Curriculum Overview –

GCSE Design and Technology : Year 10 (Part of a 2-Yr SOW with the AQA Exam Board)

Sequencing of topics ***Key idea***	**What knowledge will students develop? (Including key terminology)** ***Specification content***	**What skills will students develop? (Including literacy & numeracy)** ***Learning activity and resources***	**Homework opportunities**	**Personal development (Ursuline Values, Catholic Social Teaching, Cultural Capital, Cross curricular, Careers)**	**Curriculum links**
Materials and their properties	Materials and their working properties	• Card sort – headings of ferrous, non-ferrous, alloys, thermoforming, thermosetting polymers given and students to list as many examples under each (assessing prior knowledge). Pre-prepared exemplar sheets and PowerPoint slides used for students to read, sift and note take information for each of the categories outlined.	Worksheets, demo and focused practical tasks (FTP)		
Material properties	Materials and their working properties	• Worksheet/revision cards – headings of natural fibers, synthetic fibers, blended, woven, non-woven, knitted given and students to list as many examples under each (assessing prior knowledge). • Pre-prepared research packs used for students to read, sift and note- take information for each of the categories outlined. • Examples of each material (as a swatch for students to look through) given to students in groups. The named example material needs to be matched with the properties of that material. Students then have to justify the matches they have made.			
Material properties	Materials and their working properties	• Definitions for key properties (strength, toughness, hardness etc) given and students use note-taking skills to understand these. • Worksheet/revision cards – headings of paper, board, hardwood, softwood, manufactured board given and students to list as many examples under each (assessing prior knowledge). • Pre-prepared research packs used for students to read, sift and note- take information for each of the categories outlined. • Examples of each material (as a swatch for students to look through) given to students in groups. The named example material needs to be matched with the properties of that material. • Students then have to justify the matches they have made. • Possible card games e.g. 'Top trumps'. • Discussion about in what product each material might be used.			
Modern materials Smart materials	Developments in new materials	• Introduction to the four key developments in materials (modern, smart, composite and technical textiles). Match the correct definition to the term to assess prior knowledge. • Examples of materials and/or products made from modern materials – identify and briefly analyse these, considering the properties and reason for their use. • Demonstration of smart materials found in everyday products. Revision cards made for both material areas.			

Composite materials Technical Textiles	Developments in new materials	• Cards showing images of products made from composite materials to be matched to cards labelled with the constituent materials. • Definition of composites re-visited and questioning used to understand the importance of each constituent material. • Understanding of this term and examples shown in real life context. • Students look at technical specifications and match the correct material with the correct specification. Revision cards made for both material areas.			
Robotics, automation and production in industry	New and emerging technologies	Case study: • look at an example factory such as Jaguar Land Rover/BMW • watch this video clip about automated production Automated BMW production In groups students discuss the benefits and disadvantages of being a fully automated manufacturing system and the use of robotics.			

Production techniques and systems – automation	New and emerging technologies	• Use the following key terms to discuss production methods in industry:
		  • Computer Aided Design (CAD)
		  • Computer Aided Manufacture (CAM)
		  • Flexible Manufacturing (FMS)
		  • Just in time (JIT)
		  • Lean Manufacturing.
		• Give students examples of where these production techniques and systems may be used.
		Students discuss the benefits and potential downfalls of each.			

Example NEA style project to cover theory notes– Project 1 Shoe modelling Project.

Introducing the idea of iterative thinking and modelling.

Each specialist technical principle delivered through at least one material category listed in the specification.

Functionality Aesthetics Environmental factors Availability Cost Social factors Ethical factors	Selection of materials or components Using and working with materials	• Primary investigation of material area/s through product analysis – students can access their main taught material area as well as revise the range of other materials from the core section. Range of products analysed in terms of the choice of materials by the designer, beginning to identify characteristics, properties, and environmental factors etc… which justify their use. • Assess existing knowledge of materials, building on less familiar areas. Key terms covered and discussed. • Opportunities to visit maths links – Calculation of material costs.			
	Selection of materials or components Using and working with materials	• Assess materials knowledge through practical application. A basic phone stand/holder to be built – no designing, students experiment with materials and recall knowledge from Year 9. Material properties and how to work with them is re-visited and assessed. • Discussion of alternative materials and how their functionality would differ in terms of this project. • Exploration of materials drawing on prior knowledge and understanding. • Opportunities to visit maths links – calculation of material costs.			

Enterprise Market pull and technology push	New and emerging technologies	Discussion of different methods of creating business and making a product successful. The business case for Fairtrade cotton Fairtrade cotton in Cameroon Discussion of market pull and technology push. Look at the following products and discuss how far market pull and technology push have influenced their development: • iPhone • women's blazer • wind-up radio. Discussion of crowd funding. Give examples of when this has been successful. Ask students what they understand by virtual marketing and retail and them to name examples that they have experienced. Discuss cooperatives and their benefits to communities of people.			
People, society and culture	New and emerging technologies Design Strategies Communication of design ideas	Students look at a range of objects that have been designed with a specific user group in mind. These user groups may include different age groups, interest groups or be based on gender (the pink tax). Discussion/creation of a mind map demonstrating what issues these groups may have with specific products and what their specific needs might be. Students take a product and redesign it in order to make it more suitable for a specific group. Focus on freehand sketching techniques; this could include the use of colour/markers.			
Systems	Systems approach to designing	• Whiteboards used to define the terms input, process and output in a system. • A systems diagram or product given to groups to identify each of these parts of the system. In groups, scenarios given and a systems solution to be designed. The identification of input, process and output in their idea/product to be explained and presented to peers.			
Types of motion	Mechanical devices	• Define the term mechanism. • Give an example of a mechanism and assess students' knowledge of why mechanisms are used. • Demonstrate the 4 main types of motion – in pairs think of as many examples of products that use these motions. Produce a visual revision aid showing movement and mechanisms.			
Devices	Mechanical devices	• Discuss ways of changing one type of motion into another. • Identify specific mechanisms such as levers, linkages and rotary systems. • In smalls groups students model examples of these mechanisms and understand how they work (using card, split pins etc...) worksheets and instructions could be used to assist this activity. • Identify where these mechanisms can be found in products/machines used. • Learn how to create and understand diagrams that show motion. This may include calculations and measurement. • Opportunities to visit maths links – use of ratios, measuring of degrees etc.			

	Selection of materials or components 3.2.1 Using and working with materials 3.2.5	• Assess materials knowledge through practical application. • Continue building a basic phone stand/holder– no designing, students experiment with materials and recall knowledge from Year 9. • Exploration of materials drawing on prior knowledge and understanding. • Potential for a small range of materials to be explored. • Evaluation of outcomes identifying successes and areas for development. Questions used as starting points for discussion – questions linking to functionality, aesthetics, environment, availability, cost, social and ethical factors. Opportunities to visit maths links – Calculation of material costs.			
Designing: • sketching • modelling • testing evaluation of work.	Communication of ideas 3.3.5	• Explore and develop ideas for an MP3 docking station/holder • Different drawing techniques explored and experimented with. Materials and key areas analysed.			
The six Rs Ecological issues in design and manufacture	Ecological and social footprint 3.2.3	• Recall of the six Rs (Reduce, Refuse, Re-use, Repair, Recycle and Rethink) • Introduction to the idea of products having a carbon footprint, understanding what adds to this footprint – case study of the mobile phone to demonstrate a real-life application. Self and peer evaluation of MP3/docking station proposals against the six Rs and possible carbon footprint that could incur.			
Designing: • sketching • modelling • testing evaluation of work.	Design Strategies 3.3.4 Communication of ideas. Ecological and social footprint 3.2.3	• Ideas are enhanced and an iterative approach is adopted. Ideas are modified to encompass the learning of the six Rs and mileage of a product being understood. Alternative drawing skills explored.			
Properties of materials	Using and working with materials 3.2.5	• Explanation of key terms – working properties, physical properties. • Match up activity of three categories. Cards showing product image to be matched with card stating material name to be matched with card listing properties. Existing MP3 docking station/storage product analysed and properties identified.			
Modifying properties for a purpose	Using and working with materials 3.2.5	• Assessing prior knowledge of ways to change properties. Material sampling/testing to understand the benefits of modifying properties.			
Commercially available types and sizes of materials	Sources and origins 3.2.4 Stock forms types and sizes 3.2.6	• Understanding how primary sources are converted into workable forms. • Match-up of primary source of material, conversion process and workable material. Key terms may be filed in as a revisit exercise from Year 9. • Stock sizes and availability investigated in main material area. Advantages for purchasing in stock form considered. Opportunities to visit maths links – calculating area, volume, nesting and minimising waste.			

Designing:
• sketching
• modelling
	Communication of ideas 3.3.5
	Scales of production 3.2.7
		• Reflecting on and revisiting knowledge of:
		  • properties
		  • property modification			

• testing evaluation of work.		• stock sizes. • Discussion of scales of production. Modification of idea in order to make quantity produce part of the product. Understanding stock sizes and applying this knowledge.			
Manufacturing specification/working drawings	Investigation, primary and secondary data 3.3.1 Communication of ideas 3.3.5	• Discussion of manufacturing specifications and working drawings etc. • Techniques tried to differing levels according to the ability and experience of students. Opportunities to visit maths links – calculating quantities of materials, cost and sizes.			
Tools, equipment and processes Quality control	Specialist techniques and processes 3.2.8 Material Management 3.3.9	• Manufacture of prototype. • Marking out material discussed and demonstrated. • Production aids discussed where relevant and examples shown according to material area. • Use of production aids where appropriate. • Use a range of appropriate tools and equipment to shape, fabricate construct and assemble. Opportunities to visit maths links – Scaling of drawings, working to datums.			
Tools, equipment and processes Quality control	Specialist techniques and processes 3.2.8 Material management 3.3.9	• Manufacture of prototype. • Use of production aids where appropriate. Use a range of appropriate tools and equipment to shape, fabricate construct and assemble.			
How materials are cut shaped and formed to a tolerance Quality control	Specialist techniques and processes 3.2.8 Material management 3.3.9	• Manufacture of prototype. • Use of production aids where appropriate. Use a range of appropriate tools and equipment to shape, fabricate construct and assemble.			
How materials are cut, shaped and formed to a tolerance Quality control	Specialist techniques and processes 3.2.8 Tolerances 3.3.8	• Manufacture of prototype. • Introducing tolerance, linking to quantity production (3.2.7). Give examples of where tolerances may be used in other products. Ask students to consider what acceptable tolerances might be for their own project.			
How materials are cut, shaped and formed to a tolerance Quality control	Specialist techniques and processes 3.2.8 Tolerances 3.3.8	• Manufacture of prototype. • Recap on tolerance. Opportunity to visit maths links – nesting exercise eg How many of a product of size x can you fit onto a piece of materials size y?			
Quality control	Specialist techniques and processes 3.2.8	• Manufacture of prototype. • Discussion about the difference between quality control and quality assurance. • Application and use of quality control (QC) to include measurable and quantitative systems (see specification for examples from each material area). Students identify times when they have performed QC checks and what they can do to ensure the quality in their current project.			
Quality control	Specialist techniques and processes 3.2.8	• Manufacture of prototype. • Application and use of quality checks. Recording of evidence.			

		Discussion regarding what learning has taken place due to these checks. How could the project be improved?			
The preparation and application of surface treatments and finishes Quality control	Surface treatments and finishes 3.2.9	• Manufacture of prototype. • Understand how treatments and finishes can enhance the functional and aesthetic properties of materials. • Using a selection of common materials in the projects students are completing, demonstrate a range of treatments and finishes. • Students write notes and answer questions on the different techniques, discussing the benefits of each in different circumstances. Students try a range of techniques through mini practical sessions.			
The preparation and application of surface treatments and finishes Quality control Surface treatments and finishes Quality control	Surface treatments and finishes 3.2.9	• Manufacture of prototype. • Understand how treatments and finishes can enhance the functional and aesthetic properties of materials. • Students discuss in pairs the possible techniques they can use to complete their projects. Students apply this knowledge and understanding to their own prototype.			
The preparation and application of surface treatments and finishes Quality control	Surface treatments and finishes 3.2.9	• Manufacture of prototype • Students continue to complete making tasks in the materials and processes they have selected for their design. Students are encouraged to reflect on their designs in the final stages. How could they improve them? What skills do they need to work on? How would this product be commercially manufactured?			
The preparation and application of surface treatments and finishes Quality control	Surface treatments and finishes 3.2.9	• Manufacture of prototype • Students continue to complete making tasks in the materials and processes they have selected for their design. Students are encouraged to reflect on their designs in the final stages. How could they improve them? What skills do they need to work on? How would this product be commercially manufactured?			

Example NEA style project to cover 3.3 Section C – Project 2 Reverse engineering.

Building iteration into a project in preparation for the NEA.

Focused practical tasks on Surface treatments and sublimation printing

Types of forces and reinforcing materials	Forces and stresses 3.2.2	• Key forces defined and explained. • Identification of products being designed to withstand/resist certain forces (bridges, cars, textiles). • How it works: Skyscrapers Look at and show examples of reinforcing materials used within the classroom.			
Manipulating materials to resist/work with forces	Selection of materials or components 3.2.1 Forces and stresses 3.2.2	Practical experimentation with material. Testing materials to understand how they can resist/withstand forces applied to them.			

Investigate, analyse and evaluate the work of past and present designers/ companies	The work of others 3.3.3	• Independent research into a designer or company. A range of sources to strengthen research skills and deepen understanding of chosen focus. Understanding the design style, philosophy and products of the chosen designer/company.			
Investigate, analyse and evaluate the work of past and present designers/ companies	The work of others 3.3.3	• Presentation of research and findings. • Note taking skills employed to broaden knowledge of a range of designers and companies. • Questioning used to assess knowledge gained. • Product analysis of a range of key products for that designer. • Opportunities to visit maths links – comparative chart of performance criteria. As for existing products to help evaluate them.			
Generating imaginative and creative designs	Design strategies 3.3.4 Communication of design ideas 3.3.5	• Students identify a user/client and discuss briefly their needs and wants. • Explore and develop ideas for a lamp using sketching and modelling techniques. • Lighting to reflect the designer/company previously researched. Constant discussion about what needs to be researched as a direct response to the ideas students generate.			
Generating imaginative and creative designs	Design strategies 3.3.4 Communication of design ideas 3.3.5	• Explore and develop ideas for a lamp using sketching and modelling techniques. • Lighting to reflect the designer/company previously researched. Freehand sketching, 2D and 3D drawings used to communicate, system and schematic drawings, annotated drawings that fully explain detailed conceptual stages.			
Using primary and secondary data to understand client and/or user needs. Market research, interviews, human factors	Investigation, primary and secondary data 3.3.1	• Client/user interviewed where possible. Discussion about what information students want to get from their client and how to write good interview questions. • Discussion of the difference between anthropometrics and ergonomics. • Practical examples relating to real products discussed and students consider the data needed to inform their designs. • Percentile graphs discussed and analysed and how to use this data. • Own data found and analysed. • Opportunities to visit maths links – presentation of client survey responses. Percentile ranges used in anthropometrics and/or ergonomics.			
Constraints that are presented to designers	Environmental, social and economic challenge 3.3.2	• Further research and investigation into the chosen designer/company to understand fully the ethics upon which their designs are based (environmental, social and economic challenges). • Discussion of students' own ideas of their ethical responsibilities as a designer. What would they do to ensure these were considered in the manufacture of their design? Students add notes to their designs and continue developing this.			
How to write a design brief	Investigation, primary and secondary data 3.3.1	• Reflect and re-visit investigation work – analyse and evaluate findings.			

		• Produce a design brief based upon market research and designer/company findings. • Students should consider their own needs, wants and interests and those of others. • Students consider why a designer considers alterations to a brief and modifies the brief as required. • Peer assessment activities used to finalise the brief. Opportunities to visit maths links – frequency tables and percentile ranges.			
Generating imaginative and creative designs	Design strategies 3.3.4 Communication of design ideas 3.3.5	• Further explore and develop ideas for a product e,g. lamp/packaging using sketching and modelling techniques. • Lighting to reflect the designer/company previously researched, their ethical considerations and market research. • Iterative designing being understood as designs are re-visited and developed based on building knowledge. • Freehand sketching, 2D and 3D drawings used to communicate, system and schematic drawings, annotated drawings that fully explain detailed conceptual stages. • Students interview their client and ask them about their design ideas. Opportunities to visit maths links – measurements, scale drawings.			
Generating imaginative and creative designs	Design strategies 3.3.4 Communication of design ideas 3.3.5	• Further explore and develop ideas for a lamp using sketching and modelling techniques. Students reflect on their clients' opinion of their ideas. • Lighting to reflect the designer/company previously researched, their ethical considerations and market research. • Iterative designing being understood as designs are re-visited and developed based on building knowledge. Freehand sketching, 2D and 3D drawings used to communicate, system and schematic drawings, annotated drawings that fully explain detailed conceptual stages.			
How to write a design specification	Investigation, primary and secondary data 3.3.1	• Analysis of all investigation work carried out. • Use of math skills to compare and present data. Analysis used to produce a design specification.			
Generating imaginative and creative designs	Design Strategies 3.3.4	Further embedding of the iterative design process required in the NEA through design development and moderation.			
Isometric and perspective designs Exploded diagrams Working drawings Computer-based tools Audio and visual recordings Modelling	Communication of design ideas 3.3.5	• Demonstration and scaffolding techniques used to develop one or more of the methods of communication. Building on prior knowledge to enhance these skill sets. Design solutions communicated for interpretation by the client/user.			
Isometric and perspective designs Exploded diagrams Working drawings	Communication of design ideas 3.3.5	• Demonstration and scaffolding techniques used to develop one or more of the methods of communication. Building on prior knowledge to enhance these skill sets. Design solutions communicated for interpretation by the client/user.			

Computer-based tools Audio and visual recordings Modelling					
Satisfy the requirements of the brief Functionality Aesthetics Potentially marketable	Prototype development 3.3.6	• A product or system is prototyped to show the client/user the lighting outcome. • Materials are used and chosen reflecting their knowledge and understanding of this area. • The process of prototyping helps to develop the lighting solution further and client/user feedback can form the basis of this development. Evaluation and reflection are used to decide whether the prototype is fit for purpose. Peer and self-assessment could be used as a tool to achieve this.			
Working accurately Cutting, shaping and forming materials to tolerance Planning the cutting of materials to minimize waste (linking to tolerance)	Tolerances 3.3.8 Material management 3.3.9	• Use of maths questions in SAM's to revisit tolerances and its use in Design Technology. • Activity used to introduce the concept of nesting – differentiation of shapes/parts and sizes. • Application of tolerance and nesting to make template pieces/jigs/aids to begin to mark out materials for the final prototype. • Other quality control processes considered and examples used of how quality control is done in industry. Opportunities to visit maths links – SI units, accurate use of tolerances, decimal and standard forms, surface areas and volume, datum points and coordinates, tessellation.			

Using measuring and marking out to create and accurate and quality prototype	Selection of materials and components 3.3.7
	Material management 3.3.9
		• Consideration of potential materials that could be used. These will include:
		  • functional need
		  • cost
		  • availability.
		• All pieces for the lighting prototype to be measured and marked out.
		Use of peer assessment/feedback to check the accuracy, tolerance and amount of waste that would be generated.			

[3]					
Selection of the correct hand tools and machinery Safe use of tools Selection and use of specialist techniques (used to shape, fabricate, construct)	Specialist tools and equipment 3.3.10 Specialist techniques and processes 3.3.11	• Key processes using tools and equipment discussed, building on prior knowledge. • In pairs students could demonstrate different tools and equipment explaining key health and safety and quality control techniques. • Diary/planning activity used to ensure independent progress and learning. Assesses and re-visits processes, tools and techniques. Final prototype produced to a high standard – re-visiting the application of quality control to achieve this (3.2.8).			
Selection of the correct hand tools and machinery Safe use of tools Selection and use of specialist techniques (used to shape, fabricate, construct)	Specialist tools and equipment 3.3.10 Using and working with materials 3.2.5 Specialist techniques and processes 3.3.11	• Key processes using tools and equipment discussed building on prior knowledge. • Diary/planning activity used to ensure independent progress and learning. Assesses and re-visits processes, tools and techniques. • Final prototype produced to a high standard – re-visiting the application of quality control to achieve this (3.2.8).			

Preparing a material for a surface finish Applying a surface finish	Surface treatments and finishes 3.3.11	• Experimentation of different surface treatments and finishes. Students discuss benefits of each and show justification for their decisions.			
Selection of the correct hand tools and machinery. Safe use of tools Selection and use of specialist techniques (used to shape, fabricate, construct) Preparing a material for a surface finish Applying a surface finish	Specialist tools and equipment 3.3.10 Using and working with materials 3.2.5 Specialist techniques and processes 3.3.11 Surface treatments and finishes 3.3.11	• Key processes using tools and equipment discussed building on prior knowledge. • Diary/planning activity used to ensure independent progress and learning. Assesses and re-visits processes, tools and techniques. Final prototype produced to a high standard – re-visiting the application of quality control to achieve this (3.2.8).			
Selection of the correct hand tools and machinery. Safe use of tools Selection and use of specialist techniques (used to shape, fabricate, construct) Preparing a material for a surface finish Applying a surface finish	Specialist tools and equipment 3.3.10 Using and working with materials 3.2.5 Specialist techniques and processes 3.3.11 Surface treatments and finishes 3.3.11 Using and working with materials 3.2.5	• Key processes using tools and equipment discussed building on prior knowledge. • Diary/planning activity used to ensure independent progress and learning. Assesses and re-visits processes, tools and techniques. • Final prototype produced to a high standard – re-visiting the application of quality control to achieve this (3.2.8). • Students look at a range of different materials that they have used in previous projects. • Recap of properties and discussion of what students have found when using certain materials. • Product analysis of hand-made products within your material area/s of interest. • Consider reasons why the designer has chosen these materials. What tools and equipment have been used to manufacture these products? Why have they chosen these tools and equipment? What are the issues relating to these processes? How will the manufacturer ensure good quality control?			

Prep for Year 10 Mock exams

Use of Practice papers & Completion of CGP practice workbook throughout the year

Revision and catch-up sessions for identified students

Commence NEA folder work with Pre-release for contextual challenge for the coming exam year.