Curriculum Knowledge Map

CHS Computing and Technology 2022/2023

AQA GCSE Design and Technology (8552)

GCSE Design and Technology Exam Paper 1	Non-exam assessment (NEA)
Written exam: 2 hours **100 marks - 50% of GCSE** • Core technical principles • Specialist technical principles • Designing and making principles In addition: • at least 15% of the exam will assess maths. • at least 10% of the exam will assess science. Questions: **Section A – Core technical principles (20 marks)** A mixture of multiple choice and short answer questions assessing a breadth of technical knowledge and understanding. **Section B – Specialist technical principles (30 marks)** Several short answer questions (2–5 marks) and one extended response to assess a more in-depth knowledge of technical principles. **Section C – Designing and making principles (50 marks)** A mixture of short answer and extended response questions	**Non-exam assessment (NEA): 30–35 hours approx.** **100 marks - 50% of GCSE** **Practical application of:** • Core technical principles • Specialist technical principles • Designing and making principles • Substantial design and make task. **Assessment criteria:** • Identifying and investigating design possibilities • Producing a design brief and specification • Generating design ideas • Developing design ideas • Realising design ideas • Analysing & evaluating Contextual challenges to be released annually by AQA on 1 June in the year prior to the submission of the NEA. Students will produce a prototype and a portfolio of evidence, Work will be marked by teachers and moderated by AQA

Curriculum Knowledge Map

Year 10 (Design and Technology)

Year 10	AUTUMN		SPRING		SUMMER	
	Materials & Their Working Properties	Forces and Stresses and Production	The Work of Others	New & Emerging Technologies	Design, Modelling and Prototyping	NEA – identification and investigating design possibilities
Declarative *What should they know?*	*Students should know the different types of material properties and the correct terms used to describe these.* **Paper and boards** • Students should know the primary source of materials for producing paper and boards. • Students should be able to recognise and characterise different types of paper and boards. • Students should understand how the physical and working properties of a range of paper and board products affect their performance. **Natural and manufactured timbers** • Students should know the primary sources of materials for producing natural and manufactured timbers. • Students should be able to recognise and characterise different types of natural and manufactured timbers. • Students should understand how the physical and working properties of a range of natural and manufactured timbers affect their performance.	**Forces and stresses on materials and objects** • Students should be able to recognise and characterise tension, compression, bending, torsion and shear forces and stresses. • Students should understand the impact of different forces and stresses on materials. **Mechanical devices** • Students should be able to recognise and identify a range of movements. • Student should understand the functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements. • Students should understand how mechanisms can be used to change magnitude and direction of force, including levers, linkages and rotary systems. **Sustainability** • Students should be able to understand the impact of resource consumption on the planet: o finite o non-finite o disposal of waste • Students should be able to take into consideration the	**The work of others** • Students should know how to investigate, analyses and evaluate the work of others. • Students should understand how investigating the work of other designers and design companies can inform designing. **Design strategies** • Students should be able to use a range of design strategies to help produce imaginative and creative design ideas. • Students should understand how to explore and develop design ideas. • Explore and develop their own ideas using an iterative process including: o sketching o modelling o testing o evaluation of their work to improve outcomes. **Communication of design ideas** • Students should know how to develop, communicate, record and justify design ideas using a range of appropriate techniques such as: o freehand sketching, isometric and perspective	**New and emerging technologies** • Students should know that it is important to consider scenarios from different perspectives and considering: o planned obsolescence. o design for maintenance o ethics o the environment **Energy generation** • Students should understand how power is generated from fossil and nuclear fuels. • Students should understand how power is generated from renewable energy sources such as: wind, solar, tidal, hydroelectric and biomass. • Students should be aware of the arguments for and against the selection of fossil fuels, renewable energy and nuclear power. **Energy storage** • Students should be able to identify mechanical power and understand how it is stored. • Students should understand pneumatics and hydraulics as examples of kinetic pumped storage systems. • Students should understand the functional properties of	**Communication of design ideas and prototype development** • Students should understand how to develop, communicate, record and justify design ideas. • Students should be aware of a range of techniques to support clear communication of design ideas. • Students should know how to design and develop prototypes in response to client wants and needs. • Students should be able to critically evaluate prototypes and suggest modifications. **Design strategies** • Students should be able to use a range of design strategies to help produce imaginative and creative design ideas. • Students should understand how to explore and develop design ideas. **Communication of design ideas** • Students should know how to develop, communicate, record and justify design ideas using a range of appropriate techniques such as: o freehand sketching, isometric and perspective	**Students will be completing their NEA Tasks in GCSE Design and Technology.** Their contexts will be released by the exam board on the 1st June and released to students at the start of the summer term. • Students should complete Section A and B by the summer break: • Identify, investigate and outline design possibilities. This will be evidences through: • Identifying & investigating design possibilities • Producing a design brief & specification Student should know to identify design possibilities from a given context. Students should know a variety of analytical skills that can be applied to a given context. Students should know how to conduct primary and secondary research relating to a given context. Students should know how select relevant work from other

Curriculum Knowledge Map

	Metals and alloys • Students should know the primary sources of materials for producing metals and alloys. • Students should be able to recognise and characterise different types of metals and alloys. • Students should understand how the physical and working properties of a range of metals and alloys affect their performance. **Polymers** • Students should know the primary sources of materials for producing polymers. • Students should be able to recognise and characterise different types of polymers. • Students understand the physical and working properties for arrange of thermosetting and thermoforming polymers. **Textiles** • Students should know the primary source of materials for producing textiles. • Students should be able to recognise and characterise different types of textiles. • Students should understand how the physical and working properties of a range pf textiles affect their performance. **Forces and stresses on materials and objects** • Students should be able to recognise and characterise tension, compression, bending, torsion and shear forces and stresses.	ecological and social footprint of materials. **Environment** • Students should know the positive and negative impacts new products have on the environment: o continuous improvement o efficient working o pollution o global warming. **Ecological issues in the design and manufacture of products** • Students should know the impact of: o Deforestation, mining, drilling and farming. o Mileage of product from raw material source, manufacture, distribution, user location and final disposal. o That carbon is produced during the manufacture of products. **The 6 R's** • Students should know the 6 R method for consideration when designing and making products (Reduce, Refuse, Re-Use, Repair, Recycle and Rethink). **Social issues in the design and manufacture of products** • Students should know the safe working conditions, reducing oceanic/atmospheric pollution and reducing the detrimental (negative) impact on others. **Scales of production**	o 2D and 3D drawings o annotated drawings that explain detailed development or the conceptual stages of designing o exploded diagrams to show constructional detail or assembly. o working drawings: 3rd angle orthographic, using conventions, dimensions and drawn to scale **Production techniques and systems** • Students should know: the contemporary and potential future use of: o automation o computer aided design (CAD) o computer aided manufacture (CAM) o flexible manufacturing systems (FMS) o just in time (JIT) o lean manufacturing. **Modern materials** • Students should be able to recognise a range of modern materials. • Students should be able to describe developments made through invention of new or improved processes involving modern materials. • Students should be able to explain how modern materials can be used to alter functionality. **Smart materials** • Students should be able recognise a range of smart materials.	alkaline and rechargeable batteries. **Electronic systems processing** • Students should understand the difference between analogue and digital signals. • Students should understand how microcontrollers are programmed as counters, timers and for decision making to provide functionality to products and processes. • Students should understand the use of buzzers, speakers and lamps to provide functionality to products and process. **Mechanical devices** • Students should be able to recognise and identify a range of movements. • Student should understand the functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements. • Students should understand how mechanisms can be used to change magnitude and direction of force, including levers, linkages and rotary systems. **Production techniques and systems** **CAD/CAM** • Students should be able to understand the contemporary and potential future use of: o automation o computer aided design (CAD) o computer aided manufacture (CAM)	o 2D and 3D drawings o annotated drawings that explain detailed development or the conceptual stages of designing o exploded diagrams to show constructional detail or assembly. o working drawings: 3rd angle orthographic, using conventions, dimensions and drawn to scale o computer based tools. o modelling: working directly with materials and o components, e.g., card modelling, producing a toile when designing garments. **Selection of materials and components** • Students should be able to select and use materials and components appropriate to a specific task. • Students should understand how functionality, availability and cost affect the selection of materials and components. • Students should know the different types of material properties and the correct terms used to describe these. **Students must be able to apply the following mathematical skills.** • Arithmetic and numerical computation o Recognise and use expressions in o decimal and standard form.	to assist with design development and research. Students should know how to be concise with research and how to relate this to their contexts. **Investigation, primary and secondary data** • Students should understand primary and secondary data can be collected to assist the understanding of client and user needs. • Students should know how to write a design brief and produce a manufacturing specification. • Students should understand how the environment, and social and economic challenge influence designing and making.

Curriculum Knowledge Map

	• Students should understand the impact of different forces and stresses on materials.
	
	Improving functionality
	• Students should understand how materials may be enhanced to resist and work with forces and stresses to improve functionality.
	
	For one or two of three material areas above students should
	• Know how primary sources are converted into products.
	• Understand ecological issues in the manufacture and recycling of the material.
	• How different properties of the material make them suitable for use in commercial products.
	• Understand the commercial stock forms, types and sizes of materials in order to calculate quantities.
	• Understand wasting and abrading techniques for the material.
	• Be aware of school-based cutting, forming and process techniques tools and equipment.
	• Understand how the properties of the material affect their use in commercial appliances.
	• Be aware of commercial processing techniques.
	• Understand the use of specialist quality control methods.
	• Understand how the application of surface treatments and finishes can modify the functional and
		• Students should know how products are produced in different volumes.
		• The reasons why different manufacturing methods are used for different production volumes:
		  ○ prototype
		  ○ batch
		  ○ mass
		  ○ continuous.
		
		The use of production aids
		• Students should know how to use measurement/reference points, templates, jigs and patterns where suitable.
		
		Tolerances and allowances
		• Students should understand the use of tolerances to ensure accuracy is considered when making a product.
		• Students should understand how a range of materials are formed to designated tolerances.
		• Students should understand why tolerances are applied during making activities.
		
		Quality control
		• Students should know the application and use of quality control to include measurable and quantitative systems used during manufacture
			• Students should understand how the functional properties of a range of smart materials can be changed by external stimuli.
			
			Composite materials and technical Textiles
			• Students should understand how material properties can be enhanced by combining two or more materials.
			• Students should recognise a range of composite materials and technical textiles.
			• Students should understand how fibres can manipulated to create technical textiles.
			
			People
			• Students should know how technology push/market pull affects choice.
			• Changing job roles due to the emergence of new ways of working driven by technological change.
			
			Culture
			• Students should know how changes in fashion and trends in relation to new and emergent technologies.
			• Respecting people of different faiths and beliefs.
			
			Society
			• Students should know wow products are designed and made to avoid.
			• having a negative impact on others:
			  ○ design for disabled
			  ○ elderly
			  ○ different religious groups.
				○ flexible manufacturing systems (FMS)	○ Use ratios, fractions and percentages.
					○ Calculate surface area and volume.
					• Handling data
					○ Presentation of data, diagrams, bar charts and histograms.
					• Graphs
					○ Plot, draw and interpret appropriate graphs.
					○ Translate information between graphical and numeric form.
					• Geometry and trigonometry
					○ Use angular measures in degrees.
					○ Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects.
					○ Calculate areas of triangles and rectangles, surface areas and volumes of cubes.	

Curriculum Knowledge Map

	aesthetic properties of the material.					

Procedural
What should they be able to do?
	Student should be able to apply their theoretical knowledge to complete examination style questions.
	
	Students should be able to discuss the potential effects of new designs on culture and society.
	
	Students should be able to describe the characterises, properties and commonly used for the following material areas: Paper and board, metals and alloys, polymers, Textiles, Timber, and manufactured boards.
	
	Students should be able to describe the stock forms for the following material areas: Paper and board, metals and alloys, polymers, Textiles, Timber, and manufactured boards.
	
	Students should be able to explain how the following materials areas are converted into workable forms: Paper and board, metals and alloys, polymers, Textiles, Timber and manufactured boards.
	
	Students should be able to explain why standard components are used.
	
	Students should be able to identify and select appropriate standard components for a variety of different materials.
	
	Students should be able to explain the purpose of surface
		Students should be able to use math and science knowledge to answer questions related to design and technology.
		
		Students should be able to explain how designing and making is affected by ecological, environmental and social issues.
		
		Students should be able to discuss the benefits of Fairtrade for producers and consumers.
		
		Students should be able to explain the benefits of Computer base design and manufacture tools.
		
		Students should be able to describe how computer-based tools can be used to share and present ideas and technical information.
		
		Students should be able to describe the characteristics and give examples of different scales of manufacture.
		
		Students should be able to explain why the equipment used changes with the scale of manufacture.
		
		Students should be able to use reference points in measurements.
		
		Students should be able to explain why production aids are used.
		
		Students should be able to explain the impact of new and
			Students should be able to describe the main features of iterative design, user centred design and systems approach to designing.
			
			Students should be able to explain the advantages and disadvantages to different design strategies.
			
			Students should be able to analyse and evaluate the work of at least two different designers and companies.
			
			Students should be able to use the work of past and present designers to aid their own designing.
			
			Students should be able to describe the main methods of conducting research and investigation.
			
			Students should be able to explain the difference between primary and secondary data.
			
			Student should be able to describe the use of ergonomic and anthropometric data and use this data effectively in designing.
			
			Students should be able to describe the main stages in developing a design idea.
			
			Students should be able to use card models, toiles and breadboards to create prototypes successfully and explain why.
				Students should be able to describe the main stages that make up an electronic system.
				
				Students should be able to select and use appropriate input, process and output components in a circuit and product.
				
				Students should be able to describe the four types of motion.
				
				Students should be able to describe the basic principles of a lever and the different classes of levers.
				
				Students should be able to describe how linkages, cams, gears and pulleys transfer motion.
				
				Students should be able to explain how these mechanical devices are used to change the magnitude and direction of forces.
				
				Students should be able to describe how energy is stored and generated.
				
				Students should be able to explain he advantages and disadvantages of using renewable energy sources to power products and systems.
				
				Students should be able to describe the characterises of a variety of new materials.
					Students should be able to write a design brief and design specification for a product or system.
					
					Students should be able to modify a design brief because of user feedback.
					
					Students should be able to produce a manufacturing specification for a product or system.
					
					Students should be able to explain the meanings of the properties of materials.
					
					Students should be able to describe the typical properties of different types of materials.
					
					Students should be able to describe a range of examples of how product designs can be modified to improve the performance of a product.
					
					Students must be able to apply the following mathematical skills.
					• Arithmetic and numerical computation
					  ○ Recognise and use expressions in
					  ○ decimal and standard form.
					  ○ Use ratios, fractions and percentages.
					  ○ Calculate surface area and volume.
					• Handling data
					  ○ Presentation of data, diagrams, bar charts and histograms.
					• Graphs
						Students should be able to apply their knowledge and understanding to a given context/scenario.
						
						Students should be able to successful identify and explore design possibilities linked to a contextual challenge.
						
						Students should be able to generate client and user profiles relevant to a contextual challenge.
						
						Students should be able to research and analyse work by other designers and companies in relation to their context.
						
						Students should be able to identify economic and social impacts of products and materials in relation to research.

Curriculum Knowledge Map

	treatments and finishes for a range of materials. Students should be able to describe and apply surface treatments and finishing techniques to a range of materials. Students should be able to describe and consider a range of factors that can influence the choice of material for a product. Students should be able to explain the important properties required for commercial products. Students should be able to explain why reinforcement is used in products. Student should be able to describe and reinforce different materials to enhance their properties.	emerging technologies on industry and enterprise. Students should be able to discuss the potential effects of the use of new and emerging technologies on employment. Students should be able to explain the impact of CAD and CAM on production. Students should be able to Explain how production techniques and systems improve manufacturing efficiency. Students should be able to explain the impact of new and emerging technologies on sustainability.	Students should be able to produces sketches in perspective, isometric, exploded and orthographic styles. Students should be able to use annotation to enhance design communication. Students should be able to describe how mathematical modelling and computer-based tools are used to communicate design ideas. Students should be able to physically model ideas. Students should be able to explain the considerations that are considered when designing prototypes	Student should be able to explain what is meant by smart and composite material. Students should be able to list specific technical textiles, modern, smart and composite materials and their typical uses. Students should be able to explain reasons why accuracy is important in manufacture. Student should be able to explain the importance of quality control and types of quality control and assurance. Students should be able to explain tolerance and use it effectively.	○ Plot, draw and interpret appropriate graphs. ○ Translate information between graphical and numeric form. • Geometry and trigonometry ○ Use angular measures in degrees. ○ Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. ○ Calculate areas of triangles and rectangles, surface areas and volumes of cubes.	
Disciplinary Literacy *(Tier 3 Vocab)*	• Toughness • Component • Properties • Ferrous • nonferrous • Polymer • Thermosetting • Thermoplastic • Monomer • Ore • Veneer • Wasting • Abrading • Absorbency • Density • Fusibility • Electrical conductivity • Thermal conductivity • Strength	• Forces and Stresses • Mechanical Systems • Bending • Compression • Shear • Tension • Torsion • Gears • Magnitude • Movement • Oscillating, Linear, Reciprocating, Rotary • Pivot • Pulley • Ecological Footprint • Social Footprint • The 6 R's • Scales of Production • Production Aids	• Just in time • Kaizen • Lean manufacturing • Market pull • Technology push • Nanomaterials • Society • Culture • Biomass • Biofuel • Composite • e-textiles • hydroelectric • Kinetic • Nuclear • Renewable • Fibre optics • Innovation • Pneumatics	• Automation • Batch production • Bespoke • Biopolymers • CAD • CAM • Carbon footprint • Carbon offsetting • Emerging Technologies • Finite • Fairtrade • Input • Output • Process • Microcontroller • Influence • Brand	• Product analysis • Prototype • Quality control • Tolerance • Models • Manufacture • Variance • Adaptation • Development • 3D Communication • Inclusive design • Modification	• Questionnaire • Investigation • Primary data • Secondary data • Research • Analysis • Focus group • Product analysis • Evaluation • Summary • Client profile • Ergonomics • Anthropometrics

Curriculum Knowledge Map

	• Hardness • Toughness • Malleability • Ductility • Elasticity	• Jig/Former • Commercial processes • Surface Treatment • Consumer • End of life disposal • Fossil fuels • Fracking • Planned obsolescence				
Assessment	**Key Assessed Piece:** End of topic assessment. Students will be assessed on knowledge of materials, their working properties, selection of materials, stock forms and processing. **Key Assessed Piece:** Students will be assessed on their practical application skills relating to the manufacturing of a product using a range of materials.	**Key Assessed Piece:** Extended writing assesses students' knowledge and understanding of sustainability issued in the context of D&T. **Key Assessed Piece:** End of topic assessment Students will be assessed on their knowledge and understanding of manufacturing processes, forces and stresses, scales of production.	**Key Assessed Piece:** The work of others presentation, students will be assessed on their knowledge of designers and their influence, quality of presentation, and presenting skill. **Key Assessment Piece:** Progress Test - Students will be assessed on their knowledge and understanding of: • Materials & their working properties • Forces and Stresses • Production • The Work of Others	**Key Assessed Piece:** Design Assessment Students will be assessed on design and drawing techniques applied to a range of drawing techniques applied to their learning (isometric, perspective and orthographic). **Key Assessed Piece:** End of topic assessment. Students will be assessed on their knowledge and understanding or new and emerging technologies, energy generation and energy storage and electronic systems.	**Key Assessed Piece:** Extended writing assessment Evaluation of practical techniques including modifications Students will be assessed on suitability of their design, and justification for development works. **Key Assessed Piece:** Students will be assessed on Math GCSE questions demonstrating and correctly using Math and Science skills relevant to the D&T course.	As coursework (NEA) is an ongoing process, feedback and assessment will be continuous throughout the half term. NEA section A review and feedback. **Key Assessment Piece:** **Year 10 Summer Exams** Progress Test - Students will be assessed on their knowledge and understanding of the full Design & Technology course. Students will sit a full exam paper worth 100 marks.