Structures

		EYFS (Reception)	
		Junk modelling	Boats
Skills	Design	• Making verbal plans and material choices. • Developing a junk model.	• Designing a junk model boat. • Using knowledge from exploration to inform design.
	Make	• Improving fine motor/scissor skills with a variety of materials. • Joining materials in a variety of ways (temporary and permanent). • Joining different materials together. • Describing their junk model, and how they intend to put it together.	• Making a boat that floats and is waterproof, considering material choices.
	Evaluate	• Giving a verbal evaluation of their own and others' junk models with adult support. • Checking to see if their model matches their plan. • Considering what they would do differently if they were to do it again. • Describing their favourite and least favourite part of their model.	• Making predictions about, and evaluating different materials to see if they are waterproof. • Making predictions about, and evaluating existing boats to see which floats best. • Testing their design and reflecting on what could have been done differently. • Investigating the how the shapes and structure of a boat affect the way it moves.
Knowledge	Technical	• To know there are a range to different materials that can be used to make a model and that they are all slightly different. • Making simple suggestions to fix their junk model.	• To know that 'waterproof' materials are those which do not absorb water.
	Additional		• To know that some objects float and others sink. • To know the different parts of a boat.

Structures

		Year 1	Year 2
		Constructing a windmill	Baby bear's chair
Skills	Design	• Learning the importance of a clear design criteria. • Including individual preferences and requirements in a design.	• Generating and communicating ideas using sketching and modelling.
	Make	• Making stable structures from card. • Following instructions to cut and assemble the supporting structure of a windmill. • Making functioning turbines and axles which are assembled into a main supporting structure. • Finding the middle of an object. • Puncturing holes. • Adding weight to structures. • Creating supporting structures. • Cutting evenly and carefully.	• Making a structure according to design criteria. • Creating joints and structures from paper/card and tape. • Building a strong and stiff structure by folding paper.
	Evaluate		• Testing the strength of own structure. • Identifying the weakest part of a structure. • Evaluating the strength, stiffness and stability of own structure.
Knowledge	Technical	• To understand that cylinders are a strong type of structure (e.g. the main shape used for windmills and lighthouses). • To understand that axles are used in structures and mechanisms to make parts turn in a circle. • To begin to understand that different structures are used for different purposes. • To know that a structure is something that has been made and put together. • To know that the sails or blades of a windmill are moved by the wind. • To know that a structure is something built for a reason. • To know that stable structures do not topple. • To know that adding weight to the base of a structure can make it more stable.	• To know that materials can be manipulated to improve strength and stiffness. • To know that a structure is something which has been formed or made from parts. • To know that a 'stable' structure is one which is firmly fixed and unlikely to change or move. • To know that a 'strong' structure is one which does not break easily. • To know that a 'stiff' structure or material is one which does not bend easily.
	Additional	• To know that design criteria is a list of points to ensure the product meets the clients needs and wants. • To know that a windmill harnesses the power of wind for a purpose like grinding grain, pumping water or generating electricity. • To know that windmill turbines use wind to turn and make the machines inside work. • To know that a windmill is a structure with sails that are moved by the wind. • To know the three main parts of a windmill are the turbine, axle and structure. • To know that windmills are used to generate power and were used for grinding flour.	N/A

Structures

		Year 3	Year 4
		Constructing a castle	**Pavilions**
Skills	**Design**	• Designing a castle with key features to appeal to a specific person/purpose. • Drawing and labelling a castle design using 2D shapes, labelling: -the 3D shapes that will create the features - materials needed and colours. • Designing and/or decorating a castle tower on CAD software.	• Designing a stable pavilion structure that is aesthetically pleasing and selecting materials to create a desired effect. • Building frame structures designed to support weight.
	Make	• Constructing a range of 3D geometric shapes using nets . • Creating special features for individual designs. • Making facades from a range of recycled materials.	• Creating a range of different shaped frame structures. • Making a variety of free standing frame structures of different shapes and sizes. • Selecting appropriate materials to build a strong structure and cladding. • Reinforcing corners to strengthen a structure. • Creating a design in accordance with a plan. • Learning to create different textural effects with materials.
	Evaluate	• Evaluating own work and the work of others based on the aesthetic of the finished product and in comparison to the original design. • Suggesting points for modification of the individual designs.	• Evaluating structures made by the class. • Describing what characteristics of a design and construction made it the most effective. • Considering effective and ineffective designs.
Knowledge	**Technical**	• To understand that wide and flat based objects are more stable. • To understand the importance of strength and stiffness in structures.	• To understand what a frame structure is. • To know that a 'free-standing' structure is one which can stand on its own.
	Additional	• To know the following features of a castle: flags, towers, battlements, turrets, curtain walls, moat, drawbridge and gatehouse - and their purpose. • To know that a façade is the front of a structure. • To understand that a castle needed to be strong and stable to withstand enemy attack. • To know that a paper net is a flat 2D shape that can become a 3D shape once assembled. • To know that a design specification is a list of success criteria for a product.	• To know that a pavilion is a a decorative building or structure for leisure activities. • To know that cladding can be applied to structures for different effects. • To know that aesthetics are how a product looks. • To know that a product's function means its purpose. • To understand that the target audience means the person or group of people a product is designed for. • To know that architects consider light, shadow and patterns when designing.

Structures

		Year 5	Year 6
		Bridges	Playgrounds
Skills	Design	• Designing a stable structure that is able to support weight. • Creating a frame structure with a focus on triangulation.	• Designing a playground featuring a variety of different structures, giving careful consideration to how the structures will be used, considering effective and ineffective designs.
	Make	• Making a range of different shaped beam bridges. • Using triangles to create truss bridges that span a given distance and support a load. • Building a wooden bridge structure. • Independently measuring and marking wood accurately. • Selecting appropriate tools and equipment for particular tasks. • Using the correct techniques to saws safely. • Identifying where a structure needs reinforcement and using card corners for support. • Explaining why selecting appropriating materials is an important part of the design process. • Understanding basic wood functional properties.	• Building a range of play apparatus structures drawing upon new and prior knowledge of structures. • Measuring, marking and cutting wood to create a range of structures. • Using a range of materials to reinforce and add decoration to structures.
	Evaluate	• Adapting and improving own bridge structure by identifying points of weakness and reinforcing them as necessary. • Suggesting points for improvements for own bridges and those designed by others.	• Improving a design plan based on peer evaluation. • Testing and adapting a design to improve it as it is developed. • Identifying what makes a successful structure.
Knowledge	Technical	• To understand some different ways to reinforce structures. • To understand how triangles can be used to reinforce bridges. • To know that properties are words that describe the form and function of materials. • To understand why material selection is important based on properties. • To understand the material (functional and aesthetic) properties of wood.	• To know that structures can be strengthened by manipulating materials and shapes.
	Additional	• To understand the difference between arch, beam, truss and suspension bridges. • To understand how to carry and use a saw safely.	• To understand what a 'footprint plan' is. • To understand that in the real world, design , can impact users in positive and negative ways. • To know that a prototype is a cheap model to test a design idea.

Mechanisms / Mechanical systems

		Year 2	
		Fairground wheel	Making a moving monster
Skills	Design	• Conducting simple surveys or discussions to gather opinions on what others need or like in a design. • Knowing that a survey is used to find out what people like. • Using a simple design brief that outlines the intended use, target user, and key features of the product, to create simple design criteria. • Knowing that a design brief helps to decide what to make. • Knowing that design criteria are the steps for making a product successful. • Creating ideas with design criteria in mind. • Referring to specific parts of existing products when generating ideas. • Knowing that the design criteria help when thinking of ideas. • Using labels to explain parts of a design, label materials, etc. • Using labels to explain parts of a design, label materials, etc. • Knowing that drawings can help explain how something works. • Knowing that a label explains part of a drawing.	• Creating a class design criteria for a moving monster. • Designing a moving monster for a specific audience in accordance with a design criteria.
	Make	• Choosing materials, ingredients or components from a wider range of materials, ingredients or components. • Explaining their choices based on the properties of materials and components. • Knowing some properties of materials like hard, soft, flexible, waterproof, strong etc. • Following and recalling simple safety instructions. • Knowing that some tools are sharp like scissors and knives. • Choosing known geometric shapes when making. • Beginning to shape objects to improve how they work. • Knowing the names of some geometric shapes: triangle, pyramid, square, cube, circle, sphere. • Considering balance in their finishing, like evenly spaced decoration.	• Making linkages using card for levers and split pins for pivots. • Experimenting with linkages adjusting the widths, lengths and thicknesses of card used. • Cutting and assembling components neatly.
	Evaluate	• Discussing a range of existing products and saying what they like and dislike about them. • Evaluating existing products against design criteria. • Evaluating their ideas and creations against simple design criteria. • Knowing that design criteria help to decide if their product is a success. • Suggesting improvements to their peers' designs and products. • Knowing that improve means to make something better. • Knowing that their suggestions can improve someone else's work.	• Evaluating own designs against design criteria. • Using peer feedback to modify a final design.
Knowledge	Technical	• To know everyday objects have mechanisms. • To know many things that move have parts inside to help them work. • To know mechanisms usually limit unwanted movement. • To know everyday objects utilise wheels and axles. • To know wheels must be able to turn to work effectively. • To know axles allow wheels to turn without falling off.	• To know that mechanisms are a collection of moving parts that work together as a machine to produce movement. • To know that there is always an input and output in a mechanism. • To know that an input is the energy that is used to start something working. • To know that an output is the movement that happens as a result of the input. • To know that a lever is something that turns on a pivot. • To know that a linkage mechanism is made up of a series of levers.
	Additional	• To know the features of a fairground wheel include the wheel, frame, pods, a base an axle and an axle holder.	• To know some real-life objects that contain mechanisms.

Mechanisms / Mechanical systems

Year 4

Making a slingshot car

Skills	Design	• Designing a shape that reduces air resistance. • Drawing a net to create a structure from. • Choosing shapes that increase or decrease speed as a result of air resistance. • Personalising a design.
	Make	• Measuring, marking, cutting and assembling with increasing accuracy. • Making a model based on a chosen design.
	Evaluate	• Evaluating the speed of a final product based on: the effect of shape on speed and the accuracy of workmanship on performance.
Knowledge	Technical	• To know that air resistance is the level of drag on an object as it is forced through the air. • To understand that the shape of a moving object will affect how it moves due to air resistance..
	Additional	• To know that aesthetics means how an object or product looks in design and technology. • To know that a template is a stencil you can use to help you draw the same shape accurately. • To know that a birds-eye view means a view from a high angle (as if a bird in flight). • To know that graphics are images which are designed to explain or advertise something. •To know that it is important to assess and evaluate design ideas and models against a list of design criteria.

Mechanisms / Mechanical systems

		Year 5	Year 6
		Pop up book	Automata toys
Skills	Design	• Designing a pop-up book which uses a mixture of structures and mechanisms. • Naming each mechanism, input and output accurately. • Storyboarding ideas for a book.	• Noticing wider-reaching problems or needs in the community. • Coming up with a broader range of ideas and deeper innovation, requiring pupils to think critically about their ideas' practicality and originality. • Beginning to use more complex annotated sketches, such as cross-sectional and exploded diagrams and pattern pieces in design.
	Make	• Following a design brief to make a pop up book, neatly and with focus on accuracy. • Making mechanisms and/or structures using sliders, pivots and folds to produce movement. • Using layers and spacers to hide the workings of mechanical parts for an aesthetically pleasing result.	• Producing lists of equipment, materials and tools that they need for a task. • Selecting materials, components or ingredients based on research or user needs. • Explaining their choices, referring to their research. • Considering which equipment will work well together. • Choosing from the known range of equipment available to them with little guidance. • Assessing risks associated with different tools and equipment. • Understanding and explaining the importance of each safety rule. • Consistently apply safety instructions. • Cutting jelutong or other harder wood with a coping saw or a tenon saw in small groups. • Cutting in a back-and-forth sawing motion where appropriate. • In supervised groups, using hot glue guns safely. • Recognising that hot glue is useful for joining materials that need a strong bond that sets quickly.
	Evaluate	N/A	• Assessing their designs against a more complex set of design criteria that includes functionality, aesthetics, user experience, sustainability and cost. • Providing feedback that is helpful, specific and encouraging. • Incorporating feedback from peers or users to improve their product further, explaining the changes they made and the impact they had.
Knowledge	Technical	• To know that mechanisms control movement. • To understand that mechanisms can be used to change one kind of motion into another. • To understand how to use sliders, pivots and folds to create paper-based mechanisms.	• To know that the mechanism in an automata uses a system of cams, axles and followers. • To know that different shaped cams produce different outputs. • To know which mechanisms are working together to make a mechanical system. • To know that there are different directions of movement. • To know that mechanisms can change one type of movement to another.
	Additional	• To know that a design brief is a description of what I am going to design and make. • To know that designers often want to hide mechanisms to make a product more aesthetically pleasing.	• To know that an automata is a hand powered mechanical toy. • To know that a cross-sectional diagram shows the inner workings of a product.

Electrical systems (KS2 only)

		Year 5
		Doodlers
Skills	Design	• Identifying factors that could be changed on existing products and explaining how these would alter the form and function of the product. • Developing design criteria based on findings from investigating existing products. • Developing design criteria that clarifies the target user.
	Make	• Altering a product's form and function by tinkering with its configuration. • Making a functional series circuit, incorporating a motor. • Constructing a product with consideration for the design criteria.
	Evaluate	• Carry out a product analysis to look at the purpose of a product along with its strengths and weaknesses. • Determining which parts of a product affect its function and which parts affect its form. • Analysing whether changes in configuration positively or negatively affect an existing product.
Knowledge	Technical	• To know that series circuits only have one direction for the electricity to flow. • To know when there is a break in a series circuit, all components turn off. • To know that an electric motor converts electrical energy into rotational movement, causing the motor's axle to spin. • To know a motorised product is one which uses a motor to function.
	Additional	• To know that product analysis is critiquing the strengths and weaknesses of a product. • To know that 'configuration' means how the parts of a product are arranged.

Cooking and nutrition

		Year 1
		Smoothies
Skills	Design	• Designing smoothie carton packaging by-hand or on ICT software.
	Make	• Chopping fruit and vegetables safely to make a smoothie. • Identifying if a food is a fruit or a vegetable. • Learning where and how fruits and vegetables grow.
	Evaluate	• Suggesting information to be included on packaging.
Knowledge		• To know that a blender is a machine which mixes ingredients together into a smooth liquid. • To know that a fruit has seeds. • To know that fruits grow on trees or vines. • To know that vegetables can grow either above or below ground. • To know that vegetables is any edible part of a plant (e.g. roots: potatoes, leaves: lettuce, fruit: cucumber).

Cooking and nutrition

Year 3

Eating seasonally

Skills	Design	• Creating a healthy and nutritious recipe for a savoury tart using seasonal ingredients, considering the taste, texture, smell and appearance of the dish.
	Make	• Knowing how to prepare themselves and a work space to cook safely in, learning the basic rules to avoid food contamination. • Following the instructions within a recipe.
	Evaluate	• Establishing and using design criteria to help test and review dishes. • Describing the benefits of seasonal fruits and vegetables and the impact on the environment. • Suggesting points for improvement when making a seasonal tart.
Knowledge		• To know that vegetables and fruit grow in certain seasons. • To know that cooking instructions are known as a 'recipe'. To know that imported food is food which has been brought into the country. • To know that exported food is food which has been sent to another country.. • To know that eating seasonal foods can have a positive impact on the environment. • To know that similar coloured fruits and vegetables often have similar nutritional benefits. • To know that the appearance of food is as important as taste.

Cooking and nutrition

Year 5

Developing a recipe

Skills	Design	• Adapting a traditional recipe, understanding that the nutritional value of a recipe alters if you remove, substitute or add additional ingredients. • Writing an amended method for a recipe to incorporate the relevant changes to ingredients.
	Make	• Cutting and preparing vegetables safely. • Using equipment safely, including knives, hot pans and hobs. • Knowing how to avoid cross-contamination. • Following a step by step method carefully to make a recipe.
	Evaluate	• Identifying the nutritional differences between different products and recipes. • Identifying and describing healthy benefits of food groups.
Knowledge		• To know that recipes can be adapted to suit nutritional needs and dietary requirements. • To know that I can use a nutritional calculator to see how healthy a food option is. • To understand that 'cross-contamination' means bacteria and germs have been passed onto ready-to-eat foods and it happens when these foods mix with raw meat or unclean objects. • To know that coloured chopping boards can prevent cross-contamination. • To know that nutritional information is found on food packaging.

Textiles

		EYFS: Reception	Year 1
		Bookmarks	Puppets
Skills	Design	• Discussing what a good design needs. • Designing a simple pattern with paper. • Designing a bookmark. • Choosing from available materials.	• Using a template to create a design for a puppet.
	Make	• Developing fine motor/cutting skills with scissors. • Exploring fine motor/threading and weaving (under, over technique) with a variety of materials. • Using a prepared needle and wool to practise threading.	• Cutting fabric neatly with scissors. • Using joining methods to decorate a puppet. • Sequencing steps for construction.
	Evaluate	• Reflecting on a finished product and comparing to their design.	• Reflecting on a finished product, explaining likes and dislikes.
Knowledge		• To know that a design is a way of planning our idea before we start. • To know that threading is putting one material through an object.	• To know that 'joining technique' means connecting two pieces of material together. • To know that there are various temporary methods of joining fabric by using staples. glue or pins. • To understand that different techniques for joining materials can be used for different purposes. • To understand that a template (or fabric pattern) is used to cut out the same shape multiple times. • To know that drawing a design idea is useful to see how an idea will look.

Progression of skills and knowledge

Textiles

Year 6

Waistcoats

Skills	Design	• Designing a waistcoat in accordance to a specification linked to set of design criteria. • Annotating designs, to explain their decisions.
	Make	• Using a template when cutting fabric to ensure they achieve the correct shape. • Using pins effectively to secure a template to fabric without creases or bulges. • Marking and cutting fabric accurately, in accordance with their design. • Sewing a strong running stitch, making small, neat stitches and following the edge. • Tying strong knots. • Decorating a waistcoat, attaching features (such as appliqué) using thread. • Finishing the waistcoat with a secure fastening (such as buttons). • Learning different decorative stitches. • Sewing accurately with evenly spaced, neat stitches.
	Evaluate	• Reflecting on their work continually throughout the design, make and evaluate process.
Knowledge		• To understand that it is important to design clothing with the client/ target customer in mind. • To know that using a template (or clothing pattern) helps to accurately mark out a design on fabric. • To understand the importance of consistently sized stitches.

Digital world (KS2 only)

Year 3

Wearable technology

Skills	Design	• Problem solving by suggesting which features on a micro:bit might be useful and justifying my ideas. • Drawing and manipulating 2D shapes, using computer-aided design, to produce a point of sale badge. • Developing design ideas through annotated sketches to create a product concept. • Developing design criteria to respond to a design brief.
	Make	• Following a list of design requirements. • Writing a program to control (button press) and/or monitor (sense light) that will initiate a flashing LED algorithm.
	Evaluate	
Knowledge	Technical	• To understand that, in programming, a 'loop' is code that repeats something again and again until stopped. • To know that a micro:bit is a pocket-sized, codeable computer. • To know that a simulator is able to replicate the functions of an existing piece of technology.
	Additional	• To understand what is meant by 'point of sale display.' • To know that CAD stands for 'Computer-aided design'.

Digital world (KS2 only)

Year 6

Navigating the world

Skills	Design	• Writing a design brief from information submitted by a client. • Developing design criteria to fulfil the client's request. • Considering and suggesting additional functions for my navigation tool. • Developing a product idea through annotated sketches. • Placing and manoeuvring 3D objects, using CAD. • Changing the properties of, or combining one or more 3D objects, using CAD.
	Make	• Considering materials and their functional properties, especially those that are sustainable and recyclable (for example, cork and bamboo). • Explaining material choices and why they were chosen as part of a product concept. • Programming an N,E, S, W cardinal compass.
	Evaluate	• Explaining how my program fits the design criteria and how it would be useful as part of a navigation tool. • Developing an awareness of sustainable design. • Identifying key industries that utilise 3D CAD modelling and explaining why. • Describing how the product concept fits the client's request and how it will benefit the customers. • Explaining the key functions in my program, including any additions. • Explaining how my program fits the design criteria and how it would be useful as part of a navigation tool. • Explaining the key functions and features of my navigation tool to the client as part of a product concept pitch. • Demonstrating a functional program as part of a product concept pitch.
Knowledge	Technical	• To know that accelerometers can detect movement. • To understand that sensors can be useful in products as they mean the product can function without human input.
	Additional	• To know that designers write design briefs and develop design criteria to enable them to fulfil a client's request. • To know that 'multifunctional' means an object or product has more than one function. • To know that magnetometers are devices that measure the Earth's magnetic field to determine which direction you are facing.