DESIGN TECHNOLOGY 2022-2023

Threshold Concepts	Specific element	Milestone 1 - Y7	Milestone 2 - Y8	Milestone 3 - Y9	Milestone 4 - Y10	Milestone 5 - Y11	Milestone 6 Y12	Milestone 7 Y13
Analyse and Evaluate Testing, refining and reflecting upon outcomes will be a skill developed across all aspects of the subject. Students should be able to compare their work to specifications, draw on the opinion of others and identify logical improvements to their own designs. They should see evaluation as an ongoing process, which sews a connecting thread between all aspects of their project. Students should show an increasing awareness of how their activities impact on the environment, refining and adapting their approach to embrace sustainable practice.	Students are able to explore the work of others to gain inspiration. This can be through designers, design firms or existing products.	Can gather images of relevant existing products and comment on obvious features.	Students are able to explore the work of others to gain inspiration. From this they can extract basic design concepts to further their own ideas and understand the technology that underpins each project. For example looking at the style employed by Thomas Dambo.	Can discuss the work of an established designer or design business. Can explain some of the technology or influence that underpins the company's success.	Can tackle exam style questions on the work of designers or design businesses.	Can highlight clearly within the NEA where they have been influenced by existing designers.	Two unique courses are pursued at KS5 - A level Product Design & BTEC L3 Engineering. The BTEC course ends in 2024 nationally. Neither course will continue beyond 2023 at Glossopdale.	
	Understand the technology that underpins each project.	Can test simple mechanisms they have produced to determine function. Can suggest obvious improvements from these tests.	Can state how motion can be transferred from one type to another.	Can identify the main components found within the road safety project and explain their function.	Can explain the technology used to allow function when disassembling an existing product.	Dependent on NEA choice. Technology used needs to be clearly explained and communicated accurately.		
	Be able to write a specification.	Can gather and arrange relevant criteria to form a basic specification for their project.	Can combine technical and client requirements into a specification.	Can write a specification that combines given limitations with some relevant criteria identified through individual research.	Can produce a specification in some depth, with clear criteria and suggested testing strategies.	A detailed specification is included in the NEA, which has been written based on the material gathered in the students own research.		
	Understand the need for evaluation.	Can reflect upon their work at key stages and explain simple improvements and modifications. For example, initial ideas.	Can reflect critically on their own project, making appropriate recommendations for improvements.	Can reflect upon three major stages within the road safety project and clearly demonstrate how the findings from this have influenced future stages of the project.	Can reflect on completed projects in detail, making appropriate comments in relation to improvement and modification. Uses the specification as a reference document.	Evaluation permeates through every stage of the project, informing each step forward. Students can give a balanced view of their outcome, using client feedback as one method of stimulating this.		
	Be able to explore a task and determine a direction from this.	Produce a simple mind-map exploring the obvious areas of a task.	Can explore the task from the perspective of a client, looking to design a project for a third party, rather than themselves.	Can explore the task in the context of a specific group of users, aiming to produce a product which meets the needs of a wider audience than a single individual.	Students can adapt a generic task in order to produce a design brief and determine the direction of their own project.	Using the exam board task as a starting point, students can identify problems for which a prototype can be produced in response.		
	Show an awareness of sustainability issues.	Can name the 6R's and support these with examples.	Can link the raw material used in initial production to common environmental issues.	Can identify how they have considered sustainability at an early stage of the project, before material has been committed.	Can design with sustainability in mind, considering the impact of a product whilst being manufactured and also when in use.	Students are fully aware of the impact of manufacturing on the environment. Within their NEA they communicate the need to be sustainable with clarity, highlighting how they have followed sustainable practice within their work.		
	Draw on the opinion of third parties when evaluating their work.	Receive and give comments from classmates in relation to their current project.	Seek the opinion of a third party from outside of school for some aspects of their work. Be able to respond to this opinion.	To conduct surveys of relevant groups from within their target audience and combine the information from these to give an overview of opinion.	Students can identify and engage with an appropriate client when producing the CADAM project.	Within the NEA, students establish a client at the beginning of the project and record their engagement throughout.		
	Assessment.	MCQ 7.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	MCQ 8.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	MCQ 9.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	1. Wood theory test, with extended written question 2. MCQ 1-5 3. Wk.7 - Avg of above reported	1. Cycle 1 – Avg theory grade from tracker reported 2. Controlled assessment - Research section and Specification complete and submitted 3. Ideas and development complete, with general feedback given as per QCA guidelines		
Technical Knowledge Understand and use the properties of materials and the performance of structural elements to achieve functioning solutions. Understand how more advanced mechanical systems used in their products enable changes in movement and force.	Have a developing understanding of mechanisms.	Can produce simple interconnected mechanical joints. Knows the four types of motion.	Can explain how motion can be converted through mechanisms, specifically cams. Know the three classes of lever.	Can explain how gears are used to transmit power.	Aware of how mechanisms can be combined with pneumatic, hydraulic and electrical systems.	Can apply a broad range of knowledge relating to mechanisms to formal exam questions.		
	Students are aware of the raw material required for wood, metal and plastic.	Can explain how forests are managed to produce timber. Know how the logs are converted to useful stock forms.	Can explain how crude oil is extracted and the environmental issues surrounding this. Know how crude oil is used in the plastic production process.	Can explain how metals are extracted from ore. Be able to discuss the impact their extraction has on the environment.	Students have a sound understanding of wood, metal and plastic as material areas. They can explain what composites and alloys are and the reason for their use.	Can relate specific materials to their potential environmental impact. Aware of how joining methods can impact on recycling. Can link this to planned and perceived obsolescence.		
	Students know how materials can be processed from their stock form into useful components.	Can demonstrate how to cut and shape stock forms using basic tools.	Demonstrate a basic understanding of how components can be nested on material to reduce waste and improve efficiency.	Can explain how plastics can be thermoformed via the vacuum former and injection moulding.	Can explain how stock forms are produced in industry - extrusion and rolling. Aware of the advantages of stock forms to manufacturing businesses.	Can apply their knowledge of stock-forms when specifying material within the NEA. Able to answer exam questions relating to materials and stock forms accurately.		
	Students are aware of material properties and can make appropriate selections based on these.	Can select materials based on their commonly understood properties e.g. acrylic for its quality surface finish.	Can explain how surface treatments and finishes are applied. Be able to give specific examples and the reasons behind the need for finishes, both aesthetic and functional.	Can explain the role of smart and modern materials within manufacturing.	Students can name specific materials from the main groups and explain properties unique to each.	Can select materials appropriate for manufacturing working prototypes based on their properties.		
	Show a developing understanding of electronic systems.	Be able to create a simple series circuit for a lamp.	Be able to identify input, process and output in common systems.	Be able to trouble-shoot simple electronic systems to establish faults.	Aware of microcontrollers and their application in modern consumer products. Can write simple code for a microbit in order to control servo motors.	Can select simple electronic systems to apply when creating functional aspects of the NEA prototype.		

Understand how more advanced electrical and electronic systems can be powered and used in their products [for example, circuits with heat, light, sound and movement as inputs and outputs]. **Apply computing and use electronics to embed intelligence in products that respond to inputs [for example, sensors] and control outputs [for example, actuators] using programmable components [for example, microcontrollers].**	Show an awareness of how structures are made.	Can produce a model bridge incorporating appropriate triangualtion.	Can explain how the frame in the automata project retains its strength. Be able to demonstrate methods for improving the strength and rigidity of structures.	Understand the difference between shell and frame structures. Be able to justify the use of a shell structure in their road safety project.	Can comment on the use of safe structures within exam style questions, particularly within section 'C'.	Students apply their knowledge of structures and mechanisms within functioning elements of their NEA.		
	Demonstrate knowledge of standard components.	Can name common standard components and give clear reasons why these are used instead of manufacturing in-house.	Can name the standard components used in their project and suggest methods of quality control that have been applied to these.	Describe the expected learning for all students by the end assessment point of the year, for example: • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their	Select standard components where appropriate. Be able to tap a thread to accept a bolt.	Identify standard components for use in the NEA project. Be aware of the cost of these and be able to link this to industrial manufacture and economies of scale.		
	Aware of how technological developments impact on society.	Students are aware of that the one-off production methods they use are not generally employed by manufacturers. They have a developing awareness that different approaches are needed depending on the amount being made.	Students are aware that some products are designed to be disposable and the size, value and complexity of these is increasing.	Students show an understanding of how new technologies often make the existing products in their homes redundant. They are aware that fashion is a driver of this, but also that some products break and are difficult to repair.	Students are aware of and can give concrete examples of planned and perceived obsolescence.	Longer exam questions (6-8 marks) can be answered fluently on the subject of obsolescence and its link to the wider field of sustainability.		
	Forces & stresses. Students use technical terminology to describe forces. They demonstrate how materials can be strengthened and stiffened.	Students can link their understanding of colloquial words used to describe forces to the correct technical terms - 'pulling' creates tension, 'squashing' is compression.	Students can identify and isolate where forces are at play in their projects - Compression exists between the cam and the follower. The elastic band provides tension too that pulls the figure onto the push rod...	Students recognise where forces are important in their product. They can link standard components to the forces they produce - the nut and bolt exert a compressive force on the casing. The handle split when twisted, so it needs to be stronger in torsion.	Students can frequently extract the correct answer to forces questions posed in MCQ format.	Students can tackle forces questions taken from GCSE past papers. They demonstrate there awareness of the impact of forces within the development work of their NEA.		
	Assessment.	MCQ 7.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	MCQ 8.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	MCQ 9.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	1. Plastics theory test, with extended written question 2. CADCAM Theory test 3. MCQ 6-10 4. Wk.7 - Avg of above reported	1. Cycle 2 – Avg theory grade, inclusive of mock reported 2. Final general feedback on NEA		
Design & Develop **Students will draw upon their research to establish ideas. They will able to communicate ideas through a range of techniques from informal sketching to 3D computer aided design (CAD). Modelling will be an integral part of the process, be this in card, digitally or mathematically. Students will become aware of how the boundary between research and development can be increasingly blurred as their project progresses.**	Sketch freehand in 2D & 3D.	Can sketch in 2D to communicate ideas with increasing clarity and precision. They can produce simple 3d models, which help to establish the form and function of the final outcome.	Can sketch with some clarity in 3D to communicate ideas.	Can sketch in clarity in 3D, increasingly thinking about how components will be combined to achieve the final outcome.	Can sketch fluidly in 3D, adding appropriate annotation.	Can present their ideas within the NEA in a coherent manner.		
	Use formal drawing, such as orthographic, to prepare detailed drawings for manufacture.	Can produce an accurate 1:1 side profile of their intended articulated toy.	Can produce an accurate orthographic of their intended project.	Can produce an accurate orthographic drawing using the correct scale and dimensions.	Can produce an accurate orthographic at the correct scale and with dimensions. Can compliment this with an accurate 3D isometric.	Can produce a fully dimensioned third angle orthographic of their intended NEA prototype.		
	Use formal techniques for 3D drawing - isometric & perspective.	Can use single point perspective to communicate the layout of their final design.	Can use two-point perspective to show the layout of the automata frame.	Can use isometric paper to produce an exploded drawing of their final design.	Can select an appropriate formal drawing technique to represent elements of their current project in 3D.	Uses formal drawing to represent 3D elements of the NEA with precision. A third party manufacturer would be able to interpret these drawings.		
	Be able to use 2D & 3D CAD to communicate intent.	Can demonstrate how to use Techsoft 2D Design to produce profiles for the torch project.	Can use 2D CAD and laser cutting to produce components for the automata project.	Can use 2D CAD to generate cutting files for the vinyl cutter.	Can use 3D CAD to communicate ideas for minor projects.	Can use 3D to produce a range of images in support of the NEA project. For example exploded or assembly drawings.		
	Understand the relationship between CAD & CAM.	Students are aware of the laser cutter and can employ this to cut profiles produced in 2D.	Can explain the advantages the laser cutter has over conventional manufacture.	Can clearly state the advantages of the vinyl cutter over hand-crafted graphics - accuracy, repeatability.	Demonstrates an understanding of a range of CAM machinery. Can discuss their advantages and disadvantages with increasing clarity.	Utilises CADCAM effectively within the NEA, matching machine to task and demonstrating an ability to exploit the complex capabilities offered.		
	Be able to model in card	Can produce simple scale models of the joining method used in the articulated toy.	Can model elements of the cam to check on function prior to full manufacture.	Can produce accurate models of developed ideas, which convey clearly the design intent.	Can model for both appearance and function, combining 2D & 3D modelling where appropriate.	Can model in detail all aspects of the NEA. Can produce a development model to a high standard, which closely represents the design portfolio.		
	Be able to model technology using appropriate resources (mechanisms, electronics	Can use pin boards and card templates to test clearance of joints in the articulated toy.	Can reproduce standard cam mechanisms from kits to test function.	Can create simple prototype circuits using breadboards and standard components.	Can use commercial kits (Lego) to model functional elements of their own designs.	Selects appropriate kits to research and develop functional aspects of the NEA. Records their findings in detail within the portfolio.		
	Be able to annotate clearly.	Can label major components of the project and clarify obvious features within their design work.	Can label all major elements of their project and explain how each interacts.	Can give opinion about a design and suggest appropriate modifications. Labels materials accurately.	Annotation increasingly clarifies complex elements of the design work. Comments make reference to the specification.	Annotation contributes significantly to third party understanding of the NEA. Comments are balanced and show the thinking taking place at the time.		
	Assessment.	MCQ 7.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	MCQ 8.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	MCQ 9.1 - 9 C1 Exam C2 Exam C3 Avg & practical outcome	1. Mock GCSE paper tailored to prior taught content 2. MCQ 11-15 3. Wk.7 - Avg of above reported	1. Cycle 3 – Avg theory grade to date with NEA final value incorporated 2. External exam 3. Revision mock papers as issued		

Manufacture Students will learn how to safely manufacture items in a workshop setting. They will develop their ability to choose specialist tools, techniques and processes, demonstrating increased precision as their experience grows. Where appropriate they will access digital manufacturing equipment and be able to clearly justify their decision to use this.	Understand how to operate safely in a workshop environment.	Can identify common hazards in the workshop and take steps to protect themselves from injury (appropriate PPE etc).	Can work safely and with increasing independence. Able to operate common machinery with general supervision.	Works safely and mostly independently on common tools and equipment. Requires closer support during complex tasks.	Works safely with an increasing range of tools, machinery and equipment including heat processes. Wears the appropriate PPE without prompt.	Demonstrates consistent approach to workshop safety. Can answer exam style questions relating to H&S accurately for a range of situations.		
	Be able to measure and apply functional maths within the subject.	Can measure using mm.	Can measure in mm and work out common mathematical requirements such as surface area and perimeter of regular shapes.	Can measure accurately in mm. Can calculate the surface area of more complex shapes, including circles.	Works exclusively in metric. Can calculate area and volume for most components within their projects. Can use measuring equipment, such as digital Vernier callipers.	Can attempt all maths-based questions within GCSE Design & Technology papers.		
	Competent when using a range of hand tools to process materials.	Can cut and shape wooden components using basic hand tools.	Can create wooden components with increasing accuracy. Some exposure to more risky hand tools, for example chisel and plane.	Can create components in both wood and plastic. Capable of duplicating components with some precision.	Able to use hand tools to process wood, metals and plastics. Can create quality finishes on edges of material.	Chooses hand tools carefully, with consideration for the material being processed.		
	Competent when using machine tools to process materials.	Can operate pillar drill, belt sander and Hegner saw with general supervision following training.	Can operate pillar drill, belt sander and Hegner saw with increasing accuracy. Considers the capability of these machines when designing.	Can operate pillar drill, belt sander and Hegner saw with increasing accuracy. Can sequence projects to take advantage of these machines. Able to operate appropriate hand-power tools (battery drill & screwdriver).	Can operate all basic machine tools safely, with only limited supervision. Able to use vac-former and strip heater. Can use the 3:1 metal working machine, whilst being aware of risks.	Able to select machine tools appropriate to the component being manufactured. Aware of the capability of 1:1 machinery such as the centre lathe, wood lathe and router.		
	Aware of the capabilities of CAM and can employ these appropriately.	Can explain how a laser cutter could replace elements of hand-cut projects.	Can make appropriate use of the vinyl and laser cutters when making components for their projects. I.e. harnessing the capability to cut complex shapes.	Can employ CAM to produce projects of a semi-professional appearance.	Can produce outcomes which effectively combine hand-built and CAM produced components to answer design briefs.	Can develop ideas with CAM in mind, designing solutions which harness the capabilities of CAM.		
	Can plan manufacturing stages appropriately.	Students are aware that more than one path can be used to make the same item. They can sequence simple manufacturing steps.	Students can identify production bottle-necks and plan activity to avoid these.	Can plan increasingly complex manufacturing periods, making estimates on time needed using Gantt charts.	Can plan most stages of manufacture accurately, building in contingency to overcome potential issues.	Students can plan their manufacturing activity in enough detail for a third party to be able to produce their intended design.		
	Can adapt to problems as they arise, troubleshoot projects and suggest appropriate modifications.	Can suggest a possible solution when asking for help.	Can explain at least two different approaches that have been attempted prior to asking for support.	Keeps evidence of failed attempts for reference in evaluation material.	Can suggest alternative approaches to common problems across all major material areas.	Produces clear modification options based on client comment, testing and evaluation.		
	Assessment.	Machinery and Equipment Safety Record. Outcome from Articulated Toy.	Machinery and Equipment Safety Record. Outcome from Automata.	Machinery and Equipment Safety Record. Outcome from Road Safety Project.	Machinery and Equipment Safety Record. Outcome from OCC Puzzle, Aluminium Frame & Bud Vase.	Machinery and Equipment Safety Record. CWA from NEA prototype.		