revision techniques ➤ Examination techniques
	YEAR 11	TOPIC/ PROJECT/ DISCIPLINE	<ul style="list-style-type: none"> ➤ PRIOR SUBJECT KNOWLEDGE 	<ul style="list-style-type: none"> ➤ SUBSTANTIVE KNOWLEDGE 	<ul style="list-style-type: none"> ➤ ASSESSMENT 	SKILLS/ TECHNIQUES

	<p align="center">NEA Coursework</p> <p align="center">Identifying & investigating design possibilities</p>	<p>➤ KS3 and Year 10 subject Knowledge and skills.</p>	<p>Design possibilities identified and thoroughly explored, directly linked to a contextual challenge demonstrating excellent understanding of the problems/opportunities.</p> <p>A user/client has been clearly identified and is entirely relevant in all aspects to the contextual challenge and student has undertaken a comprehensive investigation of their needs and wants, with a clear explanation and justification of all aspects of these.</p> <p>Comprehensive investigation into the work of others that clearly informs ideas.</p> <p>Excellent design focus and full understanding of the impact on society including; economic and social effects.</p> <p>Extensive evidence that investigation of design possibilities has taken place throughout the project with excellent justification and understanding of possibilities identified.</p>	<p>➤ Verbal feedback throughout section of work, targets given once section is completed</p>	<p>➤ Resilience</p> <p>➤ Independent learning and thinking</p> <p>➤ Discussion skills</p> <p>➤ Time management/ working to deadlines</p> <p>➤ Revision techniques</p> <p>Examination techniques</p>
	<p align="center">Producing a design brief & specification</p>	<p>➤ KS3 and Year 10 subject Knowledge and skills.</p>	<p>Comprehensive design brief which clearly justifies how they have considered their user/client's needs and wants and links directly to the context selected.</p> <p>Comprehensive design specification with very high level of justification linking to the needs and wants of the client/user. Fully informs subsequent design stages.</p>	<p>➤ Verbal feedback throughout section of work, targets given once section is completed</p>	

	Generating design ideas	➤ KS3 and Year 10 subject Knowledge and skills.	<p>Imaginative, creative and innovative ideas have been generated, fully avoiding design fixation and with full consideration of functionality, aesthetics and innovation.</p> <p>Ideas have been generated, that take full account of on-going investigation that is both fully relevant and focused.</p> <p>Extensive experimentation and excellent communication is evident, using a wide range of techniques.</p> <p>Imaginative use of different design strategies for different purposes and as part of a fully integrated approach to designing.</p>	➤ Verbal feedback throughout section of work, targets given once section is completed		
	Developing design ideas	➤ KS3 and Year 10 subject Knowledge and skills.	<p>Very detailed development work is evident, using a wide range of 2D/3D techniques (including CAD where appropriate) in order to develop a prototype.</p> <p>Excellent modelling, using a wide variety of methods to test their design ideas, fully meeting all requirements.</p> <p>Fully appropriate materials/components selected with extensive research into their working properties and availability.</p> <p>Fully detailed manufacturing specification is produced with comprehensive justification to inform manufacture.</p>	➤ Verbal feedback throughout section of work, targets given once section is completed		

	Realising design ideas	➤ KS3 and Year 10 subject Knowledge and skills.	<p>The correct tools, materials and equipment (including CAM where appropriate) have been consistently used or operated safely with an exceptionally high level of skill.</p> <p>A high level of quality control is evident to ensure the prototype is accurate by consistently applying very close tolerances.</p> <p>Prototype shows an exceptionally high level of making/finishing skills that are fully consistent and appropriate to the desired outcome.</p> <p>An exceptionally high quality prototype that has the potential to be commercially viable has been produced and fully meets the needs of the client/user.</p>	➤ Verbal feedback throughout section of work, targets given once section is completed		
	Analysing & evaluating	➤ KS3 and Year 10 subject Knowledge and skills.	<p>Extensive evidence that various iterations are as a direct result of considerations linked to testing, analysis and evaluation of the prototype, including well considered feedback from third parties.</p> <p>Comprehensive testing of all aspects of the final prototype against the design brief and specification. Fully detailed and justified reference is made to any modifications both proposed and undertaken.</p> <p>Excellent ongoing analysis and evaluation evident throughout the project that clearly influences the design brief and the design and manufacturing specifications.</p>	➤		

