Design and Technology Skills Grid

	Research	Design	Make	Evaluate	Technical knowledge	CAD/CAM
Statement of what matters	Being curious and searching for answers is essential to understanding and predicting phenomena.	Design thinking and engineering offer technical and creative ways to meet society's needs and wants.				Computation is the foundation for our digital world.
Purpose:	Enterprising, creative contributors, ready to play a full part in life and work					Ambitious, capable learners ready to learn throughout their lives.
Nursery	Group shapes, patterns and textures. Use senses to experiment with simple materials.	Draw basic images, including lines and shapes that are linked. Talk about what they have drawn.	Begin to use basic motor skills to do things independently. Use one handed tools and equipment and demonstrate a preference for a dominant hand e.g. paint brushes, tweezers, tongs or a knife.	Talk about their likes and dislikes for patterns and shapes around them.	Explore how everyday items work. Identify the names of basic equipment and tools	
Reception		Draw basic images, including lines and shapes that are linked Talk about what they have drawn and explain why.	Develop motor skills to use a range of basic tools safely. Combine shapes to make new ones. Select and use resources, with help when needed.	Talk about problems they encounter and how they can solve them.	Explore how things work Group objects based on simple criteria. Identify where basic materials come from e.g paper from trees.	
Years 1 and 2	Describe how objects have changed over time. Identify materials to be used based on a criteria.	Design products that have a clear purpose for an intended user and their needs. Identify likes and dislikes of design ideas and begin asking others for their opinions. Communicate their ideas through talking, drawing and simple sentences.	Select from and use a range of hand tools and equipment to perform practical tasks with some independence [for example, cutting, shaping, joining] Make imaginative and/or complex 'small worlds' with 3D resources such as blocks and simple construction kits.	Evaluate their ideas and products against a basic criteria.	Identify where more advanced materials come from e.g. cotton from plants Explain the simple processes of how they have made items State the names of 3D shapes and give examples of products they are used in. Explore and use mechanisms [for example, levers wheels and axles] in their products. Discuss how items are powered differently E.g. batteries. Explain why things have changed over time and state why. Name basic material classifications such as wood, metals, plastics, fabrics etc.	
Years 3 & 4	Explore existing products and identify likes and dislikes. Plan ahead about how they will use, explore or play with objects or resources, for example, to consider the best way to cut a material, attach or join a material or choose equipment from a given selection to perform a set task.	Design purposeful, functional, appealing products for themselves based on a simple design criterion. Generate, develop and communicate their ideas through talking and drawing.	Use a range of tools and materials to complete practical task with some independence [for example, cutting, shaping, joining]. Build independently with a range of appropriate resources. Mark out materials in cm with some accuracy.	Suggest improvements to existing designs. Refine work and techniques as work progresses, continually evaluating the designs.	Name specific material classifications such as oak is a wood, steel is a metal etc. Begin grouping materials based on environmental criteria, for example; single use plastics etc.	.
Years 5 & 6	Explore existing products and identify their functions and how they work, such as analysing the different components a board game or the fastening to secure a coin purse. Arrange steps in the correct order to product a plan of how to make their own product e.g. the steps required to cut and construct a net to make a board game box.	Design with purpose by identifying opportunities to design. Generate a selection (more than one) of design ideas using complex 2D designs Explain ideas using simple sentences. Look at how to draw simple 3D shapes and designs e.g Oblique projection.	Use a wide range of tools and equipment to perform practical tasks accurately, for example, cutting, shaping, joining and finishing). Select materials according to their functional properties and aesthetic qualities. Disassemble simple products to understand how they work.	Evaluate the design of their products to suggest improvements to the user experience. Write an evaluation stating the positives, negatives and possible improvements of their designs and/or products	Describe the use of basic mechanical systems in their products. Apply their understanding of how to strengthen, stiffen and reinforce complex structures. Explain the terms circuits, switches, bulbs, buzzers and motors. Build structures, exploring how they can be made stronger, stiffer and more stable.	Generate simple design ideas and digitally and communicate them through computer-aided design (CAD) e.g TinkerCAD.

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	Identify what materials might be most appropriate for the product they are making, for example a strong, washable easy to sew fabric for a pencil wrap.	Select colour for design choices.	Mark out materials in millimeters (mm) with some accuracy.		Explain how key events and individuals in design and technology have helped shaped Wales and the wider world.	
Year 7	Use research and exploration to identify and understand user needs. Research possible target markets for products. Research scientific principles that will impact on the design of a product. Work to a given brief.	Generate creative ideas and communicate these using basic, annotated sketches and CAD (where applicable). Develop 3D drawing techniques such as 1-point perspective Design with the user in mind, motivated by the service or purpose of the product. Generate design ideas and communicate them through discussion, annotated sketches with complex sentences, prototypes and/or pattern pieces.	Use a range of basic workshop tools and equipment and operate them safely. Produce accurate and functioning products for an intended user. Make simple models, prototypes and templates to scale to aid manufacture. Mark out materials in mm with accuracy	Evaluate and refine a range of design ideas. Evaluate practical outcomes against a set brief	Explain how and why CAD/CAM is used in the design and manufacture of products. State multiple materials and their classifications. Explain how specific materials differ in their properties. Explain how scientific principles act upon a product and its functionality. Explain how simple mechanical systems work (for example, gears, pulleys, cams, levers etc).	Use Computer Aided Design (CAD) to create basic templates that can be adapted for Computer aided manufacture (CAM) e.g Techsoft Design V3
Year 8	Use research and exploration, to identify historical influences on design. Identify the complex needs of a target market. Develop a design brief based on research gathered. Investigate new and emerging technologies.	Generate creative design ideas and communicate them using annotated sketches in paragraphs. Use CAD to develop ideas (where applicable). Develop 3D drawing techniques such as 2-point perspective and isometric Use shading to aid with the use of colour.	Produce prototypes to a given scale. Use a range of tools and equipment and operate them safely and precisely. Use a range of materials considering their properties and combine them to make a functioning product. Practice using material finishes	Evaluate and refine design ideas against their own design brief. Evaluate and understand developments in design and technology, its impact on individuals, society and the environment.	State the names of renewable energy types and explain its use. Explain how 3D CAD in used in the design industry Explain the use and importance of prototyping in the design process. Explain how products have evolved over time and how technology has contributed Explain how and why circuits are used in products e.g., PCG	Use Computer aided Design (CAD) to create 3D models that can be adapted for Computer aided manufacture (CAM).
Year 9	Use research and exploration, such as the study of different cultures and design movements, to inform design. Analyse the work of past and present professionals. Develop a specification to inform the design of a product from research gathered	Generate a range of creative ideas and communicate these using detailed annotated sketches (and CAD). State what materials will be used for products and state the reason why Use prototyping to inform designing and move ideas forward Label design ideas with accurate sizes in mm. Develop 3D drawing techniques such as 2-point perspective and isometric perspective.	Use specialist tools, techniques, processes, equipment and machinery precisely and safely. Use a range of different materials considering their properties. Explore different finishing and decorative techniques.	Test, evaluate, and refine their ideas and products against a specification, considering the views of intended users.	Explain the different classifications of materials e.g. Thermoforming Polymers, Smart Materials, Composite Materials Ferrous and Non-Ferrous metals, natural or synthetic fibres etc. Identify suitable applications for adhesives, permanent, and semi-permanent fixing methods. Confidently apply suitable decorative techniques. Apply a surface treatment to materials. Write risk assessments and apply specific Health and Safety principles.	Generate a range of creative ideas using CAD. Use both 2D and 3D CAD to be used with CAM to make product parts that allow a product to function.

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Year 10 Product Design and Fashion & Textiles	Identify research methods and what research are needed to help inform the design of a product. Identify the wants and needs of a user/client. Identify the features of a detailed product brief and design specification	Identify what isometric, 2-point designing is and produce examples to show a range of possibilities Practice purposeful and accurate use of shading Confidently use prototyping techniques are explored and used to show how design ideas could be developed .	Practice the use of tools, materials and equipment to aid in making products Explore a range of finishes and practice their use Practice and develop safe use of tools, materials and equipment	Identify what makes a successful, reflective evaluation. State how products could be developed further to improve their function and appearance. Identify how products can be tested against a design brief and specification.	Explain and use the Design Process and the iterative design process. Consider the ergonomics of a product and gather relevant anthropometric data. Classify various materials and their properties e.g natural fibres, synthetic fibres, ferrous and non-ferrous metals, smart materials etc. Describe the process of Rapid Prototyping. Understand the important of consumer choice and User Centred Design (UCD) when analysing and designing products.	Practice the use of 2D and 3D CAD to help design product parts Practice the use of different CAM manufacture accurate parts of prototypes
Year 11 Product Design and Fashion & Textiles	Produce relevant, research that will help inform the design of a product. Identify the specific wants and needs of a user/client. Develop a measurable brief and design specification which links to the research and mentions the needs and wants of the user	Use isometric, 2-point and 3-point perspective designing to show a range of possibilities to meet a design brief and specification Design ideas feature the use of shading Prototyping is used as well as CAD to show an iterative approach .	Use appropriate tools, materials and equipment to make a functioning prototype that meets a brief and specification. Apply a suitable finish to a material accurately. Show safe use of tools, materials and equipment.	Test the final prototype against the design brief and specification. Produce a reflective evaluation of the final protype. Suggest possible developments and improvements for the prototype.	Consider the importance of legislation and standards such as BSI, CE and ISO with relation to their own products and existing products. Define market pull and Technology push. Recognise the different scales of production in industry. Confidently analyse work and design style of other British designers (such as James Dyson and Stella McCartney).	Select and use CAD and CAM (where appropriate) to develop design ideas and to help manufacture accurate parts of prototypes

Year 10 Construction	Carry out research into construction materials to plan purposeful construction projects. Carry out risk assessments on before starting construction projects. Carry out planning starting construction projects.	Replicate and amend construction drawings using the correct conventions?	Use a range of construction tools and equipment confidently and appropriately. Follow and accurately read construction drawings to produce a construction outcome that meets the stated tolerances. Show safe use of the workshop/site and construction tools/ equipment.	Test the final construction outcome against the design brief and construction drawings.	Define the properties and uses of various modern construction materials. Summarise responsibilities of health and safety legislation Identify safety signs used by construction industry Identify fire extinguishers used in different situations Describe role of the Health and Safety Executive Classify safety signs including meanings of colour coding and meanings of sign shapes	Use 2D CAD to produce orthographic construction drawings using a set criteria.
Year 11 Construction	Produce research into existing products that meet a set brief. Identify the wants and needs of a user/client. Develop brief and design specification for an engineered product.	Create own construction drawings using the correct conventions from given construction data?	Use a range of construction tools and equipment confidently and independently. Follow and accurately read their own construction drawings to produce a construction outcome. Select and apply appropriate finishes to materials. Show safe use of the workshop/site and construction tools/ equipment.	Produce a detailed, reflective evaluation of their planning for construction projects.	Demonstrate an awareness of relevant Legislation and regulations such as RIDDOR (1995) and COSHH (2002) Confidently recall the process of how to report of Injuries. Recall the Health and Safety at Work Act 1974. Explain the planning process (design, project planning, procurement).	Use 3D CAD to develop design ideas and to help manufacture accurate prototypes (where appropriate). Use 3D CAD to develop Orthographic working drawings of their final products

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					Identify and name the features of a Construction site, such as secure site, site clearance, substructure, superstructure etc. Understand how to handover to client (commissioning, handover). State ways in which a construction site requires maintenance.	

Year 10 Engineering	Carry out research into possible materials to manufacture purposeful engineered parts. Carry out risk assessments on engineering equipment before manufacturing engineered parts. Carry out planning and produce job sheets before manufacturing engineered parts.	Accurately produce isometric drawings of engineered parts. Accurately produce orthographic drawings of engineered parts. Confidently convert isometric drawings to orthographic drawings and vice versa.	Use a range of engineering tools and equipment confidently and appropriately. Follow and accurately read working drawings to produce an engineered product that meets the stated tolerances. Select and apply appropriate material finishes. Show safe use of the workshop and engineering tools/ equipment.	Test the final engineered prototype against the design brief. Produce a reflective evaluation of the final protype.	Classify thermoforming and Thermosetting polymers and recall their properties. Define modern and smart materials. Recognise composite materials and their uses. Classify Ferrous and Non-Ferrous metals and recall their properties. Identify suitable applications for adhesives, permanent, and semi-permanent fixing methods. Confidently select and apply Surface treatments of Materials. Use risk assessments and apply Health and Safety at Work Act Health and Safety principles.	Use 2D and 3D CAD to design engineered parts. Use CAM to assist in the production of engineered parts.
Year 11 Engineering	Produce research into existing products that meet a set brief. Identify the wants and needs of a user/client. Develop brief and design specification for an engineered product.	Use isometric and orthographic drawings to help design a range of engineered products that can meet a set brief. Produce an accurate final design with sizes.	Use a range of prototyping tools, to produce prototypes and models of engineered solutions to a set brief.	Select appropriate testing methods and apply them to the prototype. Test the final prototype in detail against the design brief and specification. Produce a detailed, reflective evaluation.	Understand the different types of Engineering: Structural, Mechanical, Electronic. Explain Implement mathematical Engineering Techniques (Mean, Ohms Law, Area, Volume, Metric Systems). Define Destructive/ Non-Destructive Testing. Explain the societal Impact of Engineered Products. State the name and function of Electronic Components. State the name of engineering Manufacturing methods e.g. forging, casting, injection moulding etc.	Use 3D CAD to develop design ideas and to help manufacture accurate prototypes (where appropriate). Use 3D CAD to develop Orthographic working drawings of their final products.

Year 12 Product Design	Use research to understand design possibilities and demonstrate an understanding of the problems /opportunities. Identify a user/client that is mostly relevant to the design brief. Develop a design specification with justification linking to the needs and wants of the client/user.	Develop a range of ideas. Using isometric, 2-point and 3 -point perspective Render designs to show material use Detailed annotation to explain possible manufacturing processes and material use Use orthographic drawings where appropriate Use scaled prototyping and some CAD to show an iterative approach to their work	Use a range of tools, materials and equipment confidently and appropriately Select appropriate use of processes and materials to make a functioning prototype Select appropriate material finishes Show safe use of equipment with high levels of skill.	Gather feedback about the prototype from a professional Select appropriate testing methods for the prototype Test the final prototype against the design brief and specification. Produce a reflective evaluation of the final protype against the needs, wants and values of the user/client. Suggest possible developments and improvements for the prototype	Recall Design Classics, Icons and Design Movements. Explain Just in Time manufacture. Define the qualities of a modern designer. Understand energy generation and storage with relation to designing products. Produce detailed analysis of the works and design styles of James Dyson and Bethan Gray. Define Copyright, Trademarks, Patents and International standards and apply it to their own and existing products.	Use CAD to develop design ideas and to help. Manufacture accurate prototypes (where appropriate). Use CAD to develop Orthographic working drawings. Use CAM (where appropriate) to assist in the production of a high quality, functioning product.

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Year 13 Product Design	Explore a wide range of possible problems to solve through the development of a product Produce relevant, wide ranging research to fully understand design possibilities and show a good understanding of the problems/ opportunities. Identify the complex wants and needs and values of a user/client. Develop a detailed, specific and measurable brief and design specification with good justification linking to the needs and wants of the client/user.	Creatively develop a wide range of ideas. Confidently use isometric, 2-point and 3-point perspective designing with presentation techniques. Render designs to show material use. Gather feedback from user/client to inform designing. Use orthographic drawings to help with manufacture. Use scaled high and low fidelity prototyping as well as 3D CAD to show an iterative approach to their work .	Use a wide range of tools, materials and equipment confidently and independently. Select appropriate use of processes and materials to make a high functioning prototype that solves a real-world problem. Select and demonstrate appropriate material finishes. Show safe and precise use of equipment with high levels of skill.	Gather feedback about the prototype from a professional and use this in a reflective evaluation. Select appropriate testing methods and apply them to the prototype. Test the final prototype in detail against the design brief and specification. Produce a detailed, reflective evaluation of the final protype against the needs, wants and values of the user/client. Produce designs of possible developments and improvements for the prototype	Recall Management systems for production, quality assurance, organization of equipment and people. Define the Performance Characteristics of materials; such as: Conductivity, Relative Hardness, Density, Toughness, Ductility, Elasticity, Durability, Tensile strength, Compressive strength and Malleability. Describe the use of ICT by industry in the design and manufacture of products. Understand and apply safe working practices, including identifying hazards and making risk assessments. Explain the regulatory and legislative frameworks related to product design.	Use 3D CAD to develop design ideas and to help manufacture accurate prototypes (where appropriate). Use 3D CAD to develop Orthographic working drawings of their final products. Use a wide range of CAM (where appropriate) to assist in the production of a high quality, functioning product.