Design and Technology – Year 10
SUBJECT OVERVIEW MAP 2020-2021

Year 10	Substantive Knowledge	Disciplinary Knowledge	Assessment
Half-term 1 (Weeks 1-8)	**3.1.1 New and emerging technologies** • Robotics, automation and production in industry • Production techniques and systems – automation • Enterprise • Market pull and technology push • People, society and culture • Sustainability and the environment • Critical evaluation of new and emerging technologies – planned obsolescence • Design for maintenance • Ethics • The environment **3.1.2 Energy generation and storage** • Renewable and non-renewable resources • Nuclear energy • Energy storage • Kinetic pumped storage systems • Alkaline and rechargeable batteries **3.1.4 Systems approach to designing** • Systems 3.1.5 **Mechanical devices**	• Annotation of designs including specific materials and processes where known. • Learning of key terms and meanings: ○ finite and non-finite resources, the disposal of waste, pollution and global warming ○ continuous improvement and efficient working ○ planned obsolescence, design for maintenance. Annotation of designs in terms of sustainability. • Analysis of designs in terms of impact on the environment. Discussion of finite and non-finite resources, the disposal of waste, pollution and global warming. • How have the following designs been made with the environment in mind? ○ bamboo bike, reusable cloth shopping bag. • Use of life cycle assessment to understand the impact on the environment. • Evaluation of the ethical considerations surrounding a design/product.	❑ Quizzes and short tests – scored every 3 weeks ❑ Summative assessment at the end of the half term to assess learning so far for half term 1 this will just be on theory

	• Types of motion **3.3.6 Design Strategies 3.3.4** **Communication of design ideas 3.3.5** **3.1.3 Developments in new materials** • Composite materials • Technical Textiles • Material properties **3.1.6 Materials and their working properties**	• Investigation into production methods, use of labour, sourcing materials to provide us with the products we need. Students investigate ethical issues surrounding large companies such as Dyson, Coca Cola and Primark in relation to the responsibility of the designer/maker. Product study used to focus on these areas (Dyson, Coca cola, Primark). ✓ Highlight the difference between renewable and non-renewable fuels. Give advantages and assess prior knowledge. ✓ Discuss key terminology including renewable and non-renewable fuels, fossil fuels, wind, solar, tidal, hydro-electrical, biomass, coal, gas, oil. ✓ Discuss the arguments for and against nuclear power (possible debate). Explain how it has an effect on local communities. ✓ Give information about nuclear power plant disasters such as Fukoshima and how they are avoided. ✓ Images of different energy storage – discuss how they work and the types of energy stored. ✓ 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. ✓ 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. ✓ 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 we use. ✓ Learn how to create and understand diagrams that show motion. This may include calculations and measurement. Opportunities to ✓ 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. visit maths links – use of ratios, measuring of degrees etc ✓ 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.	
Half-term 2	**3.2.1 Selection of materials or components** In relation to at least one material category or system, students should be able to select materials and components considering the factors listed below. Functionality: application of use, ease of working. Aesthetics: surface finish, texture and colour. Environmental factors: recyclable or reused	✓ Primary investigation of material area/s through product analysis –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. ✓ 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.	❑ Quizzes and short tests – scored every 3 weeks ❑ Summative assessment at the end of the half term to assess learning of theory ❑ Summative assessment on NEA skills

	materials. Availability: ease of sourcing and purchase. Cost: bulk buying. Social factors: social responsibility. Cultural factors: sensitive to cultural influences. Ethical factors: purchased from ethical sources such as FSC. **3.2.3 Ecological and social footprint** In relation to at least one material category or system, students should have a knowledge and understanding of the ecological and social footprint left by designers. Ecological issues in the design and manufacture of products Deforestation, mining, drilling and farming. Mileage of product from raw material source, manufacture, distribution, user location and final disposal. That carbon is produced during the manufacture of products **3.2.5 Using and working with materials** In relation to at least one material category or system, students should know and	✓ 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. ✓ 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. ✓ Explore and develop ideas for an MP3 docking station/holder ✓ Different drawing techniques explored and experimented with. ✓ Materials and key areas analysed.	

	understand in addition to material properties, the factors listed below. How to shape and form using cutting, abrasion and addition • Timber based materials (how to cut, drill, chisel, sand and plane). • Polymers (how to cut, drill, cast, deform, print and weld). **3.2.6 Stock forms, types and sizes** In relation to at least one material category or system, students should know and understand the different stock forms types and sizes in order to calculate and determine the quantity of materials or components required. Commercially available types and sizes of materials and components. Timber based materials: • planks, boards and standard moldings • sold by length, width, thickness and diameter • standard components e.g. woodscrews, hinges, KD fittings. Polymers:	✓ 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. ✓ Explore and develop ideas for an MP3 docking station/holder ✓ Different drawing techniques explored and experimented with. ✓ Materials and key areas analysed. ✓ 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.	

	• sheet, rod, powder, granules, foam and films • sold by length, width, gauge and diameter • standard components e.g. screws, nuts and bolts, hinges. **3.2.7 Scales of production** In relation to at least one material category or system, students should be able to select materials and components considering scales of production and referencing the processes listed in Specialist Techniques and processes. (page 25)How products are produced in different volumes. The reasons why different manufacturing methods are used for different production volumes: • prototype, batch, mass, continuous. **3.2.8 Specialist techniques and processes** In relation to at least one material category or system, students should know and understand the factors listed below. Tools, equipment and processes A range of tools, equipment and processes that can be used to shape, fabricate, construct and assemble high quality prototypes, as	✓ Self and peer evaluation of MP3/docking station proposals against the six Rs and possible carbon footprint that could incur. ✓ 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. ✓ 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. ✓ Assessing prior knowledge of ways to change properties. ✓ Material sampling/testing to understand the benefits of modifying properties. ✓ 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.	

	appropriate to the materials and/or components being used including: wastage, such as: • die cutting, perforation, turning, sawing, milling, drilling, cutting and shearing addition, such as: • brazing, welding, lamination, soldering, 3D printing, batik, sewing, bonding, printing deforming and reforming such as: • vacuum forming, creasing, pressing, drape forming, bending, folding, blow moulding, casting, injection moulding, extrusion. **3.3.1 Investigation, primary and secondary data** Use primary and secondary data to understand client and/or user needs How to write a design brief and produce a design and manufacturing specification Carry out investigations in order to identify problems and needs. **3.3.3 The work of others** **3.3.4 Design strategies**	✓ 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. ✓ Reflecting on and revisiting knowledge of: ✓ properties ✓ property modification ✓ 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. ✓ 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. ✓ 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.	

	Generate imaginative and creative design ideas using a range of different design strategies Explore and develop their own ideas **3.3.5 Communication of design ideas** **3.3.6 Prototype development** **3.3.7 Selection of materials and components**	✓ 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. ✓	
Half-term 3	**3.2.2 Forces and stresses** In relation to at least one material category or system, students should know and understand the impact of forces and stresses and the way in which materials can be reinforced and stiffened. Materials and objects can be manipulated to resist and work with forces and stresses Tension, compression, bending, torsion and shear.	• 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. • 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. • Presentation of research and findings.	❑ Quizzes and short tests – scored every 3 weeks ❑ Summative assessment NEA skills

	Materials can be enhanced to resist and work with forces and stresses to improve functionality How materials can be reinforced, stiffened or made more flexible: e.g. lamination, bending, folding, webbing, fabric interfacing. **3.2.8 Specialist techniques and processes** In relation to at least one material category or system, students should know and understand the factors listed below. Tools, equipment and processes A range of tools, equipment and processes that can be used to shape, fabricate, construct and assemble high quality prototypes, as appropriate to the materials and/or components being used including: wastage, such as: • die cutting, perforation, turning, sawing, milling, drilling, cutting and shearing addition, such as: • brazing, welding, lamination, soldering, 3D printing, batik, sewing, bonding, printing	• 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. • Manufacture of prototype. • Use of production aids where appropriate. • Use a range of appropriate tools and equipment to shape, fabricate construct and assemble. • Manufacture of prototype. • Use of production aids where appropriate. • Use a range of appropriate tools and equipment to shape, fabricate construct and assemble. • 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).	

	deforming and reforming such as: • vacuum forming, creasing, pressing, drape forming, bending, folding, blow moulding, casting, injection moulding, extrusion. The application and use of quality control to include measurable and quantitative systems used during manufacture • Timber based materials (dimensional accuracy using go/no go fixture). • Polymers (dimensional accuracy by selecting correct laser settings). **3.2.9 Surface treatments and finishes** In relation to at least one material category or system, students should have knowledge and understanding of surface treatments and finishes. The preparation and application of treatments and finishes to enhance functional and aesthetic properties. • Timber based materials (painting, varnishing and tanalising). • Polymers (polishing, printing and vinyl decals).	• Students identify times when they have performed QC checks and what they can do to ensure the quality in their current project. • 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 improvManufacture 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. • Using a selection of common materials in the projects students are completing, demonstrate a range of treatments and finishes. • Students continue to complete making tasks in the materials and processes they have selected for their design.	

	3.3.1 Investigation, primary and secondary data Use primary and secondary data to understand client and/or user needs How to write a design brief and produce a design and manufacturing specification Carry out investigations in order to identify problems and needs **3.3.3 The work of others**	• 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? • 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. • Practical experimentation with material. Testing materials to understand how they can resist/withstand forces applied to them. • 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. • 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.	
Half-term 4	**3.3.4 Design strategies** Generate imaginative and creative design ideas using a range of different design strategies Explore and develop their own ideas **3.3.5 Communication of design ideas** **3.3.1 Investigation, primary and secondary data** Use primary and secondary data to understand client and/or user needs How to write a design brief and produce a design and manufacturing specification Carry out investigations in order to identify problems and needs	• 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. • 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. • Reflect and re-visit investigation work – analyse and evaluate findings.	❑ Quizzes and short tests – scored every 3 weeks ❑ Summative assessment of theory ❑ Summative assessment NEA

		• 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. • Further explore and develop ideas for a lamp 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. • 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. • Analysis of all investigation work carried out. • Use of math skills to compare and present data. • Analysis used to produce a design specification. •	
Half-term 5	**3.3.7 Selection of materials and components** **3.3.9 Material management** Cut materials efficiently and minimise waste	✓ Use of research or costing sheets to decide on the most appropriate materials for the lighting solution. ✓ Re-visit 3.2.5 (using and working with materials) ✓ 3.2.6 (stock sizes)	❑ Quizzes ❑ Homework ❑ NEA assessment based on

	Use appropriate marking out methods, data points and coordinates **3.2.5 Using and working with materials** In relation to at least one material category or system, students should know and understand in addition to material properties, the factors listed below. Students must know and understand how different properties of materials and components are used in commercial products, how properties influence use and how properties affect performance. Students must know and understand the physical and mechanical properties relevant to commercial products in their chosen area as follows. • Timber based materials (traditional timber children's toys and flat pack furniture). • Polymers (polymer seating and electrical fittings). **3.3.10 Specialist tools and equipment** **3.3.11 Specialist techniques and processes** Surface treatments and finishes **3.2.5 Using and working with materials**	✓ Planning out materials for the final prototype manufacture ✓ 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. ✓ 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.	preliminary sections.

		✓ 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. ✓ 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. ✓ Experimentation of different surface treatments and finishes. ✓ Students discuss benefits of each and show justification for their decisions. ✓ 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? ✓ Students look at the products considered in the previous session. They consider how this product could be improved. ✓ Consideration of ways that materials can be modified to make them more suitable for purpose e.g. additives, stabilisers etc. ✓ Students then redesign this product using different materials, form and by modifying materials to change their properties.	
Half-term 6	**3.2.7 Scales of production** In relation to at least one material category or system, students should be able to select materials and components considering scales of production and referencing the processes	✓ Discussion of different scales of production including examples. ✓ Students consider what volume different products are made in and how this changes their design, materials and manufacture.	❑ Quizzes ❑ Homework submissions ❑ In-Lesson AFL

	listed in Specialist Techniques and processes. (page 25)How products are produced in different volumes. The reasons why different manufacturing methods are used for different production volumes: • prototype, batch, mass, continuous **All of sections 3.3 and section 4**	✓ Students look at how the products they have been looking at could be developed in order to make them suitable for different scales of production. ✓ Consideration of commercial processes using video clips etc. ✓ Students consider what processes could be used in the production of their modified designs. ✓ Students discuss the benefits of these commercial processes in terms of mass of batch production.	❑ End of year 10 test Start of NEA project. Students will be assessed against the exam board marking criteria.

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Year 11`	Substantive Knowledge	Disciplinary Knowledge	Assessment
Half-term 1 (Weeks 1-8)	**NEA and Section 3.3** **3.3.1 Investigation, primary and secondary data** • Use primary and secondary data to understand client and/or user needs • How to write a design brief and produce a design and manufacturing specification • Carry out investigations in order to identify problems and needs **3.3.2 Environmental, social and economic challenge** **3.3.3 The work of others** **3.3.4 Design strategies** Generate imaginative and creative design ideas using a range of different design strategies Explore and develop ideas **3.3.5 Communication of design ideas** **3.3.6 Prototype development** **3.3.7 Selection of materials and components**	**Students will be introduced to portfolio evidencing and produce sheets to outline their design journey:** **NEA Sheet 1 - Initial Investigation** Investigate the contextual challenge and break this down into smaller task-based design strategy **NEA Sheet 2 - Existing Products Research** Interact with and research existing products already available Analyse this using CAFÉ QUE/ SEA CAFÉ/ ACCESS FM **NEA Sheet 3 - Client Interview and location visit** Choose a client based on your research so far. Complete a simple questionnaire and a location vest outlining who the product is for, their likes, dislikes and aspirational functions Outline a design brief **NEA Sheet 4 - Further Research** Complete further primary research by interviewing possible target market clientele, reviewing possible materials and processes, asking the actual client to review the product idea so far **NEA Sheet 5 - Research Summary and Specification** Make analytical comments about specific areas of research.	❑ Summative assessment NEA progress assessment with current actual and reflective predictive grade – 4.4.4.1 Section A: Identifying and investigating design possibilities (10 marks) 4.4.4.2 Section B: Producing a design brief and specification (10 marks) 4.4.4.3 Section C: Generating design ideas (20 marks)

		Complete a fully justified design specification based on the information from the client and previous research **NEA Sheets 6 7 and 8 - Initial Sketched Ideas based on a design** Use a chosen design era to generate functional and aesthetically pleasing design solutions by sketching. Use taught sketching techniques to outline these. **NEA Sheet 9 - Initial Models based on previous sketches** Create cardboard/ softer materials 3d models to show form and shape. Skills of craftsmanship should also be demonstrated – knife skills, construction, joining methods for softer materials Photographic journey with detailed but relevant annotation should claim marks for development and evaluation **PRACTICAL ELEMENT** Students will be making 3D models in car and card and harder materials. This will show detailed development of their design and should reflect client opinion as well as technical solutions along the journey.	
	<u>Section 3.1 and 3.2</u> **3.1.1 New and emerging technologies** How the critical evaluation of new and emerging technologies informs design decisions. That it is	Each week a new topic will be covered as part of theoretical learning.	❑ Theory Tests/ quizzes on each section – every 2 weeks or on change of topic ❑ Summative theory assessment across the Section 3 topics covered – converted to a

	important to consider scenarios from different perspectives and considering: planned obsolescence, design for maintenance, ethics and the environment. **3.1.2 Energy generation and storage** Understand how energy is generated and stored and how this is used as the basis for the selection of products and power systems. **Fossil fuels** How power is generated from coal, gas and oil. **Nuclear power** How nuclear power is generated. **Renewable energy** How power is generated from: wind, solar, tidal, hydro-electrical and biomass. Arguments for and against the selection of fossil Fuels, nuclear power and renewable energy sources. **Energy storage systems including batteries** **Kinetic pumped storage systems.** **Alkaline and re-chargeable batteries.** **3.1.3 Developments in new materials** **Modern materials:** Developments made through the invention of new or improved processes e.g. Graphene, Metal foams and Titanium. Alterations	This will take the form of videos, written work, group research tasks and practice examination style questioning. This work will be recorded into theory books which will build to form a revision resource and collate testing evidence. ✓ Take notes and annotate from written text ✓ Write in their own words rather than copy and paste ✓ Listen to, observe and take important or key information from video resources ✓ Answer short format examination questions based on the topics covered ✓ Answer long format examination questions based on the topics covered ✓ Answer multiple choice format examination questions based on the topics covered ✓ Recall theoretical information week to week through short tests ✓ Understand how the examination scoring works and therefore how this affects the scores they can achieve ✓ Understand how to apply the knowledge learnt to examination questions ✓ Know and be able to explain which section of the examination is being covered and how they will know this from looking at the examination paper	percentage for predictive grading purposes ❑ Homework built to extend as well as test knowledge recall

	to perform a particular function e.g. Coated metals, Liquid Crystal Displays (LCDs) and Nanomaterials. **Smart materials:** That materials can have one or more properties that can be significantly changed in a controlled fashion by external stimuli, such as stress, temperature, moisture, or PH e.g. shape memory alloys, thermochromic pigments and photochromic pigments **Composite materials:** That composite materials are produced by combining two or more different materials to create an enhanced material e.g. glass reinforced plastic (GRP) and carbon fibre reinforced plastic (CRP). **Technical textiles:** How fibres can be spun to make enhanced fabrics e.g. conductive fabrics, fire resistant fabrics, Kevlar and microfibres incorporating micro encapsulation **3.1.4 Systems approach to designing** **Inputs:** The use of light sensors, temperature sensors, pressure sensors and switches. **Processes:** The use of programming microcontrollers as counters, timers and for decision making, to provide functionality to products and processes. **Outputs:** The use of buzzers, speakers and lamps, to provide functionality to products and processes. **3.1.5 Mechanical devices** Different types of movement		

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	The functions of mechanical devices to produce linear, rotary, reciprocating and oscillating movements.		
Half-term 2 (weeks 9 – 14)	**NEA and Section 3.3** **3.3.1 Investigation, primary and secondary data** • Use primary and secondary data to understand client and/or user needs • How to write a design brief and produce a design and manufacturing specification • Carry out investigations in order to identify problems and needs **3.3.2 Environmental, social and economic challenge** **3.3.3 The work of others** **3.3.4 Design strategies** Generate imaginative and creative design ideas using a range of different design strategies Explore and develop ideas **3.3.5 Communication of design ideas** **3.3.6 Prototype development** **3.3.7 Selection of materials and components** **3.3.10 Specialist tools and equipment**	**NEA Sheet 10 - Initial developments from evaluative comments** Use the client comments made to develop a second model. Modelling at this stage should show further development or improvement, direct links to the client and design brief and should encompass points from the design specification. Photographic design annotation must explain how the use of primary data has developed the stages of the design journey Clear links to the work of others should be evident through sketching, modelling and annotation **NEA Sheet 11 and 12 - Full size models in card and harder materials with specific analysis** Sketches and models showing development and improvement Material choices should extend into harder materials such as timbers, polymers, smart, modern and electronic Design annotation should reflect primary research from client input and materials interaction **NEA Sheet 13 - Further specific research**	❑ Summative assessment NEA progress assessment with current actual and reflective predictive grade – 4.4.4.1 Section A: Identifying and investigating design possibilities (10 marks) 4.4.4.2 Section B: Producing a design brief and specification (10 marks) 4.4.4.3 Section C: Generating design ideas (20 marks) 4.4.4.4 Section D: Developing design ideas (20 marks)

		Based on previous research and interactions with materials, decisions regarding further research should be undertaken. This will take the form of selection, evaluation and analysis. **NEA Sheet 14 - CAD Drawings and developments** 2D Design drawings should be developed for sections of the product. This should lead into the use of the laser cutter, complex process. It may be necessary to use technician input to make these solutions viable. Possible use and outlining of 3d printer. Probable use of bendy ply and bag press. **PRACTICAL ELEMENT** Students will be making 3D models in car and card and harder materials. This will show detailed development of their design and should reflect client opinion as well as technical solutions along the journey.	
	<u>Section 3.1 and 3.2</u> **3.1.5 Mechanical devices** Changing magnitude and direction of force Levers: first order, second order and third order. Linkages: bell cranks and push/pull. Rotary systems: CAMs and followers, simple gear trains and pulleys and belts. **3.1.6 Materials and their working properties**	Videos, written work, group research tasks and practice examination style questioning. This work will be recorded into theory books which will build to form a revision resource and collate testing evidence. ✓ Take notes and annotate from written text ✓ Write in their own words rather than copy and paste	❑ Theory Tests/ quizzes on each section – every 2 weeks or on change of topic ❑ Summative assessment - Mock examination (modified to fit theory content covered throughout course so far) ❑ Homework built to extend as well as test knowledge recall

	Know and understand the categorisation of the types and properties of the following materials. **Papers and boards** Students should have an overview of the main categories and types of papers and boards: papers including: bleed proof, cartridge paper, grid, layout paper and tracing paper boards including: corrugated card, duplex board, foil lined board, foam core board, ink jet card and solid white board. **3.1.6 Natural and manufactured timbers** Students should have an overview of the main categories and types of natural and manufactured timbers: hardwoods including: ash, beech, mahogany, oak and balsa softwoods including: larch, pine and spruce manufactured boards including: medium density fibreboard (MDF), plywood and chipboard. **3.1.6 Metals and alloys** Students should have an overview of the main categories and types of metals and alloys: ferrous metals including: low carbon steel, cast Iron and high carbon/tool steel non-ferrous metals including: aluminium, copper, tin and zinc	✓ Listen to, observe and take important or key information from video resources ✓ Answer short format examination questions based on the topics covered ✓ Answer long format examination questions based on the topics covered ✓ Answer multiple choice format examination questions based on the topics covered ✓ Recall theoretical information week to week through short tests ✓ Understand how the examination scoring works and therefore how this affects the scores they can achieve ✓ Understand how to apply the knowledge learnt to examination questions ✓ Know and be able to explain which section of the examination is being covered and how they will know this from looking at the examination paper ✓ Revise for a full examination and answer questions accordingly ✓ Time question answering to encompass whole paper answering	

	alloys including: brass, stainless steel and high-speed steel. **Polymers** Students should have an overview of the main categories and types of polymers: thermoforming including: acrylic (PMMA) high impact polystyrene (HIPS) high density polythene (HDPE) polypropylene (PP) polyvinyl chloride (PVC)polyethylene terephthalate (PET) thermosetting including: epoxy resin (ER) melamine-formaldehyde (MF) phenol formaldehyde (PF) polyester resin (PR) urea-formaldehyde (UF).		
Half-term 3 (Weeks 15 – 20)	**NEA and Section 3.3** **3.3.1 Investigation, primary and secondary data** Carry out investigations in order to identify problems and needs **3.3.7 Selection of materials and components** **3.3.10 Specialist tools and equipment** **3.3.4 Design strategies** Explore and develop ideas **3.3.5 Communication of design ideas** **3.3.6 Prototype development** **3.3.7 Selection of materials and components** **3.3.8 Tolerances**	**NEA Sheet 15 - Cutting List and Assembly Drawing** For higher mark brackets students should have this document to demonstrate understanding of the construction of their final product. List of component parts with accurate sizes. CAD or hand drawn assembly drawing or set of assembly instructions. **NEA Sheet 16 and 17 - Making and Developmental diary** These sheets will be the primary source of recording evidence for the making section of the course. Students should annotate the relevance of the making processes. How this affects the design journey What impact is the client opinion is having to any ongoing developments?	❑ Summative assessment NEA progress assessment with current actual and reflective predictive grade 4.4.4.1 Section A: Identifying and investigating design possibilities (10 marks) 4.4.4.2 Section B: Producing a design brief and specification (10 marks) 4.4.4.3 Section C: Generating design ideas (20 marks) 4.4.4.4 Section D: Developing design ideas (20 marks)

	3.3.9 Material management **Cut materials efficiently and minimise waste** Use appropriate marking out methods, data points and coordinates **3.3.10 Specialist tools and equipment** **3.3.11 Specialist techniques and processes** **Surface treatments and finishes** **<u>Section 3.1 and 3.2</u>** **Textiles** **An overview of the main categories and types of textiles:** **natural fibres including:** cotton, wool and silk **synthetic fibres including:** polyester, polyamide (nylon) and elastane (Lycra) **blended and mixed fibres including:** cotton/polyester **woven including:** plain weave **non-woven including:** bonded fabrics and felted fabrics **knitted textiles including:** knitted fabrics. **3.1.6.2 Material properties** **Material properties**	Outline how material choices are impacting on developments of the design Outline how time constraints are impacting on the design **PRACTICAL ELEMENT** This is the heaviest time for practical development. Students will spend much of their time in the workshop developing their design solutions into a final prototype. Videos, written work, group research tasks and practice examination style questioning. This work will be recorded into theory books which will build to form a revision resource and collate testing evidence. ✓ Take notes and annotate from written text ✓ Write in their own words rather than copy and paste ✓ Listen to, observe and take important or key information from video resources ✓ Answer short format examination questions based on the topics covered ✓ Answer long format examination questions based on the topics covered ✓ Answer multiple choice format examination questions based on the topics covered ✓ Recall theoretical information week to week through short tests	❑ Theory Tests/ quizzes on each section – every 2 weeks or on change of topic ❑ Summative theory assessment across the Section 3 topics covered (possible second modified mock done over a double lesson) – converted to a percentage for predictive grading purposes ❑ Homework built to extend as well as test knowledge recall

	Understand physical properties such as: absorbency (resistance to moisture) density, fusibility and electrical and thermal conductivity. **Understand working properties such as:** strength, hardness, toughness, malleability and ductility and elasticity. **3.2.1 Selection of materials or components** **Select appropriate materials and components considering the factors listed below.** Functionality: application of use, ease of working. Aesthetics: surface finish, texture and colour. Environmental factors: recyclable or reused materials. Availability: ease of sourcing and purchase. Cost: bulk buying. Social factors: social responsibility. Cultural factors: sensitive to cultural influences. Ethical factors: purchased from ethical sources such as FSC. **3.2.2 Forces and stresses** **Know and understand the impact of forces and stresses and the way in which materials can be reinforced and stiffened.**	✓ Understand how the examination scoring works and therefore how this affects the scores they can achieve ✓ Understand how to apply the knowledge learnt to examination questions ✓ Know and be able to explain which section of the examination is being covered and how they will know this from looking at the examination paper	

	Materials and objects can be manipulated to resist and work with forces and stresses Tension, compression, bending, torsion and shear. Materials can be enhanced to resist and work with forces and stresses to improve functionality How materials can be reinforced, stiffened or made more flexible: e.g. lamination, bending, folding, webbing, fabric interfacing. **3.2.3 Ecological and social footprint** Knowledge and understanding of the ecological and social footprint left by designers. Ecological issues in the design and manufacture of products Deforestation, mining, drilling and farming. Mileage of product from raw material source, manufacture, distribution, user location and final disposal. That carbon is produced during the manufacture of products. The six Rs Reduce, refuse, re-use, repair, recycle and rethink. Social issues in the design and manufacture of products Safe working conditions; reducing oceanic/ atmospheric pollution and reducing the detrimental (negative) impact on others. **3.2.4 Sources and origins**		

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	Know and understand the sources and origins of materials. Primary sources of materials and the main processes involved in converting into workable forms for at least one material area. • Timber based materials (seasoning, conversion and creation of manufactured timbers). • Polymers (refining crude oil, fractional distillation and cracking).		
Half-term 4 (weeks 21 – 26)	**NEA and Section 3.3** **3.3.1 Investigation, primary and secondary data** Carry out investigations in order to identify problems and needs **3.3.7 Selection of materials and components** **3.3.10 Specialist tools and equipment** **3.3.4 Design strategies** Explore and develop ideas **3.3.5 Communication of design ideas** **3.3.6 Prototype development** **3.3.7 Selection of materials and components** **3.3.8 Tolerances** **3.3.9 Material management** Cut materials efficiently and minimise waste	**NEA Sheet 16 and 17 - Making and Developmental diary** These sheets will be the primary source of recording evidence for the making section of the course. Students should annotate the relevance of the making processes. How this affects the design journey What impact is the client opinion is having to any ongoing developments? Outline how material choices are impacting on developments of the design Outline how time constraints are impacting on the design **NEA Sheet 18 – Environmental, Social and Economic challenge** Outline how the design meets the requirements of the society it is designed for. Explain how it is inoffensive to any group of people.	❑ Summative Assessment NEA progress assessment with current actual and reflective predictive grade 4.4.4.1 Section A: Identifying and investigating design possibilities (10 marks) 4.4.4.2 Section B: Producing a design brief and specification (10 marks) 4.4.4.3 Section C: Generating design ideas (20 marks) 4.4.4.4 Section D: Developing design ideas (20 marks) 4.4.4.5 Section E: Realising design ideas (20 marks) 4.4.4.6 Section F: Analysing and evaluating (20 marks)

	Use appropriate marking out methods, data points and coordinates **3.3.10 Specialist tools and equipment** **3.3.11 Specialist techniques and processes** Surface treatments and finishes	Explain how the product is economically desirable and how these considerations have impacted the process of designing and making Explain and demonstrate how the product is or could more environmentally friendly. Outline sources of materials, product lifecycle and carbon footprint. **NEA Sheet 19 - Evaluation against a final specification** Key documentation: explain how the product does or does not meet the requirements of the design specification. Marks are allocated in the same way for both results, it's the process of explaining and knowing that matters. Utilise the specification already written and evaluate directly over this. **NEA Sheet 20 - Final Prototype photographs and Client** Explain how the final product has been received by the client. Explain any further developments that could be done Explain how the product has completed or not completed the design brief Explain how it could be made commercially viable **PRACTICAL ELEMENT** Students will spend some of their time in the workshop finishing their design solutions into a final prototype. Practical must not now be the main focus. Evaluation and analysis are now more important in terms of marks.	

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	<u>Section 3.1 and 3.2</u> **3.2.5 Using and working with materials** Know and understand in addition to material properties, the factors listed below. Know and understand how different properties of materials and components are used in commercial products, how properties influence use and how properties affect performance. Know and understand the physical and mechanical properties relevant to commercial products in their chosen area as follows. • Timber based materials (traditional timber children's toys and flat pack furniture). • Polymers (polymer seating and electrical fittings). **3.2.6 Stock forms, types and sizes** Know and understand the different stock forms types and sizes in order to calculate and determine the quantity of materials or components required. Commercially available types and sizes of materials and components. Timber based materials: planks, boards and standard moldings • sold by length, width, thickness and diameter • standard components e.g. woodscrews, hinges, KD fittings. Polymers:	During this half term there will be a bigger focus on NEA work rather than purely section 3 theory. Students have an Easter deadline to meet with. Their theory work will still take the form of videos, homework, written work, group research tasks and practice examination style questioning. This work will be recorded into theory books which will build to form a revision resource and collate testing evidence. ✓ Take notes and annotate from written text ✓ Write in their own words rather than copy and paste ✓ Listen to, observe and take important or key information from video resources ✓ Answer short format examination questions based on the topics covered ✓ Answer long format examination questions based on the topics covered ✓ Answer multiple choice format examination questions based on the topics covered ✓ Recall theoretical information week to week through short tests ✓ Understand how the examination scoring works and therefore how this affects the scores they can achieve ✓ Understand how to apply the knowledge learnt to examination questions Know and be able to explain which section of the examination is being covered and how they will know this from looking at the examination paper	❑ Theory Tests/ quizzes on each section – every 2 weeks or on change of topic ❑ Summative theory assessment across the Section 3 topics covered (possible third modified mock done over a double lesson – converted to a percentage for predictive grading purposes ❑ Homework built to extend as well as test knowledge recall

	• sheet, rod, powder, granules, foam and films • sold by length, width, gauge and diameter • standard components e.g. screws, nuts and bolts, hinges. **3.2.7 Scales of production** Select materials and components considering scales of production and referencing the appropriate processes. How products are produced in different volumes. The reasons why different manufacturing methods are used for different production volumes: prototype, batch, mass and continuous. **3.2.8 Specialist techniques and processes** Know and understand the factors listed below. The use of production aids How to use measurement/reference points, templates, jigs and patterns where suitable tools, equipment and processes A range of tools, equipment and processes that can be used to shape, fabricate, construct and assemble high quality prototypes, as appropriate to the materials and/or components selected: wastage, such as: die cutting, perforation, turning, sawing, milling, drilling, cutting and shearing methods of strengthening with additions, such as: lamination, soldering, 3D printing and printing		

	deforming and reforming such as: vacuum forming, bending, folding, blow moulding, casting, injection moulding and extrusion. How materials are cut shaped and formed to a tolerance The manufacture to minimum and maximum measurements. **Commercial processes** • Timber based materials (routing and turning). • Polymers (injection moulding and extrusion). **3.2.8 Specialist techniques and processes** In relation to at least one material category or system, students should know and understand the factors listed below. Quality control The application and use of quality control to include measurable and quantitative systems used during manufacture • Timber based materials (dimensional accuracy using go/no go fixture). • Polymers (dimensional accuracy by selecting correct laser settings). **3.2.9 Surface treatments and finishes** Knowledge and understanding of surface treatments and finishes. The preparation and		

	application of treatments and finishes to enhance functional and aesthetic properties. • Timber based materials (painting, varnishing and tanalising). • Polymers (polishing, printing and vinyl decals).		
Half-term 5 (Weeks 27 – 32)	**All of section 4 as detailed about for NEA and all of section 3.1 as outlined above. For the first two weeks of this term until NEA final submission. Primary focus on weaker areas to improve factual understanding.** **Know and be able to explain the characteristics and style of at least 2 designers/ companies from each listed area:** • Alexander McQueen • Aldo Rossi • Charles Rennie Macintosh	Complete any relevant sections of the NEA that are missing. Complete an evaluation against the criteria from the marking schedule to identify any areas lacking in enough detail. Complete any practical work as necessary. For the first 2 weeks of this term, students will focus solely on their NEA work as the deadline for marks submission to the examination board is the 7th May. Their theory work will still take the form of videos, homework, written work, group research tasks and practice examination style questioning.	❑ Summative Assessment NEA progress assessment with current actual and reflective predictive grade 4.4.4.1 Section A: Identifying and investigating design possibilities (10 marks) 4.4.4.2 Section B: Producing a design brief and specification (10 marks) 4.4.4.3 Section C: Generating design ideas (20 marks) 4.4.4.4 Section D: Developing design ideas (20 marks) 4.4.4.5 Section E: Realising design ideas (20 marks) 4.4.4.6 Section F: Analysing and evaluating (20 marks) ❑ Theory Tests/ quizzes on each section – every 2 weeks or on change of topic ❑ Summative theory assessment across the Section 3 topics covered (modified mock done over a double lesson – converted to a percentage for predictive grading purposes

	• Coco Chanel • Ettore Sottsass • Gerrit Reitveld • Harry Beck • Louis Comfort Tiffany • Marcel Breuer • Mary Quant • Norman Foster • Philippe Starck • Raymond Templier • Sir Alec Issigonis • Vivienne Westwood • William Morris. **Companies:** • Alessi • Apple • Braun • Dyson • Gap • Primark	Lessons may be disrupted due to other final examinations taking place. ✓ Focus on examination techniques to make the most efficient use of time and answering on the examination ✓ Full content coverage of Sections 3.1 and 3.2 where appropriate Intervention strategy to tackle weaker areas for individual students/ full cohort where appropriate. This should be based on data analysis from theory tests, quizzes and summative assessments done throughout the year This work will be recorded into theory books which will build to form a revision resource and collate testing evidence. ✓ Take notes and annotate from written text ✓ Write in their own words rather than copy and paste ✓ Listen to, observe and take important or key information from video resources ✓ Answer short format examination questions based on the topics covered ✓ Answer long format examination questions based on the topics covered ✓ Answer multiple choice format examination questions based on the topics covered ✓ Recall theoretical information week to week through short tests ✓ Understand how the examination scoring works and therefore how this affects the scores they can achieve	❑ Homework built to extend as well as test knowledge recall – weaker student areas to be identifies from data collection

		✓ Understand how to apply the knowledge learnt to examination questions Know and be able to explain which section of the examination is being covered and how they will know this from looking at the examination paper	
Half-term 6 (Weeks 33 – Exam)	All of sections 3.1, 3.2, 3.3 and 4 as appropriate. Detailed above. Areas of study for these weeks are to be identified form data analysis from the testing undertaken over the course of the last 9 months.	Lessons will be disrupted due to other final examinations taking place. ✓ Focus on examination techniques to make the most efficient use of time and answering on the examination ✓ Full content coverage of Sections 3.1 and 3.2 where appropriate ✓ Intervention strategy to tackle weaker areas for individual students/ full cohort where appropriate. This should be based on data analysis from theory tests, quizzes and summative assessments done throughout the year	❑ Final examination – 15th June 2022 PM